The Effectiveness of Classroom Vocabulary Intervention for Adolescents with Language Disorder

Hilary Lowe

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Division of Language and Communication Science
School of Health Sciences
City, University of London

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Declaration

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Abstract

Children who have language disorder frequently have difficulties with vocabulary acquisition, and these difficulties often persist into adolescence. Language disorder is known to be associated with long-term influences on a range of academic, social, emotional, health, and employment outcomes. Phonological-semantic intervention has been shown to be effective in enhancing the vocabulary skills of children with language disorder in small-group or individual settings, but less is known about vocabulary interventions for adolescents with language disorder or interventions in whole-class models of delivery.

This thesis undertook three strands of enquiry: a systematic review; a survey of teaching and speech and language therapy practice; and an experimental effectiveness study. The systematic review of the evidence regarding vocabulary intervention with adolescents confirmed that the use of a phonological-semantic approach in a universal model of delivery is under-researched in this age group. The survey of mainstream secondary school teachers and speech and language therapists showed that a phonological-semantic approach is frequently used by speech and language therapists but less often by teachers. The experimental study investigated the effectiveness of phonological-semantic vocabulary intervention, delivered by teachers and embedded into the secondary school curriculum in a whole-class model of delivery, for adolescents with language disorder.

In the intervention study, 78 adolescents with language disorder aged 11 – 13 years were taught science curriculum words by teachers in class, under two conditions: 1) 10 words taught through usual teaching practice; and 2) 10 matched words taught using an experimental intervention incorporating phonological-semantic activities, embedded into the teaching of the syllabus. Ten matched control words received no intervention. Word knowledge was assessed at pre-intervention, post-intervention, and follow-up timepoints.

The main findings of the study were that: the experimental classroom vocabulary intervention was more effective than usual teaching practice in increasing the word knowledge of participating students; there was a high degree of acceptability for the intervention activities amongst both students and teachers; and there were mixed preferences amongst students for whole-class, small-group, and individual models of intervention delivery.

Clinical and teaching implications include the importance of intervening during the adolescent years, with classroom vocabulary intervention being a viable option for collaborative teacher and speech and language therapy practice.

List of abbreviations

AAN	American Academy of Neurology Classification of Evidence Scheme
ACE 6 - 11	Assessment of Comprehension and Expression 6 - 11
ANOVA	Analysis of variance
BPVS	British Picture Vocabulary Scale
CATV	Cognitive Attainment Test, Verbal subtest
CATNV	Cognitive Attainment Test, Nonverbal subtest
CELF-R	Clinical Evaluation of Language Fundamentals - Revised
CELF-3	Clinical Evaluation of Language Fundamentals, third edition
CELF-4 UK	Clinical Evaluation of Language Fundamentals, fourth edition, UK
Chronological age in years and months e.g. eleven years six months: 11:6	
CPD	Continuing Professional Development
DCSF	Department for Children, Schools, and Families
DfE	Department for Education
DfES	Department for Education and Skills
DLD	Developmental language disorder
DoH	Department of Health
EHCP	Education Health and Care Plan
GCSE	General Certificate of Secondary Education
H1	Hypothesis 1, etc.
ID	Student participant identity number
IQ	Intelligence quotient
IQR	Interquartile range
ITBS	Iowa Test of Basic Skills
ITPA	Illinois test of psycholinguistic abilities
KS3	Key stage 3 (Years 7, 8, and 9; age 11 – 14 years)
KS4	Key stage 4 (Years 10 and 11; age 14 – 16 years)
M	Mean
MSST	Mainstream secondary school teacher
NBSS	National Behaviour Support Service
NIHCE	National Institute of Health and Care Excellence
NVIQ	Nonverbal intelligence quotient
PAN	Published Admission Number
PhAB	Phonological Awareness Battery
PPVT	Peabody Picture Vocabulary Test
PSTM	Phonological short-term memory
RCSLT	Royal College of Speech and Language Therapists

RCT	Randomised control trial
RQ	Research question
SD	Standard deviation
SEF	Social-Emotional Functioning Interview
SEN	Special educational needs
Senco	Special educational needs coordinator
SES	Socio-economic status
SLCN	Speech, language and communication needs
SLI	Specific language impairment
SLT	Speech and language therapist
SLT/T	Dually qualified speech and language therapist and teacher
Spec Sch T	Special school teacher
Spec T	Specialist teacher
SS	Standard score
TA	Teaching assistant
TAWF	Test of Adult/Adolescent Word Finding
TD	Typically developing
TOLD	Test of Language Development
Topic 1	Active control condition: usual teaching practice
Topic 2	Experimental condition: Word Discovery intervention
TOWK	Test of Word Knowledge
TWF	Test of Word Finding
TWFD	Test of Word Finding in Discourse
T.1, T.2 etc	Teacher 1, teacher 2, etc
VEP	Vocabulary Enrichment Intervention Programme
UK	United Kingdom
USA	United States of America
WASI-2	Wechsler Abbreviated Scale of Intelligence, second edition
WASI-2 V	Wechsler Abbreviated Scale of Intelligence, second edition; Vocabulary subtest
WISC-3	Wechsler Intelligence Scale for Children, third edition
WMTBC	Working Memory Test Battery for Children
Y7, Y8, Y9	Year 7, Year 8, Year 9

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Chapter 3

"Some words are tricky"

(student participant identity number 44)

Chapter 1

Language disorder and vocabulary acquisition

Overview

The first chapter of this thesis explores concepts within the field of language disorder, in order to lay a foundation for subsequent chapters in the thesis. Firstly, processes involved in the word learning of typically developing (TD) children are explored. Following this, the chapter turns to language disorder, with a focus on how word learning is affected in children and adolescents with language disorder. The importance of vocabulary skills for academic attainment and long-term life outcomes is also discussed.

1.1 Language

Language may be considered as a medium for communication between members of a society. Bloom and Lahey (1978) illustrate three overlapping components of language: form, content, and use (Figure 1.1).

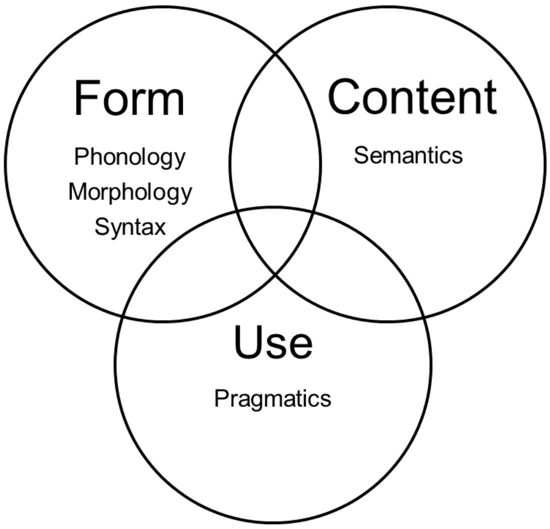

Figure 1.1. Model of language (Bloom & Lahey, 1978, p.22)

Motivation to communicate is central to the use of language: to make our needs and wishes known; to show; to ask for information; to socialise. This is the function or purpose of the message to be communicated, known as the pragmatic aspect of language. The meaning of the message is expressed through the content; through words and their relationship with each other. This is referred to as semantics. Form is the means through which the content of a message is expressed. In spoken language, this entails speech sounds (phonology), word segments (morphology), and the organisation of words into sentences (syntax). Language can also take other forms such as signing or written language.

The focus of this thesis is the interaction between phonological form and semantic content in the context of word learning. Clark (1993, p.259) emphasises the importance of word learning, stating that "the lexicon is basic to language and language use. It provides the context for syntax and the instantiation of syntactic rules, and it is the environment for phonological and morphological patterns." In order to understand the overall context for the current research, word learning in typical development will now be discussed.

1.2 Early word learning in typically developing children

Three aspects of word learning will be considered in this section: semantic representation, phonological representation, and phonological short-term memory.

Early word learning has been widely researched. In the first years of life, word learning becomes very efficient, such that children can learn the meaning of a word, and can use it, with very few exposures; a phenomenon known as fast-mapping (Clark, 1993). In order to learn the meaning of a word, children need to identify a recurring phonological form from the stream of speech, and map that phonological form onto the meaning of the word (Bishop, 2014). To use a word expressively, children need to retrieve the phonological form that they have previously mapped onto the meaning of that word, and access the motor program required to produce the word. Efficient word learners have intact cognitive skills, and motivation to communicate. They also make use of contextual cues to assist them in the mapping process: for example, social, perceptual, or intonational cues (Clark, 1993). The integration of this information enables a lexical representation for each word to develop.

1.2.1 Semantic representation

Semantic representation refers to information about the concept which a word symbolises. The first words which children learn are frequently labels of objects (Clark, 1993). As the vocabulary expands, links with object function and location are made; for example, children begin to associate the word *banana* with the word *eat*, and learn that bananas are kept in the kitchen. A vocabulary for attributes of objects also develops; for example, bananas are *nice, long, yellow.* As children begin to group objects with other similar objects, the words are linked with other words of the same class e.g. *banana, apple, orange*. A hierarchy of superordinate categories such as *fruit, food,* develops, and eventually a taxonomy for each word is built up (Murphy, 2010). Figure 1.2 contains an example of a taxonomy. Each word in a taxonomy continues to be connected to its early-acquired links of function, location, and attribute, resulting in complex semantic networks.

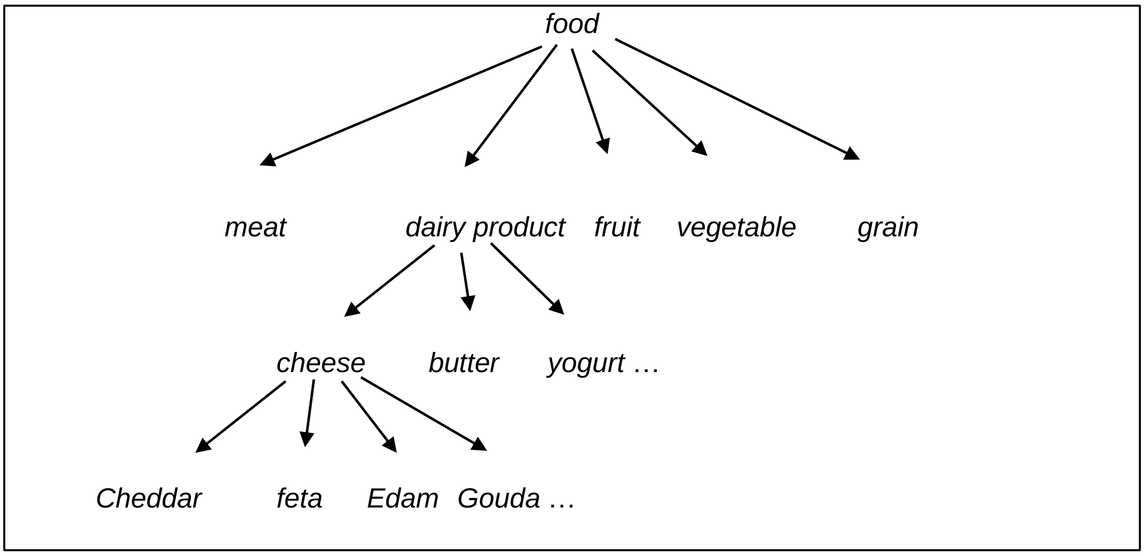

Figure 1.2. A partial taxonomy for *cheese* (Murphy, 2010, p,114)

Many words are polysemous, and semantic networks take this into account. For example, the word *grain* will also belong to another taxonomy related to its meaning of the patterns and textures in wood.

Semantic representations also contain information about the syntactic category of the word, i.e. whether it is a noun, verb, adjective and so on, and thus contain information about how the word functions in a sentence (Murphy, 2010). Some words belong to more than one syntactic category; for example, the word *butter* is a noun in the *cheese* taxonomy (figure 1.2), but can also function as a verb, as in the sentence: “I butter my toast while it’s hot.”

Semantic representations include information personalised to the individual; for example, whether one likes cheese or not will influence whether it is associated with *delicious* or *disgusting*. Furthermore, there is a dimension of appropriacy – the knowledge that it is acceptable to use some words in certain social situations but not in others (Murphy, 2010).

1.2.2 Phonological representation

As well as a semantic component, lexical representation also includes the phonological representation of the word. Phonological representations consist of information about the sound structure of the spoken word. This information can be stored according to the word’s onset phoneme, its rhyme, and its syllable structure. One way of conceptualising how children process phonological information in order to arrive at a phonological representation of a word is through the theoretical speech processing model of Stackhouse and Wells (1997, p.166) (Figure 1.3). The model is divided into input and output processes, each of which is broken down into several levels of processing, with lexical representations in the centre. Input includes phonological awareness skills such as phonetic discrimination and phonological recognition, and output includes skills such as motor programming and motor execution.

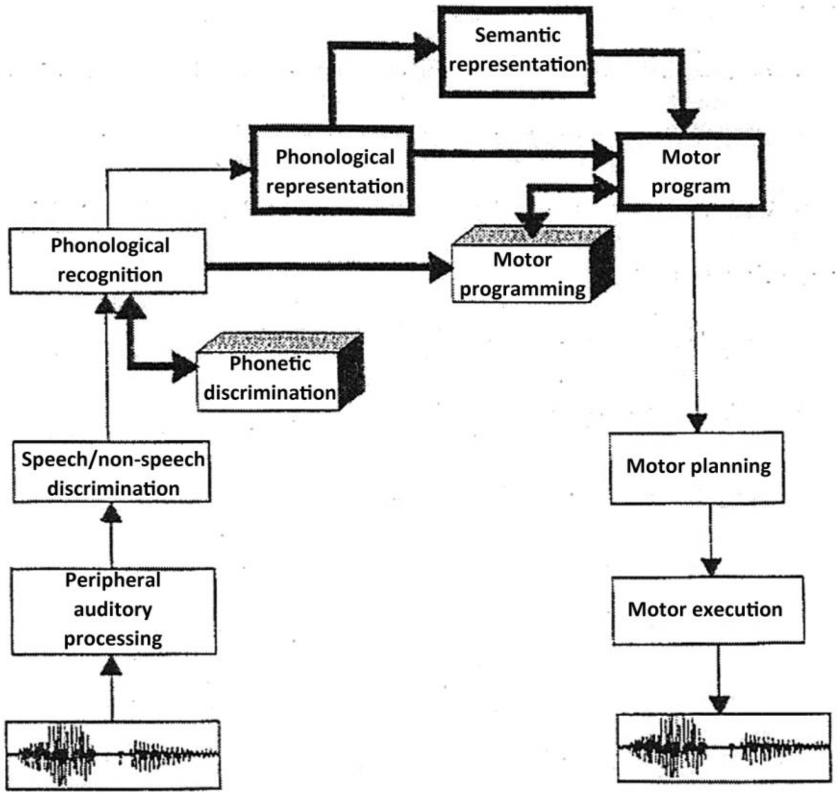

Figure 1.3. Psycholinguistic model of speech processing (Stackhouse & Wells, 1997, p.166)

In a completely independent line of enquiry, Gupta and Tisdale (2009) created a computational model of lexical learning, which had the same essential structure as the theoretical speech processing model described by Stackhouse and Wells (1997). This lends support to the validity of the Stackhouse and Wells' (1997) speech processing model.

1.2.3 Phonological short-term memory

In order to integrate semantic and phonological information, auditory input needs to be temporarily stored as it is processed. The working memory model by Baddeley (2000, p.421) provides a way of conceptualising these processes (Figure 1.4).

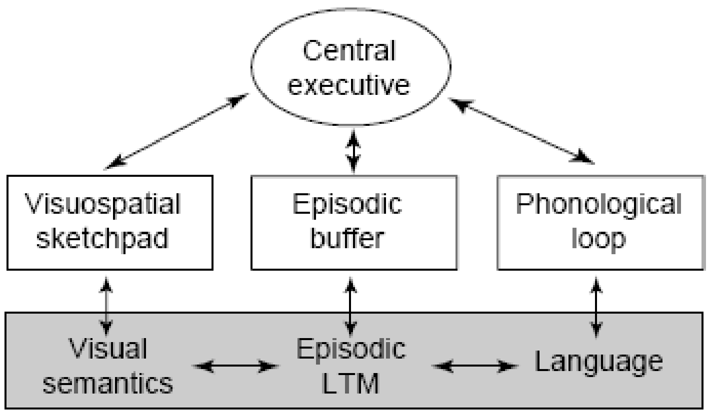

Figure 1.4. A model of working memory (Baddeley, 2000, p.421)

In the working memory model, there are four separate components, which all work together to support everyday cognitive processes such as thinking, learning, remembering and reasoning. The central executive is the overall attentional controller, responsible for focusing, dividing and switching attention as needed. There are two passive temporary storage systems, one for visuospatial information (the visuospatial sketchpad) and one for phonological information (the phonological loop). The phonological loop comprises a phonological store, which holds auditory input passively for 1-2 seconds, and an articulatory rehearsal mechanism, which allows the maintenance of information in the phonological store via a voluntary process of sub-vocal rehearsal. The phonological loop thus allows for the temporary holding of the phonological form of the word while it is processed for understanding. Baddeley et al. (1999) denote this process phonological short-term memory (PSTM). The episodic buffer component of working memory provides extra storage capacity for auditory and visual information, and also allows the use of information from long-term memory to support current learning tasks, supporting the integration of new words within the existing lexicon. Efficient PSTM is thus essential to the operation of Stackhouse and Wells' (1997) speech processing model. This assertion is verified by the computational lexical learning model by Gupta and Tisdale (2009) (see section 1.2.2) which also has a PSTM component.

1.3 Word learning in older children and adolescents

The fast-mapping process is usually applied to the learning of labels for objects in young children, whereas when children get older, the word-learning process becomes increasingly complex. The words which children need to learn and use as they get older become less concrete and more abstract. Children learn to map words onto actions, attributes, and concepts. Opportunities to match a word with a concrete referent, which would enable fast-mapping in a younger child, are not enough. The fast-mapping process does not allow for deep processing of the word, which entails embedding the new word within existing representations (Dockrell, Braisby & Best, 2007). Instead, increased sophistication of cognitive skills is required, and the network of connections needs to be developed. This comprises semantic, grammatical, and phonological elements (Leonard, 1998), thereby enabling increasingly detailed lexical representations.

Older children and adolescents have a bank of knowledge and experiences into which new knowledge needs to be integrated. The study by Dockrell et al. (2007) showed how, even in younger children, a foundation level of knowledge about a domain is necessary in order to acquire meanings of words specific to that domain; for example, some knowledge of *space* was required for TD children aged four to six years (N=233) to learn what *satellite* meant. Another study by these researchers (Best, Dockrell, & Braisby, 2006a) supported this position by showing that TD children aged four to six years (N=80) with higher existing receptive vocabulary levels were more able to name and define four new science adjectives than those with lower existing receptive vocabulary levels. Thus, children accumulate a lexicon with which newly encountered words must be compared and contrasted, in order to establish and adjust the semantic boundaries of the words (Nippold, 2007). Words needs to be encountered several times within meaningful contexts in order to develop a well-rounded understanding (Anderson & Nagy, 1996).

Additional skills also contribute to word learning in older children and adolescents. Literacy is developing during this period: during the school years, language and literacy "enjoy a symbiotic relationship" (Nippold, 1988, p.29). With proficient literacy skills, children and adolescents absorb new vocabulary through reading, with spoken and written language developing hand in hand. Morphological information gained from the written word can be used to provide clues to word meaning. Morphological awareness begins to develop as early as two years of age (Clark, 1993), and continues to increase in a developmental sequence throughout childhood and adolescence (Kieffer & Lesaux, 2007). Children develop knowledge of morphemes such as prefix, root, and suffix, and how these influence meaning. For example, if a child understands that *timid* means "a bit scared", and that the suffix "-ly" describes the way in which an action is carried out, on meeting the word *timorously*, a child may well be able to deduce that it means "as if scared".

Another continuing development throughout childhood and adolescence is that of metalinguistic awareness, enabling adolescents to reflect consciously on the nature of language (van Kleeck, 1984). Van Kleeck related stages of metalinguistic development to Piagetian stages of cognitive development (Piaget, 1952), describing how, during the concrete operational stage (age seven to 11), children become aware of polysemy and learn to understand abstract meanings of concrete words such as *sweet, hard*. With the onset of the formal operational stage, at about 11 years of age, the development of hypothetical reasoning skill allows adolescents to move further beyond the literal to the comprehension and production of figurative language (van Kleeck, p.147). Benelli, Belacchi, Gini, and Lucangeli (2006) expanded on this by showing that 11-year-olds were able to explore word meanings, and discuss the phonological and semantic properties of words. Spencer, Clegg, and Stackhouse (2013) illustrated the relevance of metalinguistic development to success in school through their interviews of 42 14 -- 15-year-olds. The participants demonstrated insight into the nature of their own language, how it defined them as people, and how they were aware that a mastery of relevant vocabulary was necessary for academic success.

Adolescents are able to integrate all these aspects of word learning by operating at a greater level of abstraction, attention control, memory, and processing skill (Ravid, 2004). The development of these skills is perhaps related to the heightened neurological changes taking place during adolescence (Blakemore & Choudhury, 2006). Blakemore and Choudhury's review of magnetic resonance imaging studies revealed ongoing growth of white matter, particularly in the frontal cortex, during puberty and beyond.

1.4 Language disorder

Some children show developmental difficulties acquiring proficiency in their first language. Children may present with receptive and/or expressive difficulties in any of the areas within the form, content and use model by Bloom and Lahey (1978) (figure 1.1). It is widely documented that literacy is also frequently implicated (e.g. McArthur, Hogben, Edwards, Heath, & Mengler, 2000; Stanovich, 1986).

1.4.1 Defining language disorder

Leonard (1998) used the term specific language impairment (SLI) to denote this difficulty with language acquisition, in which the language difficulty is the primary need of the child, and where language is disordered relative to other areas of development. He proposed the following criteria:

- Language test scores of -1.25 standard deviations (*SD*) or lower below the normative mean
- Nonverbal intelligence (NVIQ) standard score[1] (SS) 85 or higher
- Normal hearing with no recent episodes of otitis media with effusion
- No evidence of seizures, cerebral palsy or brain lesions
- No abnormality of oral structure or function
- No symptoms of impaired social interaction.

Leonard's criteria, being largely exclusionary, are a simplification of the phenomenon, and exclude some children who do have difficulties with language. The use of a verbal-nonverbal discrepancy has been widely used in research in order to study language impairment. However, the relationship between verbal and nonverbal abilities is complex, particularly as children mature. Leonard et al. (2007), for example, found that 14-year-old children with language impairment were slower at responding to both verbal and nonverbal stimuli. Botting (2005) showed that NVIQ decreased in children and adolescents with language impairment between the ages of seven and 14, which led her to propose that language and nonverbal ability have a dynamic and reciprocal relationship. She suggested that cognitive mechanisms such as working memory may be the underlying factor in this relationship.

In order to arrive at a better definition of difficulties which are specific to language, inclusionary criteria have been considered. Differences have been found between children with SLI and TD children in tasks of non-word repetition, sentence repetition, and verb tense marking (Conti-Ramsden, Botting & Faragher, 2001). These have all been proposed as clinical markers of SLI, with Conti-Ramsden et al. finding that sentence repetition was the most sensitive. The use of such criteria acknowledges those who have language difficulties in association with other conditions, such as congenital syndromes or hearing impairment, or co-occurring neurodevelopmental disorders such as dyspraxia or attentional difficulties.

Differing perspectives of what constitutes language impairment culminated in a recent international Delphi exercise (Bishop, Snowling, Thompson, Greenhalgh, & CATALISE consortium, 2016; 2017), which proposed a definition of language impairment and its accompanying terminology. The exercise encompassed the views of research, clinical, and educational communities, as well as people with language impairment and their carers. It concluded with a consensus for the term *language disorder* to refer to those who have difficulties acquiring their first language. Where these difficulties occur in association with a biomedical condition, the term *language disorder associated with X* was recommended; otherwise, it was

[1] A standard score is an individual test score expressed as the deviation from the mean score of a normative sample. If the mean value is 100, one standard deviation is 15.

proposed that the term *developmental language disorder* (DLD) should be used. It was recognised that DLD can co-occur with other neurodevelopmental conditions such as dyspraxia or attention deficit disorder. A number of risk factors for DLD were identified, including a positive family history, and lower socio-economic status (SES).

This approach acknowledges that DLD may have various aetiologies. The association between a positive family history and language disorder suggests the presence of a genetic factor, a view that is supported by twin studies which show a higher concordance of the presence of language disorder between monozygotic twins than between dizygotic twins (Bishop, 2014). Molecular studies provide explanatory evidence; for example, genetic sequences on chromosome 16q which are related to language disorder, and mutations of specific genes; but it is likely that, rather than being the responsibility of a single gene or genetic site, there is a more distributed genotype underlying language disorder (Norbury, Tomblin, & Bishop, 2008).

A purely genetic account for language disorder does not acknowledge the contribution made by the environment. This is illustrated in part by the association between SES and language disorder. Converging evidence suggests that children growing up in areas of social disadvantage are at risk of low language levels (Hart & Risley, 1995; Locke, Ginsborg, & Peers, 2002). Hart and Risley undertook a longitudinal observational study of parent-child interaction with 42 children between the ages of eight months and three years. They found that children in families of lower SES heard less than a third of the number of words per hour than children in families of higher SES, impacting on the number of words which the children learnt. Multiple regression analysis indicated that parenting style was the key predictor rather than the economic status per se.

Differences in language ability relative to SES continue through childhood and adolescence. Spencer, Clegg, and Stackhouse (2012) compared a cohort of 103 12 – 14-year-olds from an area of social disadvantage with an age-matched group of 48 peers from an area of relative social advantage. The social disadvantage group performed significantly less well than the social advantage group on four out of six standardised language assessments. The social disadvantage group was at particular risk of low vocabulary scores: the lowest language scores for the social disadvantage group were found in receptive vocabulary, with a group mean (*M*) SS of 85.21 (*SD* = 12.89), on the British Picture Vocabulary Scale 2 (BPVS-2: Dunn, Dunn, Whetton, & Burley, 1997) compared with the social advantage group mean SS of 100.46 (*SD* = 20.61).

To conclude, genotypical and environmental influences interact to produce the particular profile of language difficulty within each individual child. In this thesis, the term *language disorder* will be used to refer to a difficulty with first language acquisition due to any aetiology. When referring to studies which use other terms, the terminology of the authors concerned will be used. One term in common usage in educational settings since the introduction of the Special Educational Needs (SEN) Code of Practice (Department for Education and Skills (DfES), 2001), is *speech, language, and communication needs* (SLCN). This is used as an overarching term for any type of difficulty with speech, language, or communication skills (Department for Education (DfE) & Department of Health (DoH), 2015), of which language disorder is just one example.

1.4.2 The prevalence and natural history of language disorder

A widely-quoted prevalence figure for language disorder comes from Tomblin et al. (1997), who carried out a cross-sectional epidemiological study in the USA, screening 7,844 children for SLI, and administering further diagnostic testing on 2,084 children who failed the screen. The criteria used for a diagnosis of SLI was performance below 1.25 *SD* from the normative mean on at least two of five language measures, in the context of age-appropriate nonverbal ability. Tomblin and colleagues chose this cut-off point to maximise the trade-off between sensitivity and specificity. Thus, they arrived at a prevalence figure for SLI in five-year-olds of 7.4%.

Recent research in the UK by Norbury et al. (2016), employed a stricter cut-off point on language assessment (-1.5 *SD*), as being consistent with other previous studies and clinical practice. However, unlike Tomblin et al. (1997), they included children of below average nonverbal ability. On this basis, 7.58% of five-year-old children were found to have language disorder as their primary need. When children with a known medical diagnosis or intellectual disability were included, the prevalence figure rose to 9.92%. Under the classification recommended by Bishop et al. (2016), where language disorder is defined so as to include those who have language disorder in association with a bio-medical condition or intellectual disability, this latter figure is more likely to represent the numbers of children who, at school entry, have a language need which requires support.

Language disorder has been shown to persist into adolescence. Law, Boyle, Harris, Harkness, and Nye (2000), conducted a systematic review of prevalence studies, drawn from a number of English-speaking countries, and covering an age range from birth to adulthood. They arrived at a median figure for “language delay only” (p.169) of 6.8%, and extrapolated from the data that prevalence changes little over the childhood years. However, this prevalence figure referred to “primary speech and language delay” (p.165), and inspection of the individual studies cited in the review reveal that the studies covering the older age range pertained to speech delay only: the oldest age covering language delay only was seven years.

Nonetheless, the notion that language disorder persists into adolescence is strongly supported by a range of longitudinal studies which have followed children with language disorder into adolescence and adulthood. Beitchman et al. (1994), in the Ottawa Study, followed up 101 children who had been identified with speech and/or language disorder at five years of age, and reassessed them at 12 years of age. The criteria for impairment was more than one *SD* below the mean on one of the following: the spoken language quotient of the Test of Language Development (TOLD: Newcomer & Hammill, 1988); the Peabody Picture Vocabulary Test (PPVT: Dunn & Dunn, 1981); or the content and sequence subtests of the Goldman-Fristoe-Woodcock auditory memory tests (Goldman, Fristoe, & Woodcock, 1974): or more than two *SD* below the mean on any of the TOLD subtests. The TOLD subtests are Picture Vocabulary, Oral Vocabulary, Grammatic Understanding, Sentence Imitation, Grammatic Completion, Word Discrimination, and Word Articulation. The PPVT is a receptive vocabulary test in which the child hears a word and points to the appropriate picture out of a choice of four. Of the children who had shown receptive or receptive/expressive language difficulties (without speech difficulties) at five years old (21 out of 101), 81% still showed impairment at 12 years. Although this seems a small sample, the one-in-three stratified random sampling method used in this longitudinal study gives some confidence that this figure can be taken to be representative of a wider population.

The Ottawa cohort was followed up again at 19 years of age (Johnson et al., 1999). Stability in language status over time was indicated by a high positive correlation of language measures for individuals across the three timepoints at ages five, 12, and 19 years (r = 0.83). Group classification was reported slightly differently here, resulting in a larger cohort of participants who had been identified as language-impaired (with or without speech difficulties) at five years old (N= 103): 73% of these remained language-impaired at 19 years. From the data, the authors calculated a prevalence rate for language impairment of 11.7%. Vocabulary continued to be an area of difficulty: the group mean SS on the Test of Adult/Adolescent Word Finding (TAWF: German, 1990) was 81 (*SD* = 15). This cohort were followed up again at 25 years of age (Johnson, Beitchman, & Brownlie, 2010). At this point, the only language measure administered was the Peabody Picture Vocabulary Test 3rd Edition (PPVT-3: Dunn & Dunn, 1997). The mean SS on this assessment for the language-impaired group at age 25 years was 93. Direct comparisons across time are difficult to make as the PPVT-3 is a receptive vocabulary assessment, whereas the TAWF is an expressive assessment; nonetheless, comparisons with control groups at 25 years of age indicate continued lower vocabulary levels for the language impaired group (M = 93) relative to TD controls (M = 109) and speech-impaired controls (M = 107).

Research by McLeod and McKinnon (2007) supported this finding by suggesting a prevalence rate for communication disorder of 12.5% of 11 – 16-year-olds from a Catholic diocese in Sydney. McLeod and McKinnon used a broad classification of communication disorder, based on teacher perceptions of learning need rather than psychometric testing.

Other studies have found similar patterns. Botting, Faragher, Simkin, Knox, and Conti-Ramsden (2001) followed up 117 children at 11 years of age, in the Manchester Language Study. The children, who had been recruited from language units (specialised language settings within a mainstream school) at seven years of age, were included in the follow-up study if, at the age of seven, they had scored within 2 *SD* of the mean on NVIQ assessment, but more than one *SD* below the mean on at least one of the standardised language assessments administered. At 11 years of age, using the same criteria but excluding those with pragmatic difficulties according to the Children’s Communication Checklist (Bishop, 1998), difficulties on a range of language measures were still present. Vocabulary appeared to be one of the most recalcitrant of language skills over time: at seven years, 36% of the children scored below the 16th percentile on The British Ability Scales naming vocabulary subtest (Elliot, 1983), and at 11 years of age, 89% scored below the 16th percentile on the Expressive Picture Test (Williams, 1997). At seven years, no receptive vocabulary measure was reported, but at 11 years, 88% of the children performed below the 16th percentile on the BPVS-2. Thus, Botting and colleagues replicated the findings of Beitchman and colleagues (1994; 1999) in terms of the persistence of language disorder into adolescence, and extended the findings to a UK population.

To summarise, there is a strong body of evidence indicating that approximately 7 - 8% of five-year-old children have language disorder as their primary need, and a further 2 - 3% of children have language disorder in association with another condition. Language disorder frequently persists into adolescence and even adulthood, with a prevalence rate for those requiring support in adolescence reaching approximately 12%.

These figures are of particular importance as they suggest a considerable need for vocabulary support in the adolescent age range, a key theme in the current thesis. The next section will consider how word learning is affected in children and adolescents with language disorder.

1.5 Word learning in children and adolescents with language disorder

Children with language disorder are often late in their acquisition of early words (Hulme & Snowling, 2009), and show deficits in receptive vocabulary, expressive vocabulary, and word recall (Leonard, 1998). A number of studies have described the differences in lexical acquisition between TD children and children with language disorder in the pre-school and school-age years. Oetting, Rice, and Swank (1995), for example, studied 28 children with SLI and 60 TD children, aged six to eight years. Criteria for SLI in this study was one *SD* below the mean on the PPVT and at least one other standardised language test, and a nonverbal SS of 85 or above on the standardised assessments routinely used in the child's locality. The children were exposed to 20 experimental words, five times each, through viewing video clips. The words were not explicitly defined but occurred in context. The researchers compared the word learning of these children with pre-school (three-year-old) children from a previous study (Rice & Woodsmall, 1988). The TD pre-schoolers learnt an average of 1.56 words, whereas pre-school children with SLI learnt 0.7 words; TD school-age children (six to eight years old) learnt an average of 4.67 words; whereas school-age children with SLI learnt 2.29 words. The authors concluded that the word-learning rate of the school-age children with SLI was more comparable to TD pre-schoolers than to their age-matched peers.

Another study illustrating the differences in lexical acquisition between TD children and children with SLI was by Gray (2005). Criteria for SLI was based on 1.5 *SD* below the mean on two standardised language tests, and a nonverbal SS of 75 or above on the Kaufman Assessment Battery for Children (Kaufman & Kaufman, 1983), an assessment of cognitive ability. Twenty-four children with SLI and 24 age-matched TD children took part in daily word learning trials over 19 days. Four familiar objects and four unfamiliar objects were used. In fast-mapping trials, the children were taught novel names for these objects through modelling, comprehension, and naming tasks. The children then participated in word learning trials following the same structure, but with the addition of direct requests for imitation, plus the provision of either a semantic cue or a phonological cue. Comprehension and naming was assessed using pictures of the objects. The TD children required significantly fewer trials than the children with SLI to achieve word comprehension in both the semantic cue and the phonological cue conditions. For the children with SLI, semantic cues supported comprehension, while phonological cues supported naming, leading Gray to hypothesise that naming might be related more to phonology than to semantics.

Apart from the different threshold for nonverbal ability, the cohorts in these two studies are similar, providing supporting evidence that word learning in children with language disorder is compromised, and moreover, Gray (2005) illustrates the different roles that semantics and phonology may potentially play.

Vocabulary continues to be a challenge for older children and adolescents with language disorder. McGregor, Oleson, Bahnsen, and Duff (2013) found a pattern of limited breadth and depth of vocabulary knowledge persisting through the school years. One hundred and seventy-seven children who had been diagnosed in kindergarten according to the criteria in Tomblin et al. (1997) (see section 1.4.2) were assessed in Grades 2, 4, 8, and 10 (age seven to 16 years). They used the expressive subtest of the Comprehensive Receptive and Expressive Vocabulary Test (Wallace & Hammill, 1994), which is a definition production task, and compared their performance on this subtest with that of 325 TD children. Breadth of vocabulary was determined by the number of words defined correctly, and depth of vocabulary was determined by assigning a rating to the information contained in the definition. Even though 61/177 children (35%) outgrew their initial diagnosis of language impairment over time, both the breadth and depth scores of the children originally identified as language-impaired remained consistently and significantly below that of the TD group at all four timepoints.

Rice, Oetting, Marquis, Bode, and Pae (1994) suggested that children with language disorder do have the capacity to learn new words, as long as there is sufficient input. They compared the word learning of 30 children with SLI aged four years three months to five years nine months (4:3 – 5:9) with 30 age-matched controls and 30 language-matched controls. The children were exposed to eight experimental words through the viewing of two video clips in three conditions: one where the experimental words occurred 10 times; one where the experimental words occurred three times; and one where the experimental words were substituted for eight control words. The TD children in the group receiving three word-exposures made significant gains in word knowledge, unlike the children with SLI in this group, who failed to make significant gains. In contrast, the children with SLI in the group receiving 10 word-exposures did make significant gains, at the same rate as the age-matched TD children. This led Rice and colleagues to suggest that there is a minimal input constraint on the frequency of word exposure, which enables word learning to occur. This evidence supports the finding of Hart and Risley (1995), described in section 1.4.1, that the greater the input, the more words were learnt. Thus, increased exposure can enhance the word learning of children with language disorder. However, the children with SLI in Rice et al.’s (1994) study did not retain the word knowledge as well as the age-matched TD children as little as one to three days later, suggesting that increased exposure alone was insufficient. One possible explanation for this is that the lexical representations which the children with SLI assembled were too shallow or fragile to be maintained.

The next three sections discuss possible factors underlying the cause of shallow or fragile lexical representations, further discussing aspects of word learning previously mentioned: semantic representation (section 1.2.1); phonological representation (1.2.2); and PSTM (section 1.2.3).

1.5.1 Deficits in semantic representation

Some researchers have hypothesised that poorly developed and disorganised semantic representations account for the vocabulary difficulties of children with language disorder. In younger children, inefficiently organised taxonomies (section 1.2.1) result in confusions between like terms, e.g. *knife/fork*, and limited ability to categorise words into superordinate categories. In older children, semantic limitations manifest as difficulties with: generalising meanings of words to new contexts; understanding the subtle connotations of words with similar meaning e.g. *frustrated* and *irritated (*Culatta & Wiig, 2006); and understanding figurative application of concrete words such as *sweet*, *hard* (Dockrell & Messer, 2004). Kail and Leonard (1986) proposed that if words are inefficiently stored within the semantic system, this has consequences not only for depth of understanding but also for a child's ability to retrieve a word in order to use it expressively.

McGregor, Newman, Reilly, and Capone (2002) provided support for Kail and Leonard's proposal. These researchers compared the object naming and semantic representations of 16 children with SLI aged 5:0 – 7:11 with that of 16 age-matched TD peers. Although the types of naming errors of both groups were similar, the children with SLI named fewer items and had sparser semantic representations, as assessed through a drawing task, than their age-matched peers. Further support comes from Alt, Plante, and Creusere (2004), who investigated the word learning of children with SLI aged four – six years using non-words. The children with SLI learnt fewer semantic features of newly taught non-words relative to age-matched controls, and recognised fewer lexical labels on a receptive task.

Together, these studies provide evidence that poorly developed semantic representations impact on both receptive and expressive aspects of word learning.

1.5.2 Deficits in phonological representation

Another hypothesis is that phonological processing difficulties result in weak phonological representations, affecting word learning. Examples of weak phonological representations in children with language disorder can be illustrated by the production errors they make e.g. [nɒkamilaz] for *binoculars* (Constable, Stackhouse, & Wells, 1997), and also by the comprehension errors they make between similar sounding words e.g. *contract/extract, ascending/descending* (from the current researcher's records). Inefficient skills on the input side of the speech processing model (Stackhouse & Wells, 1997) (figure 1.3) may result in "fuzzy phonological representations" (Stackhouse, Pascoe, & Gardner, 2006, p.240), whereby an inaccurate phonological form of a word is stored. Inefficient output skills serve to weaken the representation still further, as inaccurate production interferes with the storage of accurate phonological information. Constable et al. accounted for the word-finding difficulties of a 10-year-old boy by difficulties at several levels of the speech processing model, both input and output, while his semantic skills appeared largely intact.

1.5.3 Deficits in verbal working memory

Closely linked with phonological processing is the phonological loop of Baddeley's (2000) working memory model (section 1.2.3). An inefficient phonological loop could result in difficulties holding the phonological form of the word in temporary storage, impeding the processing of semantic content. Evidence for this comes from non-word repetition tasks, which have been widely used as a way of measuring relatively pure PSTM. Even though other abilities may also be involved in a non-word repetition task, such as awareness of language structure, phonological awareness skills, and speech production skills, there is limited reliance on the central executive. Non-words have no pre-existing semantic representations, so long-term knowledge is of restricted use in supporting performance on the task. In TD children, the evidence is strong for links between PSTM and language. For example, Gathercole and Baddeley (1993) found significant correlations between non-word repetition and vocabulary knowledge in TD children aged four, five, six, and eight years. They used cross-lagged correlations to determine the direction of causality, showing that PSTM capacity affects the ability of children to learn new words. With increasing age, there was less influence of PSTM on vocabulary acquisition, and it was posited that this was because older children could draw on an existing lexicon both phonologically and semantically; thus, executive-loaded verbal working memory may play a greater part. Leonard et al. (2007) provided supporting evidence of this, through latent variable regression analyses of children with and without language impairment. Their regression model did not separate the effects of PSTM and executive-loaded verbal working memory, as they used two PSTM assessments and two executive-loaded verbal working memory assessments, collapsing these into one verbal working memory variable. Verbal working memory nevertheless accounted for the greatest variance in language ability in 14-year-olds, over motor speed, non-linguistic cognitive speed, linguistic speed, and nonverbal working memory.

A recent review by Henry and Botting (2017) confirmed that not only is there a marked PSTM component involved in language disorder, but also that there is strong evidence for links between executive-loaded verbal working memory and language disorder, in children aged four to 14 years. Executive-loaded verbal working memory is particularly implicated when attempting to process phonological and semantic information concurrently; for example, accessing semantic representations of a word while holding its phonological form in temporary storage – a skill which is relevant for vocabulary acquisition.

1.5.4 The interaction between semantic representation and phonological processing skills

The current researcher's view is that semantic and phonological accounts for vocabulary difficulties do not stand in opposition to one another. Rather, it is likely that both are relevant in children with language disorder to varying degrees. The research of Lahey and Edwards (1999) provided evidence of this, examining the language profiles of children who made different types of naming errors. Children with SLI aged 4:3 to 9:7 made both phonological and semantic errors, but children who had expressive-only SLI made a greater percentage of phonological errors, and children with expressive-receptive SLI made a greater percentage of semantic errors. This suggests that for some children with language disorder, relatively weaker phonological skills are the main foundation for their word learning difficulties, particularly affecting naming, whereas for others, relatively weaker semantic representations have greater influence, particularly affecting comprehension. This position supports the view of Gray (2005) (section 1.5). However, as was described in section 1.5.2, a strong phonological representation is also necessary for word comprehension; therefore, it is difficult to entirely dissociate the phonological and semantic aspects of word learning. An inaccurate or unstable phonological representation could result in a tenuous link between a word's phonological form and its semantic representation, impeding efficient receptive word learning as well as word retrieval. If the semantic system is also poorly developed, this would compound the difficulty.

Further evidence for this position comes from Nash and Donaldson (2005), who taught eight words to 16 children with SLI aged 5:5 – 9:0, 16 age-matched controls and 16 vocabulary matched controls. Semantic information was provided either incidentally through a story context, or explicitly through pictures and a definition. Phonological information was not explicitly provided. Semantic and phonological knowledge was assessed at two timepoints, after six exposures and after 12 exposures to each word. Semantic representation was assessed by a word definition production task, a meaning recognition task, and a picture selection task. Phonological representation was assessed by a naming task and a pronunciation judgement task. For all groups of children, the explicit teaching condition had a greater impact on word learning than the incidental condition on two of the three semantic tasks, but there was no differential impact between the groups on the phonological tasks. Because the children with SLI performed significantly lower than age-matched controls on all tasks at both timepoints, and less well than the vocabulary-matched controls on the naming task (tapping phonological knowledge) at the second time-point, Nash and Donaldson suggested that semantic naming errors could be a result of either semantic weaknesses or phonological weaknesses. They refer to this as a dual deficit position in which both phonological and semantic difficulties interact to produce word learning difficulties.

To conclude, children and adolescents with language disorder are vulnerable to word learning deficits. For some children, the basis of these difficulties may lie in inadequate semantic skills resulting in weak semantic representations. For others, limited phonological processing skills result in inaccurate phonological representations, with weak verbal working memory serving as a further contributory factor. The present thesis takes the position that semantic and phonological processing skills interact to produce a unique constellation of language strengths and weaknesses within each child and adolescent.

The next sections will outline why language disorder, and specifically vocabulary difficulties, have such a profound effect on a child's development.

1.6 Language disorder and academic attainment

The school curriculum is delivered through the medium of language; consequently, language disorder could be expected to have an impact on academic success. Johnson et al. (1999) investigated academic outcomes of the Ottawa cohort, using standardised reading, spelling, and maths assessments. There were 78 19-year-olds with language impairment at this follow-up timepoint, and 128 TD controls. The mean SS of the language impairment group were: reading 91, spelling 92, and maths 88. By contrast, those of the TD were much higher: reading 113, spelling 106, and maths 107. At this timepoint there were also differences in nonverbal ability between these two groups (language impairment group M = 92, TD group M = 110), but bearing in mind the interaction between language and NVIQ (Botting, 2005) (section 1.4), this is unsurprising. Johnson and colleagues' findings illustrated potential differences in academic attainment between adolescents with language impairment and their TD peers, although the statistical significance of group differences was not stated, and NVIQ was not controlled for. Furthermore, this study did not elucidate how adolescents with language disorder fared in examinations.

Stothard, Snowling, Bishop, Chipchase, and Kaplan (1998) concurred with Johnson et al. (1999) on the influence of language on literacy outcomes. They found that SLI persisting beyond the age of 5:6 was associated with lower literacy composite scores on the Wechsler Objective Reading Dimensions test (Wechsler, 1993) at 15 years of age, in a longitudinal study of 71 participants. Snowling, Adams, Bishop, and Stothard (2001), following up children from the same cohort, addressed the issue of the impact on examination results. The found that only 8.3% of the persistently language-impaired group (N=30) obtained five or more GCSE[2] passes at grades A – C, compared to 67.4% of the TD control group (N=49). This is a high percentage for the control group, given a national average in 1999 of 47.8%. Dockrell, Lindsay, Palikara, and Cullen (2007) suggested a slightly more positive picture, such that 12.8% of 65 adolescents with SLI gained five GSCEs at grades A – C. However, at that time, the national average had also risen, to 56.3% (DfE, 2015) so it is debatable whether this represented progress in real terms.

Unlike Johnson et al. (1999), Conti-Ramsden, Durkin, Simkin, and Knox (2009), controlled for NVIQ in the Manchester Language Study, thus enabling investigation of the specific impact of language on academic attainment. They studied 120 adolescents who had a history of SLI, and 121 TD controls. Current language status was established using the Word Classes and Recalling Sentences subtests of the Clinical Evaluation of Language Fundamentals - Revised (CELF-R: Semel, Wiig, & Secord, 1987). After controlling for IQ and maternal education, early and concurrent literacy and language were predictive of examination success at 16+. A mean of 1.7 (SD = 2.7) GSCE grades A* - C were achieved by the SLI group, compared with 6.5 (SD = 3.8) by the controls.

[2] General Certificate of Secondary Education examinations, taken in the UK at the age of 16.

The converging findings of these studies provide strong evidence of the links between language skills and academic success. The next section will look specifically at the relationship between vocabulary knowledge and academic attainment.

1.6.1 Vocabulary knowledge and academic attainment

Vocabulary knowledge is an aspect of language that is particularly crucial for accessing the curriculum. The influence of vocabulary knowledge on reading comprehension has been demonstrated both in TD children and in children with a family history of dyslexia. Nation and Snowling (2004) examined the relationships between oral language skills at 8:5 and reading ability at 13 years in a cohort of 72 TD children. Phonological skills, measured by bespoke rhyme generation and rhyme judgement tasks, and expressive vocabulary, measured with the vocabulary subtest of the Wechsler Intelligence Scale for Children (WISC-3: Wechsler, 1991), were both strong predictors of word recognition and reading comprehension. These findings were supported by Snowling, Muter, and Carroll (2007), who classified 50 12 – 13-year-olds on the basis of family history and current reading levels into three groups: children with dyslexia, children at risk of dyslexia but unimpaired, and age-matched TD children. There was a significant main effect of group for all language measures (Vocabulary and Verbal Similarities subtests from the Wechsler Abbreviated Scale of Intelligence (Wechsler, 1999), a bespoke sentence recall task, and a bespoke phoneme awareness task), with both the at-risk unimpaired and the control groups performing better than the dyslexia group.

These findings emphasise the association between vocabulary and reading outcomes. The amount a child reads also plays an important part in long-term vocabulary development. Muter and Snowling (2009) found that the amount of a child's exposure to print was a predictor of reading achievement at eight years of age, meaning that the less a child reads, the less their reading develops. This impacts upon vocabulary development, because children and adolescents typically absorb new vocabulary through derivation of meaning from context during reading, as well as direct instruction (Nippold, 2007). In a vicious circle, limited vocabulary, in turn, impacts on the further development of reading, particularly affecting reading comprehension. Stanovich (1986, p.360) uses the term the 'Matthew effect' ("the rich get richer and the poor get poorer") to describe this reciprocal relationship between vocabulary knowledge and reading ability.

It has already been noted that language and literacy ability are associated with examination success at 16+ (Conti-Ramsden et al., 2009). Croll (1995) provided evidence of the contribution that vocabulary makes to this. Croll followed up 101 children from the Bristol Study (Wells, 1986) at 16 years of age. There were two cohorts of children: the older cohort took 'O' levels and Certificates of Secondary Education[3]; and the younger cohort took GCSEs. Receptive vocabulary was assessed at 3:3 with the English Picture Vocabulary Test (Brimer & Dunn, 1962). In both cohorts, a significant correlation between receptive vocabulary at 3:3 and 16+ examination results was found.

[3] 'O' levels and Certificates of Secondary Education were examinations taken in the UK at the age of 16. They were replaced by GCSEs in 1988.

In summary, the effects of language disorder and vocabulary difficulties on academic outcomes are well established in the literature. In addition, language disorder is frequently associated with behavioural, social, and emotional difficulties, and continues to be implicated in a range of long-term occupational and psychiatric outcomes. These will be discussed in the following sections.

1.7 Language disorder and behaviour

Links between language disorder and behaviour have been shown in a number of studies. Benner, Nelson and Epstein (2002) conducted a systematic review of 26 studies which explored the prevalence of co-occurring language disorder and emotional and behavioural difficulties. Overall in the studies reviewed, which covered an age range of four to 19 years, 71% of children who had been identified with emotional and behavioural difficulties also experienced clinically significant language deficits, and 57% of children with diagnosed language deficits also experienced emotional and behavioural difficulties. The authors stated that these relationships were correlational and were unable to comment about direction of causality.

It is now widely recognised that behavioural difficulties are often the outward manifestation of an underlying factor such as social or emotional well-being (Ofsted, 2005), a position supported by recent research (Bornstein, 2017).

1.8 Social well-being

Using the friendships and social relationships section of the Social-Emotional Functioning Interview (SEF: Howlin, Mawhood, & Rutter, 2000), Durkin and Conti-Ramsden (2007) assessed 121 15-year-olds with SLI from the Manchester Language Study cohort, and 118 TD peers. The groups were matched on age and SES. The SLI group mean SS on the CELF-R Word Classes (Receptive) subtest was 83.7 (*SD* = 16.5); on the Recalling Sentences subtest, 73.6 (*SD* = 10.3); and on the WISC-3 Performance IQ scale, 84.3 (*SD* = 18.8). The means for the TD group were 99.9 (*SD* = 13.3); 97.5 (*SD* = 14.9); and 101 (*SD* = 15.2) respectively. The SEF is a structured interview where responses are coded and scored following assessment. The students and their parents also completed the Strengths and Difficulties Questionnaire (SDQ: Goodman, Meltzer, & Bailey, 1998). This questionnaire, completed by students, parents, and teachers, has scales for Emotional Symptoms, Conduct Problems, Hyperactivity/Inattention, Peer Relationship Problems, and Prosocial Behaviour. The first four scales can be combined to obtain a Total Difficulties score. Based on three self and parental report measures, elicited during the SEF (having a normal range of non-intimate relationships; having more than one friend with shared interests; and having one or more relationship involving sharing and seeking contact), only 60% of the adolescents with SLI reported good friendship quality, compared to 97% of the TD peers. Fifty-four percent reported having a normal range of non-intimate relationships, compared to 92% of the TD peers. Even after controlling for NVIQ, the SDQ Prosocial score, and the SDQ Total Difficulties score, language remained predictive of reported friendship quality.

Clegg, Hollis, Mawhood, and Rutter (2005) showed the impact of language disorder on social well-being into adulthood. They followed up 17 men in their thirties (mean age 36 years; range 33:0 – 38:1) who had had receptive language disorder when recruited at seven years of age. At the age of seven, group mean verbal IQ SS of the cohort of 18 children on the Wechsler Intelligence Scale for Children (Wechsler, 1949) was 76.5 (*SD* = 10.82) while the group mean NVIQ SS was 90.81 (SD = 10.47) (Bartak, Rutter, & Cox, 1975). In the follow-up study, non-language-disordered siblings of each participant (apart from for one participant who had no siblings) acted as controls (mean age 36:10; range 25:0 to 44:0). Clegg et al. also used the SEF, but an earlier version (Rutter et al., 1988). They found that only 47% of the men in the language disorder group reported a normal range of friendships, compared to 100% of their siblings. These figures are comparable to those of Durkin and Conti-Ramsden (2007), thus providing corroborative evidence.

1.9 Emotional well-being

As well as an association between language and social well-being, there is evidence for an association between language disorder and emotional well-being. Joffe and Black (2012) recruited students (mean age 12:8; *SD* = 4 months) from mainstream secondary schools (serving 11 – 16-year-olds), who had low academic attainment according to school records. Following language assessment, 352 students were included who scored -1 *SD* below the mean on at least two of the assessments or -1.5 *SD* below the mean on one assessment. Language assessments included: the BPVS-2; the Formulated Sentences and Recalling Sentences subtests of the Clinical Evaluation of Language Fundamentals—Fourth Edition (CELF-4; Semel, Wiig, & Secord, 2003a); and the Expressive Vocabulary, Multiple Contexts, and Figurative Usage subtests of the Test of Word Knowledge (TOWK: Wiig & Secord, 1992). Although these students had no formal diagnosis of language disorder, and were not in receipt of speech and language therapy support, their language assessment profiles indicated a difficulty with language sufficient to impede their access to the curriculum. Students, parents, and teachers completed the SDQ for each student. On the Emotional Symptoms, Conduct Problems, Hyperactivity, and Peer Relationship Problems scales of the SDQ, a higher score indicates greater difficulty. On the Prosocial Behaviour scale, a lower score indicates greater difficulty. The students with low language and academic attainment scored significantly higher on the Emotional Symptoms subtest, as well as on the total SDQ score, than the published normative mean. There were positive correlations between student-reported total SDQ scores and academic attainment, with students who had lower academic attainment having higher total SDQ scores. There was also a positive correlation between student-reported SDQ and receptive vocabulary on the BPVS-2, with students who had lower receptive vocabulary levels showing higher total SDQ scores. These findings provide supporting evidence of the links between vocabulary and academic attainment, as well as the impact on emotional well-being.

Jerome, Fujiki, Brinton, and James (2002) examined a possible contributing factor to emotional vulnerability, investigating self-esteem measures in 23 children with SLI and 23 TD children in a six to nine-year-old age group, and 17 children with SLI and 17 TD children in a 10 – 13-year-old age group. They used the Pictorial Scale of Perceived Competence and Social Acceptance for Young Children (Harter & Pike, 1984) for the younger children, which has sub-scales for general competence (Cognitive Competence and Physical Competence) and social acceptance (Peer

Acceptance and Maternal Acceptance). In the six to nine-year-olds, there was no difference between the children with SLI and the TD children on these scales. For the older age group, the Self-Perception Profile for Children (Harter, 1985) was used. This has scales for Scholastic Competence, Athletic Competence, Behavioural Conduct, Social Acceptance, Physical Appearance, and Self-worth. In the 10 – 13-year-olds, there was a significant difference between the SLI group and the TD group in scholastic competence, social acceptance, and behavioural conduct; however, the group scores of the SLI children still fell within one standard deviation of the normative mean. This indicated that although the older children with SLI did not have low self-esteem per se, it was lower than that of their TD peers. These different results between the younger and the older age group suggest that self-esteem in children with SLI decreases with maturity, perhaps due to increased self-awareness and greater concern with social comparisons (Harter & Pike, 1984). Thus, as adolescence advances, the child with language disorder may have a heightened perception of the discrepancy between their own ability and that of their peers, adversely affecting their self-esteem and emotional well-being.

Emotional well-being was indeed found to be at continued risk, by Botting, Durkin, Toseeb, Pickles, and Conti-Ramsden (2016), who followed up 81 participants from the Manchester Language Study at the age of 24 years. The participants with language impairment presented with more emotional health problems as measured by the Beck Depression Inventory, second edition (Beck, Steer, & Brown, 1996) and the Beck Anxiety Inventory (Beck & Steer, 1993), in comparison with 87 age-matched peers.

This profile of academic, behavioural, social, and emotional difficulties within the population of those with language disorder has been shown to have long-term consequences in a number of areas, affecting the individual's ability to function as an effective member of society. These will now briefly be discussed.

1.10 Language disorder and long-term outcomes

1.10.1 Criminal behaviour

Research has found an association between language disorder and criminal behaviour. Bryan (2004) assessed 58 young offenders (mean age 17 years) in one young offenders' institution in the UK. A high prevalence of speech, language and communication difficulties was found on measures of naming (43%), grammatical competency (73%), comprehension (23%), and picture description (47%). Although this is only from one institution, research by Snow and Powell (2011) provided corroborating evidence, finding that 46% of a sample of 100 young offenders (mean age 19 years) at one Australian young offenders' institution scored at least two *SD* below the mean on two of three subtests (Ambiguous Sentences, Listening Comprehension - Making Inferences, and Figurative Language) of the Test of Language Competence – Expanded edition (Wiig & Secord, 1989) and also on the core language score from the Clinical Evaluation of Language Fundamentals, 4th edition, Australian standardization (Semel, Wiig, & Secord, 2003b). These figures compare unfavourably with the 12% of adolescents in the general population with language disorder (section 1.4.2).

1.10.2 Mental health

In the study by Clegg et al. (2005), four of the 17 men with language disorder (24%) presented with symptoms of depression. The siblings of the men with language disorder, and a cohort from the National Child Data Study (NCDS: Ferri, 1993), matched to the language disorder cohort on NVIQ and SES, were used as comparisons: only one (6 %) of the siblings and 9.6% of the NCDS cohort showed symptoms of depression. Two (12%) of the men with language disorder had developed schizophrenia, compared with <1% of the general population (Kirkbride et al., 2012). As a small sample, this study has limited generalisability to a wider population. Beitchman et al. (2001), however, reported on the psychiatric outcomes of a larger sample, in the Ottawa Study, finding significantly higher rates of psychiatric disorder at 19 years of age in 31 (40%) of the 77 participants with language disorder, compared with 27 (21%) of 129 unimpaired controls. In the Joffe and Black (2012) study, psychiatric problems were not apparent at twelve years of age, with only the teacher rating of the Prosocial Behaviour scale falling within the clinical threshold for borderline psychiatric disorder. This suggests that mental health problems may increase through adolescence and adulthood in young people with language disorder.

1.10.3 Employment

Language disorder, impacting as it does on academic success (section 1.6), has consequences for employment outcomes. Of the men in the Clegg et al. (2005) study, only 59% were in employment, compared to 94% of their siblings, and 96% of the NCDS cohort. The 25-year-old adults in the Ottawa Study (Johnson et al., 2010) whose language impairment as a group was less severe, fared better: 76% of the language-impaired group and 82% of unimpaired controls were in full or part-time employment; however, the language-impairment group had less earning capacity; 50% earning <$20,000 per annum compared to 36% of controls, and 3% earning >$50,000 compared to 12% of controls.

1.10.4 Summary of language disorder and long-term outcomes

The research on social, emotional, and long-term outcomes cited here did not investigate vocabulary per se as a risk factor; however, as was explained in section 1.1, vocabulary is the linchpin of language, and vocabulary knowledge is particularly crucial for accessing the curriculum (section 1.6.1). The interaction between all the factors mentioned here is complex, but this brief summary of the literature indicates that in addition to, and perhaps partly because of, the impact on academic success, children with language disorder are at risk of less favourable long-term life outcomes than their peers in a range of domains. This dismal outlook for some children and adolescents with language disorder provides a strong rationale to intervene in order to enhance the vocabulary skills of those with language disorder, and vindicates continued intervention into adolescence. One such intervention is the subject of the main experimental study of this thesis, described in Chapter 6.

Summary of Chapter 1

Language is central to communication amongst members of a society, and vocabulary, in turn, is central to language (section 1.1). Semantic skills, phonological processing ability, and verbal working memory are fundamental to the acquisition of new vocabulary (section 1.2). In older children and adolescents, a range of factors additionally contribute to successful word learning, such as experience, motivation, and literacy (section 1.3). Up to 12% of children and adolescents have language disorder (section 1.4) and frequently show deficits in vocabulary acquisition (section 1.5).

The link between vocabulary knowledge and academic progress is well-established (section 1.6). Furthermore, language disorder has long-term influences on a range of social, emotional, health, and employment outcomes (sections 1.7 - 1.10). A premise central to the current thesis, therefore, is that improving vocabulary skills will enhance the life chances of young people with language disorder. The central purpose of the investigations in this thesis is to explore the effectiveness of direct phonological-semantic intervention in the classroom for adolescents with language disorder. An experimental study exploring this is reported in Chapters 6, 7, and 8. But before coming to this, the literature on vocabulary interventions for children (Chapter 2) and adolescents (Chapter 3) will be reviewed, and vocabulary intervention from the practitioner perspective will be explored (Chapter 4).

Chapter 2

Vocabulary intervention for children with language disorder

Overview

Chapter 1 described how children who have language disorder frequently have difficulties with vocabulary acquisition, with these difficulties often persisting into adolescence. Semantic and phonological processing skills were shown to be within-child factors in the acquisition of new vocabulary. The link between language, particularly vocabulary knowledge, and academic progress was explored; and language disorder was shown to have long-term influences on a range of social, emotional, health, and employment outcomes. The evidence delivers a mandate for educational and clinical professionals to support and develop the vocabulary skills of the children and adolescents they work with.

In the current chapter, the research evidence pertaining to enhancing the vocabulary skills of children and adolescents will be explored. This will be divided into the following sections:

- Vocabulary instruction for typically developing children (section 2.1)
- Vocabulary intervention for children with language disorder (section 2.2)
- Universal, targeted, and specialist models of intervention delivery (section 2.3)

The chapter concludes with a summary of the rationale for the current research.

2.1 Vocabulary instruction for typically developing children

2.1.1 Literacy-based approaches

A widely-advocated approach to vocabulary teaching is that of Beck, McKeown, and Kucan (2002; 2013), who promote the concept of robust vocabulary instruction. Robust vocabulary instruction involves discussing in depth the vocabulary encountered in literary texts in class. The rationale is that there are too many words to teach individually, and therefore the aim is to create an interest in wanting to know what new words mean, to encourage asking questions for clarification, and to explore and discuss personal contexts in which one might use a word. There is an emphasis on using contextual cues from the adjacent text, and on using morphological cues within the word. This is essentially a semantic approach, and one which fosters independent word learning in literary contexts. Beck and colleagues advocate using a three-tier approach to vocabulary, as explained in Table 2.1. Examples are taken from Beck et al. (2002, p.16).

Table 2.1. The three-tier approach to vocabulary (Beck et al., 2002, p.16)

Tier	Description	Examples
1	Basic, everyday words which most children will have acquired prior to school entry	*baby, happy*
2	Words which are of high frequency within the vocabulary of mature language users, and can be used across a variety of contexts	*maintain, fortunate, perform*
3	Low frequency words which will probably only be encountered in a topic-specific context	*isotope, peninsula*

Robust vocabulary instruction focusses on the teaching of Tier 2 words: words which are crucial to the understanding of the text, and are of maximum functionality because they occur in a variety of contexts. A rule of thumb for identifying a Tier 2 word is whether it is a more advanced word for a concept which a child can already express e.g. *fortunate* for *lucky*. In this way, children are given opportunities for building on prior knowledge, and for adding to and enriching their existing lexicon. Beck and colleagues describe the implementation of robust vocabulary instruction within the context of the English classroom, where literary appreciation is the purpose of the lesson. The concept of Tier 2 words can be also applied to the wider curriculum, where they are known as cross-curricular words. This includes a set of words sometimes known as command words, or exam words. These are often verbs e.g. *compare, evaluate, predict* (AQA, 2016).

Evidence for the effectiveness of the robust vocabulary approach comes from early studies in the USA by Beck and colleagues; for example, Beck, Perfetti, and McKeown (1982). In this study, 27 fourth grade (9 – 10 years old) TD children received robust vocabulary intervention in Language Arts lessons over 12 weeks. Their word knowledge was compared with 39 control children who did not receive the intervention. The children were matched pairwise on pre-test vocabulary and reading scores on the Iowa Tests of Basic Skills (ITBS: Hieronymus, Lindquist, & Hoover, 1979), and bespoke vocabulary tests which included semantic decisions, sentence verification, and story recall. These measures were also used as the outcome measures. The children who received the intervention made significantly greater progress than the control group on the bespoke measures, and also on the ITBS, indicating that there was a generalisation effect of intervention, enhancing independent word learning.

Corroborative evidence of the success of a literacy-based approach was provided by another study in the USA by Lubliner and Smetana (2005), working with 77 TD children aged 10 – 11 in an area of social disadvantage. Intervention included teaching the use of clarifying strategies, practice of these during reading, and building word knowledge. Intervention took place in a whole-class setting, twice a week for 12 weeks. Outcome measures included the extent to which participants could identify words that they did not know in reading passages, and a multiple-choice reading comprehension assessment, which included general comprehension questions as well as a 20-item vocabulary comprehension test. Significant progress was made with all these outcomes. Mean vocabulary gain on the vocabulary comprehension test from pre-intervention to post-intervention was 1.94 words out of 20. Lack of progress during a repeated baseline period suggested that progress was attributable to the intervention.

2.1.2 Oral language approaches

McGregor, Sheng, and Ball (2007), also in the USA, have provided some evidence that an approach without recourse to the written word can enhance word learning in TD children. Thirty-four TD children, eight years of age, were randomly assigned to a high-exposure or a low-exposure group, and were taught 20 words through individual watching of a slide show. Pictures of each referent were presented on-screen with a pre-recorded script containing the spoken word. For 10 words, no further information was given, but for the other 10 words, definitional and semantic information was also given. In the high-exposure group, words were heard 32 times, and in the low-exposure group, words were heard 16 times. Depth of word knowledge was assessed through a definition production task. Children in the high-exposure group performed significantly better on the definition production task for words learnt in the more informative context than in the less informative context, whereas children in the low-exposure group performed similarly in both learning contexts. Although this study did not replicate the natural learning context of the classroom, it illustrated that both exposure and amount of informative content have an impact on word learning in an experimental setting.

2.1.3 The extent of vocabulary instruction for typically developing children

The evidence so far described suggests that the vocabulary skills of TD children can be enhanced using word-learning opportunities both with and without a literacy component. Despite the evidence for effective universal direct vocabulary instruction, there is limited evidence that this takes place in schools. Ford-Connors and Paratore (2015) undertook a systematic review which explored vocabulary teaching practices with 10 – 16-year-old TD students. After excluding studies involving children with SEN, 33 studies were reviewed. The authors concluded that, even though there were studies showing evidence of successful whole-class methods for in-depth vocabulary teaching, involving focussed discussion, and the teaching of independent word-learning strategies, these practices were not commonplace in the classroom. They report that vocabulary teaching tended to take the form of direct instruction of targeted words rather than more in-depth vocabulary skills teaching. Although most of the studies in the review were based in the USA, this view echoed earlier observations of others in the USA and UK (Dockrell & Messer, 2004; Graves, 1987; Nagy & Herman, 1987), seeming to indicate that there has been little change over a number of years. This places children and adolescents who need specific vocabulary support at a disadvantage, since many children and adolescents with language disorder are educated in mainstream schools (Lindsay, Dockrell, Mackie, & Letchford, 2005).

2.2 Vocabulary intervention for children with language disorder

If in-depth vocabulary teaching is not commonplace in mainstream classrooms, children with language disorder may need an enhanced level of vocabulary support in order to keep pace with the vocabulary demands of the classroom. Literacy-based approaches to supporting vocabulary development may be insufficient for children with language disorder, who frequently have limitations in literacy development (McArthur et al., 2000; Stanovich, 1986). Arguably, therefore, they are less able to glean information from the written word, and thus less able to benefit from literacy-based approaches. Although McGregor et al. (2007) have shown that an oral vocabulary approach can be successful in enhancing word-learning, they did not investigate whether such an approach would be effective in children with language disorder. The present section will consider whether children with vocabulary deficits need more specific and targeted intervention in order to benefit maximally from word-learning opportunities.

Section 1.5 explained two contrasting views of the basis of word-learning inadequacies: either that they are largely semantic in nature (e.g. McGregor et al., 2002); or that there is a weakness of phonological processing, resulting in inaccurate phonological representations (e.g. Constable et al., 1997). As will be seen, studies have measured the enhancement of vocabulary skills in different ways. Before examining the evidence for semantic and phonological intervention, these various forms of assessment will first be outlined.

2.2.1 Assessment of vocabulary skills

The varied forms of assessment of vocabulary skills enhancement measure various facets of word learning. The assessment of targeted word knowledge typically takes one of the following forms.

Receptive vocabulary (comprehension)

Receptive vocabulary is typically assessed through a multiple-choice assessment, either using a bespoke measurement containing target words, or standardised assessment such as the BPVS-2.

Depth of word knowledge

Multiple-choice tasks provide breadth of knowledge information only, giving no information about depth of word knowledge. Depth of word knowledge is variously assessed through bespoke definition production or drawing tasks. Standardised assessments include the Vocabulary subtest of the Wechsler Abbreviated Scale of Intelligence, second edition (WASI-2: Wechsler, 2011), or the Word Classes subtest of the CELF-4 UK. In a definition production task, the child is required to describe the meaning of the words, which provides depth of knowledge information, and although definition production tasks are dependent upon expressive language skills, they provide insight into a child's semantic representation of a word in a way that a multiple-choice task does not (Dockrell et al., 2007). In the Word Classes subtest of the CELF-4 UK, the child is given four words (e.g. *pillow – door – blanket – lamp*) and asked to identify the two that go together (the receptive scale), and to say why (the expressive scale).

Expressive vocabulary (naming)

Expressive vocabulary is typically assessed through bespoke picture-naming tasks, or a standardised naming assessment such as the Expressive Vocabulary subtest of the CELF-4 UK, giving information on a child's repertoire of expressive vocabulary as well as insight into any word-finding difficulties.

Independent word learning skills

Assessment of the generalisation of intervention to independent word learning frequently takes the following forms:

- A bespoke author-created measure to assess progress on a control set of words, which measures near-transfer effects.
- Standardised assessment, which gives an indication of far-transfer effects.

The assessment of generalisation effects is discussed further in section 2.2.4.4.

The evidence for semantic and phonological intervention to enhance vocabulary skills of children with language disorder will now be examined.

2.2.2 Semantic intervention

Semantic intervention directly teaches features of word meaning, such as function, location, attribute, and category, as well as strategies for linking new words with words for other known concepts, with the aim of strengthening and developing children's semantic representations. The suggestion that children with language disorder need more specific and targeted vocabulary intervention than TD children is supported by Justice, Meier, and Walpole (2005), who examined the word learning of 57 kindergarten children in the USA with low vocabulary levels, aged 5:0 – 6:5. Stories were read by an adult to small groups of children, in 20 sessions over 10 weeks. In one condition, the words were exposed only in context through the reading of the story. In a second condition, denoted the elaboration condition, in addition to the words being exposed through the reading of the story, children were also given the definition of the word followed by an example of its use in a sentence. Depth of word knowledge was measured using a bespoke definition production task. The researchers found that elaboration was necessary for the children to learn the meanings of new words. Furthermore, in the elaboration condition, children with lower baseline vocabulary scores made greater progress than children with higher baseline vocabulary scores. By comparing a context-only condition with an elaboration condition, Justice et al. extended the findings of McGregor et al. (2007) from a TD population to a population of children with language disorder.

Nash and Snowling (2006) conducted an experiment in the UK which elucidated why exposure in context is not sufficient to foster vocabulary development for children with low vocabulary levels. In a between-groups study of 7 – 8-year-olds, 24 children with low vocabulary levels were taught 24 words in two conditions: in the first, they were taught the definitions of words; in the second, they were explicitly taught strategies for deriving meaning from context. Children received intervention in small groups for 30 minutes twice a week for six weeks. Word knowledge was measured through a bespoke staged assessment which involved firstly a definition production task, then a multiple-choice task. These researchers classed the definition production task as an expressive vocabulary measure, although the children were not required to say the word. A further

24 words were assessed but not included in the intervention programme in order to examine transfer to independent word learning. After intervention, the children in the context condition were able to express more knowledge about both taught and untaught words than the children in the definitions condition. The researchers concluded that when children receive direct teaching in how to derive meaning from context, this is even more effective than being taught definitions.

The evidence from these two studies suggests that a two-pronged approach can successfully impact on the word learning of children with language disorder; firstly, providing direct definitional instruction, and secondly, teaching strategies for independent word learning.

2.2.3 Phonological intervention versus semantic intervention

As children with language disorder may have weaknesses in both semantic and phonological processing (section 1.5), evidence will now be considered for the relative value of phonological intervention versus semantic intervention. Phonological intervention directly teaches phonological features of word forms, and strategies for linking new words with other similar-sounding words, for example by initial phoneme, rhyme, or number of syllables.

In this section, firstly, the impact of intervention on receptive vocabulary is considered, then depth of word knowledge, and finally expressive vocabulary.

2.2.3.1 Phonological versus semantic intervention: receptive vocabulary

Zens, Gillon, and Moran (2009) constructed a study design that allowed separation of the effects of phonological input from semantic input. Nineteen children with SLI in New Zealand aged 6:3 – 8:2 were matched by gender with a control group of 19 TD children. For 15 of the children, matches also included age and NVIQ, but this was not possible for the remaining four. The criteria for SLI was a SS of -1.25 *SD* on the CELF-4 (no subtests were stated so an assumption has to be made that this refers to the Total Language Score). The children with SLI received intervention, delivered by a speech and language therapist (SLT)[4], in small groups for one hour twice a week, for six weeks, and the TD children in the control group received no intervention. Half of the children with SLI received phonological intervention followed by semantic intervention, and the remainder received the same interventions in reverse order. The phonological intervention comprised generalised phonological awareness training, unrelated to the words used in the semantic intervention. Phonological awareness was assessed through bespoke tasks involving phoneme blending, phoneme isolation, phoneme segmentation and phoneme deletion. The semantic intervention included categorisation tasks such as word generation, word associations, and similarities. Semantic skills were assessed through bespoke tasks involving word generation, word description, relational vocabulary, and word associations. Receptive vocabulary was assessed using a bespoke picture-pointing test with the intervention words. The children with SLI made significant progress in phonological and semantic skills, unlike the control group who made

[4] In some countries, e.g. USA, Australia, and New Zealand, speech and language therapists are known as speech-language pathologists. The terms speech and language therapist and speech and language therapy are used throughout this thesis with no intention of distinction from speech-language pathologist and speech-language pathology.

no progress; thus, the authors attributed progress to the intervention. However, the authors reported that neither phonological-first nor semantic-first intervention could be demonstrated to have any impact on receptive vocabulary, because receptive vocabulary scores were close to ceiling.

2.2.3.2 Phonological versus semantic intervention: depth of word knowledge

In another study comparing phonological with semantic intervention, Steele, Willoughby and Mills (2013) compared phonological, semantic, and combined phonological-semantic intervention during reading, with 11 TD children and 12 children with language impairment, aged nine to 11 years, in the USA. The phonological intervention included blending (discrimination) and segmenting (production) tasks; the semantic intervention included the provision of a synonym and definition as well as elicitation of the word. There was also a control condition in which the children were shown the written word and heard it spoken aloud but were not required to say the word. Each child received individual intervention for five words in each condition. Assessment and intervention, delivered by an SLT or SLT pre-registration student, took approximately four sessions with each child. Depth of word knowledge was measured through a dynamic assessment task eliciting descriptions of word meaning. The researchers reported that phonological-only intervention was of no assistance in the acquisition of word meaning for either group, whereas both TD and children with language disorder made progress following semantic and combined phonological-semantic intervention. In this study, the phonological input was entirely dissociated from semantic input, and in the phonological condition, no definitional or contextual cues were given. Therefore, these results, although unsubstantiated by statistical analysis, are unsurprising, as the children could not be expected to glean any information about word meaning. The focus of the paper was on between-group differences, and for this their conclusions were supported by statistical analysis. No significant differences in word learning were found between the semantic only and the combined phonological-semantic conditions for either group, suggesting that the addition of phonological input conferred no added benefit.

2.2.3.3 Phonological versus semantic intervention: expressive vocabulary

As was discussed in section 1.5, some research (e.g. Gray, 2005; Lahey & Edwards, 1999) suggests that phonological processing ability is particularly important for expressive vocabulary. Three studies are described here which measured expressive vocabulary skills and aimed to make a direct comparison between phonological and semantic intervention.

Wing (1990) worked with two groups of five 6-year-olds who had word-finding difficulties, in the USA. The groups were matched by age and raw scores on the Test of Word Finding (TWF: German, 1989). Raw scores were used because the scores of many of the children were lower than the standardised norms on the TWF. One group received semantic intervention, which involved semantic elaboration of an unspecified number of words; the other group received phonological intervention, which involved phonological elaboration of a different set of 99 words, as well as perceptual tasks to develop imagery and visual memory. Children received thirty 25-minute intervention sessions with a SLT over two and half months. In the latter part of the intervention period, children did the phonological or semantic activities with the other word set;

thereby, all children were exposed to the same words. Children in the phonological-perceptual group made significantly greater progress on the TWF than the children in the semantic treatment group. However, no information was provided about whether the individuals' word-finding difficulties were predominantly due to phonological deficits or semantic deficits, which could have differentially influenced the children's response to intervention approaches. Moreover, this small-scale study did not strictly contrast phonological-only with semantic-only treatment, as the phonological treatment included a visual-perceptual content which was not included in the semantic treatment.

Hyde Wright, Gorrie, Haynes, and Shipman (1993) extended this line of research in the UK, working individually with 30 children with language disorder aged 8:1 – 14:6. These children also had word-finding difficulties, as shown by TWF standard scores; and, like Wing (1990), no information was provided on the individuals' profiles of word-finding difficulty. Children were matched by age and divided into two groups. Fifteen children received individual intervention delivered by SLTs for 150 words, involving elaboration of words through games, three times a week for five weeks. For half the children (N=8), the elaboration was semantic; for the other half (N=7), it was phonological. The remaining 15 children acted as controls, receiving no intervention. The outcome measure was a naming task for 50 words not included in the intervention. Between-groups comparisons showed a significant treatment effect: children receiving semantic intervention made significantly greater progress than the control group, whereas children receiving phonological intervention made no more progress than the control group. These results seemed to indicate that developing semantic skills was more effective in facilitating word retrieval than developing phonological awareness skills. However, the semantic intervention gave rise to more opportunities for greater elaboration, thereby taking more time (30 mins per session) than the phonological intervention (15-20 mins per session), resulting in an unequal dosage of intervention, and possibly more exposure to the words.

Bragard, Schelstraete, Snyers, and James (2012) overcame the limitations of Wing (1990) to some extent by defining the phonological intervention more stringently, and the limitations of Hyde Wright et al. (1993) by controlling dosage. They compared phonological with semantic intervention in a case study series of four Belgian French-speaking children with word-finding difficulties aged 9:6 – 13:9. Children received three 30-minute sessions over three weeks, followed by two weekly sessions of assessment, then a further three 30-minute sessions over the next three weeks. In each session, children received phonological intervention for one set of eight words followed by semantic intervention for a different set of eight words. There was a further set of eight control words, but it is not clear how these were used. Specific phonological and semantic skills were assessed using these 24 experimental and control words. These words were a subset of 80 words which were additionally used in outcome measures of naming accuracy, naming response times, and analysis of naming errors. Bragard et al. gave more information about the type of word-finding errors made by the children than did Wing and Hyde Wright et al., with the intention of investigating potential differential responses to intervention in relation to individual children's linguistic profiles. It was hypothesised that children with semantic deficits would respond better to semantic intervention, and that children with phonological deficits would respond better to phonological intervention. This was the case with one of the children; however, for two of the children, the reverse happened. For the other child, the basis of the word-finding difficulty was not fully explained. The authors suggested that the results could illustrate the value of building on children's strengths rather than targeting their weaknesses, although with only four children it is premature to draw firm conclusions.

These were all small-scale studies, and their findings are inconclusive regarding the effectiveness of phonological intervention versus semantic intervention in improving the expressive vocabulary skills of children with word-finding difficulties. A possible confounding factor is the problem of entirely dissociating phonological information from semantic information. The study by Zens et al. (2009) (section 2.2.3.1) investigated expressive vocabulary as well as receptive, and, as already noted, their study design allowed separation of the effects of phonological input from semantic input. The expressive outcome measure in their study was a naming task of the 27 words used in the semantic intervention. The group who had received phonological-first intervention made significant gains in naming, but the group who had received semantic intervention first, and the control group, did not. This showed that the phonological-first intervention had a greater impact on expressive vocabulary than semantic-first intervention, and as such provides a small amount of support for the hypothesis that phonological processing ability is particularly important for expressive vocabulary.

2.2.3.4 Summary of phonological versus semantic intervention

To summarise, evidence is weak with regard to the relative merits of phonological and semantic intervention for improving receptive vocabulary, depth of word knowledge, or expressive vocabulary. The finding of Steele et al. (2013), that phonological-only intervention does not improve knowledge of word meaning, does, however, confirm that phonological information needs to be linked to semantic information about the words in order to increase the efficiency and accuracy of word storage and to strengthen lexical representation (Leonard, 1998; Nash & Donaldson, 2005). Accordingly, the evidence for combined phonological-semantic intervention will now be considered.

2.2.4 Combined phonological-semantic intervention

Much of the evidence for phonological-semantic intervention for children with language disorder has explored intervention in small-group or individual models of delivery. There is some research addressing phonological-semantic intervention in a whole-class setting, and this will be discussed further in the section on models of delivery (see section 2.3). Meanwhile, in order to focus closely on the *type* of intervention in the present section, only studies implementing phonological-semantic intervention in small-group or individual models of delivery will be discussed here. Receptive vocabulary, depth of word knowledge, and expressive vocabulary outcomes will be considered, followed by the impact of combined phonological-semantic intervention on the development of independent word learning skills. Lastly, the evidence for phonological-semantic intervention compared with increased exposure will be explored.

2.2.4.1 Combined phonological-semantic intervention: receptive vocabulary

Progress in receptive vocabulary skills in response to phonological-semantic intervention has been reported by Parsons, Law, and Gascoigne (2005). These UK researchers used a combined phonological-semantic approach to teach 18 maths words in individual intervention, in 18 30-minute sessions, delivered by a SLT over seven or eight weeks, for two children with SLI aged 8:10 and 9:5. Receptive vocabulary was assessed through bespoke multiple-choice methods using pictures, objects, and the written word, by a SLT who was blind to the treatment status of the words. Both participants made significant gains in comprehension of the 18 treated words compared to 32 untreated words, though as the sample size was small (N=2), these findings needed corroboration.

Wilson et al. (2015) also used a bespoke receptive vocabulary outcome measure in another within-subjects study in the UK, with twelve children aged seven to 11 years who had word-finding difficulties. The study design allowed differential assessment of three sets of words: experimental words used in phonological-semantic intervention; active control words in the same category (pictures of which appeared in intervention sessions but were not spoken); and passive control words in a different category (which did not appear in intervention at all). Intervention was delivered individually by a SLT, in two 15-minute sessions a week for six weeks. Intervention was based on a therapy schedule used by Ebbels et al. (2012) (see section 2.2.4.3). This was reported by Ebbels et al. to include games, questions, and activities designed to develop knowledge of item function, location, attribute, category, and phonological information, and to use these as word-finding strategies. Receptive vocabulary was assessed by asking children to find a named item from four items in the same category; however, pre-intervention scores were close to ceiling, so improvements could not be demonstrated.

2.2.4.2 Combined phonological-semantic intervention: depth of word knowledge

Two studies have used depth of word knowledge as an outcome measure. In a UK study, Clegg (2014) worked with five boys aged six to eight years who had language disorder as well as social, emotional, and behavioural difficulties. Phonological awareness training was used as a precursor to phonological-semantic intervention. Like the study by Zens et al. (2009), the words featuring in the phonological awareness training were unrelated to the words subsequently targeted in the phonological-semantic intervention. In the phonological-semantic intervention, six curriculum words were taught by a SLT in individual intervention, and compared with six control words from the same topic that were being taught in the classroom by a teacher. The individual intervention was delivered twice a week for six weeks in sessions 20 – 30 minutes long. Depth of word knowledge was assessed through eliciting descriptions of word meaning. All the children learnt the meanings of all the target words and none of the control words. This was interpreted as demonstrating the effectiveness of phonological-semantic intervention, although possible differences in exposure of the target versus control words were not accounted for.

A larger study was conducted in Germany by Motsch and Marks (2015). These researchers compared the performance on standardised assessment of 153 children with SLI aged eight to nine years following phonological-semantic intervention. The children were randomly divided into experimental (phonological-semantic intervention: "Lexicon Pirate", p.237) and control (usual therapy) conditions. In Lexicon Pirate, as the children collected treasures (words), the words were elaborated upon phonologically and semantically through means of questions. The intervention was delivered individually (30-minute sessions) or in small groups (45-minute sessions) by a SLT, in 20 sessions over five months. The experimental group made significantly more progress than the control group on the Acting Sequences subtest (sentence comprehension) of the Sprachstandserhebungstest 5 – 10 (Petermann, 2010), and the Vocabulary subtest (semantic relations) of the Potsdam-Illinois Test for Psycholinguistic Abilities (Potsdam ITPA: Esser, Wyschkon, Ballaschk, & Hansch, 2010), though not on the Forming Analogies subtest of the Potsdam ITPA. A confounding factor in this study was that most of the children (140/153) continued to receive additional vocabulary support in the classroom, and some were also in receipt of additional individual school support and/or speech and language therapy. It is not clear in the paper how many children this refers to, nor is the content of the additional support or therapy explained. To overcome these confounding factors, the researchers conducted analyses including only those children who were not receiving additional input, and this showed even greater treatment effects on semantic relations, and also a significant treatment effect on forming analogies, confirming a positive impact on depth of word knowledge in response to the experimental intervention. When the dosage of the experimental intervention and additional therapy was compared, the control group were reported to receive a higher dosage of input; therefore, progress was attributed to the content of the experimental intervention.

Evidence is thus beginning to accumulate that phonological-semantic intervention can successfully improve receptive vocabulary and depth of word knowledge in primary school age children (aged five to 11 years) with language disorder in individual and small-group settings, but as the children in the studies reviewed here were aged six to nine years, exploration of this in the secondary school age group (aged 11 to 16 years) is lacking.

2.2.4.3 Combined phonological-semantic intervention: expressive vocabulary

This section reviews studies investigating the impact of combined phonological-semantic intervention on expressive vocabulary.

Easton, Sheach, and Easton (1997) was one such study in the UK, in which four children with SLI, aged 10:9 – 10:11, received group intervention in a specialist language setting in a mainstream primary school. Two intervention sessions a week for five weeks were taken alternately by a SLT and a teacher. Forty experimental words were taught using a combined phonological-semantic intervention, and 40 control words received no intervention. Semantic elaborations and phonological elaborations for each word were provided through games. Semantic elaborations included discussion of function, location, attribute, group, association, and synonyms. Phonological elaborations included initial sound, syllable, rhyme, initial letter, and finger-spelling. It was reported that all four children made greater improvements in naming the experimental words than in naming the control words. Although this was a promising result, only four children were involved and no information on statistical significance was given, so improvement might have been due to chance.

More empirically sound evidence was provided by Ebbels et al. (2012), albeit still with a small sample. Ebbels and colleagues looked at the effectiveness of semantic intervention, which contained a phonological component, on word retrieval in students with specific word-finding difficulty aged 9:11 - 15:11 in a specialist language school in the UK. A randomised control design was used; eight participants receiving intervention versus seven waiting controls. Intervention was delivered individually by a SLT, in two 15-minute sessions a week for eight weeks. Intervention included games, questions, and activities designed to develop knowledge of item function, location, attribute, category, and phonological information, and to use these as word-finding strategies. Knowledge of the words targeted in the intervention was not assessed, but rather, progress in the use of word-finding strategies was assessed through standardised tests. Improvement in single-word naming was shown by increase in standard scores on the Test of Adult/Adolescent Word Finding (TAWF: German, 1990), though no improvement was made at discourse level, using raw scores of the Test of Word Finding in Discourse (TWFD: German, 1991).

The study by Wilson et al. (2015) (section 2.2.4.1) used a bespoke naming outcome measure as well as their receptive vocabulary measure. Children made significant progress in naming the experimental words, as well as in naming the active control words (words in the same category which had appeared in intervention sessions). Their naming of passive control words (the words from a different category which had not appeared in intervention) made no progress. Thus, there was some generalisation effect of intervention to expressive vocabulary ability, but only to semantically-related words which had appeared in intervention without being spoken.

The promising findings of these small studies were corroborated by the large randomised controlled trial by Motsch and Marks (2015). As well as assessing depth of word knowledge, Motsch and Marks also measured expressive vocabulary using the Expressive Vocabulary subtest of the Wortschatz- und Wortfindungstest 6 – 10 (Glück, 2011). Following intervention, the experimental group made significantly more progress on this subtest than the control group. When analyses were conducted including only those children who were not receiving additional input, this showed even greater treatment effects.

Further support for combined phonological-semantic intervention was provided by Joffe, Rixon, Hirani, and Hulme (in preparation). These researchers implemented a vocabulary enrichment programme, which included teaching phonological and semantic strategies for word learning as well as activities to foster independent word learning skills. Three hundred and fifty-eight children with SLCN aged 12 – 13 years attending mainstream secondary schools in the UK were randomly assigned to one of four intervention groups: vocabulary, narrative, combined vocabulary and narrative, and control (delayed intervention). Intervention was delivered in small groups by teaching assistants, in two 50-minute sessions a week for six weeks. The children in the vocabulary group and the combined group made significantly greater gains in bespoke expressive vocabulary assessments than the children in the control group.

Overall, as these studies covered an age range of six to fifteen years, they provide converging evidence of the effectiveness of combined phonological-semantic intervention for expressive vocabulary in children and adolescents with language disorder.

2.2.4.4 Combined phonological-semantic intervention: independent word learning

Because there are too many words to teach individually (Beck, et al., 2013; Nagy & Herman, 1987), it is important to consider not only whether interventions impact upon specifically taught words, but also whether there is any generalisation effect of treatment, resulting in improved independent word learning ability. Findings on this subject are now reviewed, looking at several previously mentioned studies.

Using a bespoke author-created measure to assess progress on a control set of words, Wilson et al. (2015) found improvement in naming active control words (in the same category which had appeared in intervention sessions), but not in passive control words (in a different category which had not appeared). The authors proposed that intervention strengthened underlying semantic representations, as demonstrated by the generalisation of naming success to words which shared semantic features with the experimental words.

Using standardised assessment to measure generalisation effects of intervention, Easton et al. (1997) (section 2.2.4.3) reported increases in percentile scores on the TWF and Renfrew Word Finding Vocabulary Scale (Renfrew, 1988) but not the BPVS. Indeed, for three of the four children, BPVS scores seemed to have regressed. This was taken to indicate generalised improvements in naming but not comprehension, and while visual inspection of the data suggests that this may be the case, statistical information was not reported, nor were other variables discussed which may have contributed to this pattern of assessment results, such as the individual language profiles of the children. Motsch and Marks (2015), a much larger study (N=153) with results supported by statistical analysis, reported progress on three of four standardised assessment subtests. Ebbels et al. (2012) illustrated a generalisation effect of intervention by improvements on the TAWF, but there was no improvement on the TWFD.

One of the constraints on demonstrating improvement on a standardised outcome measure could be the timescale between pre- and post-intervention assessments. This view is supported by Marulis and Neuman (2010), who conducted a meta-analysis of vocabulary intervention in young children. The review covered 67 studies using a range of approaches with 5,029 TD children aged six or below. Greater effect sizes were found in studies using author-created outcome measures than in studies using standardised outcome measures. These researchers suggested that although independent standardised measures are more psychometrically robust, and may be a more rigorous option for measuring generalisation effects of intervention, they may not be sensitive enough over the timescale of a study to demonstrate the effectiveness of intervention. Bespoke word-knowledge assessments, although potentially weighted towards the content and target of the intervention, may, therefore, be a more viable option, even though they measure near-transfer rather than far-transfer effects. Marulis and Neuman’s recommendation is to employ a combination of standardised and author-created measures, so that a balanced position is achieved.

Two studies have, in fact, used both standardised and bespoke measures to assess response to intervention. The two participants in Parsons et al. (2005) made significant gains in a bespoke receptive vocabulary assessment of treated words, but not on the BPVS or the TWF, suggesting that progress in word knowledge was confined to the treated words, with no increase in independent word-learning skills. Similarly, in the study by Joffe et al. (in preparation), both the vocabulary intervention group and the combined narrative/vocabulary group made more progress on a bespoke vocabulary idiom awareness measure than the control group, suggesting near-transfer effects. However, changes over time on standardised vocabulary tests – the Figurative Usage subtest of the TOWK and the British Picture Vocabulary Scale, third edition (BPVS-3: Dunn, Dunn, Sewell, & Styles, 2011) – were not significant.

With the available evidence producing such a mixed array of results, additional research is required to further explore the impact of vocabulary intervention on independent word learning skills.

2.2.4.5 Combined phonological-semantic intervention versus increased exposure

Finally in this section, the issue of phonological-semantic intervention versus increased exposure will be considered. As Rice et al. (1994) illustrated (section 1.5), given increased word exposure, children with language disorder do have the capacity to learn new words. Many of the studies considered so far did not include in their design a comparison of specific phonological-semantic intervention versus increased exposure of the words. Some studies, however, have attempted to control for exposure in some form.

Wilson et al. (2015), as previously discussed, included an active control set of words. The pictures of these words appeared in intervention but they were not named or specifically targeted. Children made more progress in naming the experimental words compared to the active control words. However, there was no exposure to the spoken word of these active control words, only the picture, so this did not entirely address the issue of exposure.

Another example from the UK comes from St. John and Vance (2014), who delivered intervention for 10 experimental curriculum words to 18 five to six-year-olds who had a range of language and learning needs. Intervention was delivered in small groups by the teacher, daily for 10-15 minutes over three or four weeks. Intervention was multi-faceted, including games to strengthen and develop phonological-semantic links and independent word learning skills. Ten control curriculum words received routine exposure in the classroom but were not part of the specific intervention. Word knowledge was assessed through a checklist which involved naming as well as questions to elicit phonological and semantic knowledge about the words. The scoring system yielded an overall score rather than making a distinction between receptive vocabulary, depth of word knowledge and expressive word use. Children made progress in both sets of words, with progress in the experimental words being significantly greater than the control words, indicating that the phonological-semantic intervention was more effective in developing word knowledge than exposure without the phonological-semantic intervention. Bias was, however, present, in that the assessor was not blind to the treatment status of the words, and no reliability checks were reported.

The issue of phonological-semantic intervention versus routine or increased exposure has therefore not been satisfactorily resolved.

2.2.4.6 Summary of combined phonological-semantic intervention

In summary, there is limited evidence for the effectiveness of combined phonological-semantic intervention in increasing receptive vocabulary; some evidence for its effectiveness in increasing depth of word knowledge in primary school age children with language disorder; and some evidence for its effectiveness in increasing expressive vocabulary in primary and secondary school age children with language disorder. It is argued that the effectiveness of combined phonological-semantic intervention is due to two reasons: firstly, because phonological form and semantic content need to be linked in order to acquire new words (section 1.5.4); and secondly, because it addresses the individual constellation of skills in each individual, by not only developing skills in which there is a deficit (Nash & Donaldson, 2005), but also building on strengths (Bragard et al., 2012).

With regard to independent word-learning skills, a positive impact of intervention has been found when bespoke measures are used, but attempts to show generalisation effects through standardised assessment have met with mixed results. Concerning the relative value of phonological-semantic intervention versus routine or increased exposure, further research is required.

In order to focus closely on the *type* of intervention, only studies using an individual or small group model of delivery have been explored in this section. In the next section, the *model* of the intervention will be examined; namely, the relative merits of delivering intervention individually, in small groups, or in a whole-class approach.

2.3 Universal, small-group, and individual models of intervention delivery

The terms *universal, targeted* and *specialist* are frequently used in the UK to describe levels of health and educational provision for children with SEN and disabilities. *Universal* provision is available to all children, as exemplified by whole-school approaches or whole-class teaching. In relation to SLCN*, targeted* services are provided for children identified as being at risk, such as those of low SES, or children with speech or language difficulties that are expected to be transient. At the targeted level, children are withdrawn from the classroom for periods of time-limited intervention, either individually or in small groups. *Specialist* services are provided for children with severe and complex speech and language disorder, who require ongoing or intensive intervention. At the specialist level, individual intervention is often required.

These levels broadly equate to the waves model of intervention (Department for Children, Schools and Families (DCSF), 2008). Wave 1 (universal) refers to whole-class teaching for all pupils and is known as “Quality First Teaching” (p.9); Wave 2 (targeted) refers to small-group time-limited additional intervention for pupils just below national expectations; Wave 3 (specialist) refers to individual or small-group intervention with a trained and supported teaching assistant or specialist teacher.

The Royal College of Speech and Language Therapists (RCSLT) recommends a framework of workforce management which accounts for the role of the SLT at all levels of universal, targeted, and specialist provision (Gascoigne, 2006). The way speech and language therapy resources can be deployed is illustrated in the balanced system model of Gascoigne (2012), shown in Figure 2.1. This framework shows a greater amount of speech and language therapy resource (specialist workforce) being used per child at targeted level than at universal level, and an even greater amount of speech and language therapy resource per child at specialist level. A child who has severe and complex speech and language disorder may receive input at all three levels: he may be in receipt of individual intervention, as well as time-limited group interventions, and in addition, specific strategies may be in place within class to support his communication and his access to the curriculum. The model of delivery employed may alter at different points in a child's course of development. As the framework illustrates, within the context of school, the role of the specialist (a SLT), may be to provide specialist intervention, as well as to train and support others (for example, teachers and teaching assistants) to deliver targeted or universal intervention.

Figure 2.1. Workforce deployment in universal, targeted, and specialist levels of service provision (Gascoigne, 2012; p.16).

In this thesis, the term *universal* will be used to refer to *whole-class* models of intervention delivery. This will be contrasted with the terms *small group* and *individual* in order to reflect the model of intervention delivery, rather than whether the intervention is classed as targeted or specialist, because targeted and specialist levels of provision may take both small-group and individual forms.

2.3.1 The advantages of universal intervention

Sections 2.1 and 2.2 presented evidence that although being given a definition of what a word means provides a useful foundation for word learning, the word also needs to be encountered several times within meaningful contexts, which provides opportunities to develop independent word learning skills. Thus, a well-rounded understanding of the word's meaning can be attained, embedding the new word within the existing lexicon and extending existing representations. For children and adolescents with language disorder, the strengthening of phonological and semantic skills may also be required (section 1.5). An individual model of intervention delivery may be indicated for some children and adolescents with language disorder so that they may develop such skills, but encountering words in class provides a natural incentive for needing to know what the words mean (Miller & Gildea, 1987), and provides opportunities to derive meaning from the contextual clues of the lesson. A one-to-one setting necessarily removes the student from the lesson and thus from the opportunities afforded by the context of the lesson. From a theoretical stance, therefore, providing specific word-learning activities within the classroom may be advantageous.

There are also educational considerations to be taken into account when deciding on an appropriate model of intervention. Students moving to secondary school at 11 years of age encounter an increasingly complex and exam-orientated educational environment, with government policy in the UK exerting pressure on teachers for their students to achieve high examination grades (Department for Education (DfE), 2017a). Ehren (2002) described the challenge of withdrawing students from class to provide individual or small-group intervention in secondary schools: the students miss out on the content of lessons, which often results in them falling further behind, placing more demand on the student and the teacher.

In addition, remaining in the classroom rather than being withdrawn for individual tuition is preferable for a substantial proportion of children. Klingner, Vaughn, Schumm, Cohen, and Forgan (1998) found that 37.5% of a cohort of 32 children aged nine to 11 with learning disability (known as specific learning difficulty or dyslexia in the UK) preferred an inclusion model of support. This percentage may be even higher during the teenage years, when peer acceptance becomes of paramount importance (Whitmire, 2000). "When students just want to fit in, any educational practice that singles them out may be doomed" (Ehren, 2002, p.65). To address these concerns, Ehren advocated the concept of curriculum-relevant therapy, the essence of which is collaboration between teacher and SLT.

A whole-class approach to vocabulary intervention may also have resource advantages, particularly at secondary school, as many children with language disorder in the UK are educated in mainstream schools (Lindsay et al., 2005), and specialist speech and language support typically decreases as children move from primary to secondary education (Lindsay et al., 2002; Bercow, 2008). As the balanced model (Gascoigne, 2012) shows, the wider workforce has greater contact with children than the SLT does, thus a small amount of speech and language therapy time spent training the wider workforce could potentially address the needs of a large number of children and adolescents through universal provision.

2.3.2 The evidence for universal vocabulary intervention

2.3.2.1 Semantic intervention in a universal model

Marulis and Neuman (2010), in their meta-analysis of vocabulary intervention in young children, found that instruction was equally effective in all models of delivery; whole-class, small-group, or individual. Furthermore, the largest effect sizes were found amongst those who had received instruction in a whole-class model.

A range of intervention models can also be effective with primary school age children who have language disorder. In the USA, Throneburg, Calvert, Sturm, Paramboukas, and Paul (2000) compared three models of vocabulary intervention in 177 children with language disorder aged five to nine years: 1) a collaborative model in which the teacher and SLT planned and delivered intervention in the classroom together; 2) an independent class-based model in which the SLT delivered intervention in the classroom without the teacher; and 3) a withdrawal model in which the SLT delivered intervention outside the classroom individually or in small groups. Sixty words were targeted in the intervention, and knowledge of 20 of these was used as the outcome measure, using bespoke tasks measuring comprehension, definition production, and usage. Children with language disorder who had received the collaborative model of intervention made significantly greater progress than those who had received the independent class-based model or withdrawal model. Progress was compared with that of TD children from twelve separate classes. The number of control children was not specified. Those who had received the collaborative model or the independent class-based model made significantly greater progress than those who had received routine class-based teaching. These results suggested that both TD children and children with language disorder benefited from specific vocabulary intervention, and that the children with language disorder benefited still further from the added value created by the collaboration of the teacher and SLT. A caveat to this conclusion is that the children already in receipt of speech and language therapy intervention (32/177) continued to receive this, individually or in small groups, in addition to the classroom intervention, and this could have contributed to their overall progress. In addition, clarification was lacking in exactly how the intervention conditions differed, or what the content of the intervention was.

Starling, Munro, Togher, and Arciuli (2012) investigated a universal approach to language intervention (not specifically vocabulary) in older students. Two Australian schools were randomly assigned to an experimental or waiting-control condition. A whole-school training programme was implemented in the experimental school, in which teachers were trained to modify their oral and written language in order to provide support for those with language impairment. The language profiles of 21 students (13 – 14 years of age) were measured on the Wechsler Individual Achievement Test Australian Standardised Edition (Wechsler, 2007), and showed significant progress in the Listening Comprehension and Written Expression subtests in comparison with 22 students in the control school, although no difference was found on the Reading Comprehension or Oral Expression subtests, which involve receptive and expressive vocabulary skills respectively. This study demonstrated that collaborative working between teachers and SLTs can positively influence teachers' language in the classroom, and that this change in practice can impact on students’ language levels. The lack of impact on vocabulary skills could have been because, although a vocabulary component was included in the teacher training, the intervention did not specifically target vocabulary.

2.3.2.2 Combined phonological-semantic intervention in a universal model

Few studies have investigated the use of a combined phonological-semantic approach in a universal model of delivery. Boland (2009) addressed this in a small study involving 11 children with SLI and 41 TD children, aged 8:10 to 10:6, in mainstream schools. Ten teachers were trained in a combined phonological-semantic approach, and used this to pre-teach three new science words at the beginning of one lesson. Word knowledge was assessed using receptive, depth of knowledge (drawing) and expressive tasks. Progress was compared with three further science words which gained an equal amount of exposure during the lesson but were not pre-taught. As a group, the children with SLI made significant overall gains on the word knowledge tasks for the pre-taught words compared to the non-pre-taught words, but the intervention did not appear to benefit the TD controls, suggesting some narrowing of the gap between the children with SLI and the TD children.

Lowe and Joffe (2017) followed this up in a feasibility study with a class of 15 13 -- 14-year-old students with a range of language and learning needs, attending a mainstream secondary school in the UK. The teacher embedded phonological-semantic activities into curriculum delivery for 10 words, and progress was compared with 10 further words which were taught in the same topic but without using the phonological-semantic activities. Word learning progress, assessed through a definition production task, for the five lowest frequency words was significant in favour of the words taught using phonological-semantic activities. There were, however, limitations to this study: the high frequency of some of the curriculum words chosen, limiting the potential to demonstrate progress; difficulty achieving close matching of the experimental and control words; and the small sample size. Nonetheless, the approach was well-received by students and their teacher, which demonstrated the feasibility of phonological-semantic vocabulary intervention within mainstream secondary school classes.

A larger study in Ireland by Murphy et al. (2017) explored the delivery of an adapted Vocabulary Enrichment Intervention Programme (VEP: Joffe, 2011) within mainstream secondary school classes in a delayed intervention randomised control design. The VEP teaches phonological and semantic word learning strategies, with a focus on curriculum words as well as independent word-learning skills. This was delivered during 12 – 16 English lessons to 203 students aged 11:11 – 13:11 attending schools in an area of social disadvantage. Improvements in standard scores of the intervention group relative to the control group did not reach significance. When raw scores were considered, no between-group differences were found in the CELF-4 UK Word Classes (Receptive), Word Definitions, or Word Associations subtests, but the intervention group showed significantly greater progress relative to controls in raw scores on the CELF-4 UK Word Classes (Expressive) subtest and the BPVS-3. However, raw scores do not necessarily show relative improvement, as they would be expected to increase with maturity; therefore, any progress made could not be unequivocally demonstrated to be due to the intervention. Significant improvement on standardised scores was reported for the experimental group following intervention on the Word Classes (Receptive), Word Classes (Expressive), and Word Definitions subtests of the CELF-4 UK, and on the BPVS-3. However, the waiting control group also made significant progress on the Word Classes (Receptive) and Word Definitions subtests, so improvements on these two measures cannot be accounted for by the intervention. The researchers noted that the students had recently begun to attend secondary school, and so improvements may have been influenced by exposure to the increased word-learning opportunities that secondary school provides. Nonetheless, following their delayed intervention, the waiting control group did make significant progress on the Word Classes (Expressive) subtest and the BPVS-3, whereas progress on these two subtests during the baseline period had been non-significant. Thereby, this study added strength to the evidence for the effectiveness of phonological-semantic vocabulary intervention in a mainstream secondary whole-class setting, but overall, due to the mixed pattern of results, the evidence provided by this study needs corroboration.

2.3.2.3 The impact of universal vocabulary intervention on academic attainment

A key purpose of improving the vocabulary skills of children and adolescents with language disorder is to enable improved access to the curriculum. No studies known to the current researcher specifically targeting vocabulary intervention for adolescents with language disorder have included curriculum assessment in their outcome measures. Two studies are mentioned here which include participants with low vocabulary levels, though in the context of second-language learning as well as social disadvantage.

Snow, Lawrence, and White (2009), implemented a class-based vocabulary intervention in the Word Generation project in the USA, using a robust vocabulary approach (section 2.1.1) for cross-curricular words with 11 – 14-year-olds, for the duration of one academic year. The participating 697 students made progress relative to 319 controls on a multiple-choice reading task involving 40 of the 120 intervention words. The authors did not report statistical significance, but showed that the experimental group learnt a mean of 4.43 words, while the control group learnt a mean of 1.95 words (d = 0.21, small effect size). Vocabulary improvement was found to significantly predict scores on the Massachusetts Comprehensive Assessment System, a curriculum assessment used in the USA. In a similar study with 2,082 11-year-olds, Lesaux, Kieffer, Kelley, and Harris (2014), as well as finding significant gains in bespoke reading comprehension tasks containing the taught words, also reported gains in standardised reading comprehension assessments, which would indicate generalisation of independent word learning skills, though the gains just fell short of significance.

2.3.2.4 Summary of universal vocabulary intervention

There is some evidence that a universal model of vocabulary instruction can be effective with younger children with language disorder, and adolescents with low vocabulary levels in the context of second language learning, but despite evidence that a phonological-semantic approach can be effective in small-group and individual models of delivery (section 2.2), there is limited research into the use of a phonological-semantic approach in a universal model with adolescents. A universal model of intervention delivery may be important at secondary school for several reasons: to capitalise on natural word-learning processes; to minimise withdrawal from lessons; and to make efficient use of resources.

Summary of Chapter 2 and rationale for the current research

Review of educational studies in the literature has indicated that universal vocabulary teaching for all learners tends to consist of semantic, literacy-based approaches focussing on reading comprehension and the development of independent word-learning skills (section 2.1). However, despite evidence for the effectiveness of universal vocabulary teaching for all learners, it is reported that there is little explicit vocabulary instruction in schools, making children and adolescents with language disorder vulnerable. As these young people are less able to absorb meanings of new words through contextual abstraction, direct teaching of new vocabulary is particularly important for them.

Moreover, the universal vocabulary approaches for TD children and adolescents described in this chapter do not include explicit phonological instruction, raising the question of whether such an approach is used in practice. For children with language disorder, evidence from clinical studies favours a phonological-semantic approach. This has been found to be successful in individual intervention in specialist educational settings, and in individual or small-group intervention in mainstream settings (section 2.2.4). Nevertheless, the use of a phonological-semantic approach in a universal model of delivery in a mainstream secondary setting is under-researched (section 2.3.2.2). There is evidence for effective universal vocabulary intervention with adolescents in the context of social disadvantage in areas with a high proportion of second language learners, but not specifically with adolescents who have language disorder.

A whole-class context becomes increasingly important in the secondary school years, when the implementation of small-group or individual intervention can become problematic in terms of the disadvantages of withdrawing students from the classroom (section 2.3.1).

The review of the literature in the current chapter reveals three key priorities for further investigation. The first priority is to address the lack of research into the effectiveness of a phonological-semantic approach in a universal model of delivery in a mainstream secondary school setting. To establish whether this is an effective approach for enhancing the vocabulary skills of adolescents with language disorder is the central purpose of the current thesis. This forms the main experimental study of the thesis, which applies a therapeutic approach normally delivered in a small-group or individual setting to a universal setting. This experimental study is reported on in Chapters 6 (methods), 7 (results), and 8 (discussion). Prior to this, in the light of the limited research, a second priority is to undertake a thorough appraisal of the extant evidence regarding vocabulary intervention focusing exclusively on the adolescent age group. This is addressed in Chapter 3, by a systematic review of the current evidence base. Thirdly, because the literature reveals little about what type of vocabulary teaching currently takes place in the mainstream secondary school classroom in the UK, and because the experimental study needs to be relevant to clinical and educational practice, it is necessary to quantify and qualify current speech and language therapy and teaching vocabulary practices. This is addressed by a survey of teachers and SLTs, reported on in Chapter 4.

Chapter 3

Vocabulary intervention for adolescents with language disorder: A systematic review

The systematic review reported in this chapter has been published as follows:

Lowe, H., Henry, L., Müller, L., and Joffe, V. (2017) Vocabulary intervention for adolescents with language disorder: a systematic review. *International Journal of Language and Communication Disorders* Early View Online.

Overview

Chapter 2 identified a priority to undertake a thorough appraisal of the extant evidence regarding vocabulary intervention focusing exclusively on the adolescent age group. The current chapter, therefore, reports on a systematic review of the literature in this field. After a brief introduction and rationale, the methods section describes the inclusion criteria and the search strategy. The results section summarises the characteristics of the included studies (N=13) and rates their quality. The discussion section appraises these studies in terms of type of intervention approach and model of intervention delivery. The chapter concludes with a summary of the emerging evidence for the effectiveness of a phonological-semantic approach with the adolescent age group, and makes suggestions for future research.

The literature review in Chapter 2 evaluated some studies which were also identified during the systematic searches of the literature. These studies are also included in the current chapter in order to provide a comprehensive and cohesive account of vocabulary intervention for adolescents with language disorder.

3.1 Introduction and rationale

Chapter 1 reported that 7 - 8% of five-year-old children have developmental language disorder as their primary need (Norbury et al., 2016), and that this can persist into adolescence (Johnson et al., 1999). When students are included who have language needs in association with another condition such as a known medical diagnosis or intellectual disability, prevalence rises to 10 - 12%. Evidence was presented that vocabulary skills are often at risk for children and adolescents with language disorder (e.g. Leonard, 1998; McGregor et al., 2013), and that vocabulary knowledge is associated with academic progress (e.g. Nation & Snowling, 2004).

Chapter 2 explored vocabulary intervention for children with language disorder, finding evidence for the effectiveness of a phonological-semantic approach (section 2.2). However, most of the evidence comes from studies of primary school age children, as less research has been conducted with the secondary school age group. Many changes take place during adolescence, both neurologically (Blakemore & Choudhury, 2006) and socially (Whitmire, 2000), and, moreover, students moving to secondary school at 11 years of age encounter an increasingly complex and exam-orientated educational environment. It cannot, therefore, be assumed that the same therapeutic approach is applicable to the secondary school age group. The main purpose of the current thesis was to conduct an experimental study (see Chapters 6, 7, and 8) which addresses this gap in the evidence base, investigating a universal model of delivery for combined phonological-semantic vocabulary intervention with adolescents who have language disorder. Prior to this, in order to ensure a thorough appraisal of the existing evidence in this field, a systematic review was performed.

Seven previous systematic reviews relevant to vocabulary intervention are known to the current researcher. Two reviews covered an adolescent age range (11 – 16 years), but did not include adolescents with language disorder (Ford-Connors & Paratore, 2015; Stahl & Fairbanks, 1986); four included participants with language disorder or low academic attainment, but did not include 11 – 16-year-olds (Cirrin & Gillam, 2008; Cirrin et al., 2010; Marulis & Neuman, 2010; Steele & Mills, 2011); and one included the adolescent age range but only considered children with specific learning difficulties (Jitendra, Edwards, Sacks, & Jacobson, 2004). None of these reviews investigated vocabulary intervention specifically for secondary school age adolescents with language disorder.

The current review builds on and extends previous research by addressing the following specific question: What evidence is there for the effectiveness of vocabulary intervention in enhancing the vocabulary skills of adolescents who have language disorder?

3.2 Methods

The review was registered in the PROSPERO International prospective register of systematic reviews on 24.5.15, under the title “Vocabulary intervention with adolescents who have language difficulties: a systematic review”, registration number CRD42015020846. The title was updated on 24.4.17 to “Vocabulary intervention with adolescents who have language disorder: a systematic review” to reflect current terminological usage.

3.2.1 Search strategy

The following databases were first searched between 5.6.15 and 9.6.15: Embase 1974-June 2015; Medline 1945-May week 5, 2015; Cochrane Central Register of Randomised Control Trials (RCTs); Cochrane Database of Systematic Reviews, British Education Index; Cinahl Plus with Full Text; Education Abstracts; ERIC-PsycArticles; PsycINFO; Academic Search Complete; Communication Source; Web of Science; BASE; and Open Grey. No date limits were set except for the Embase and Medline databases, in which date ranges are compulsory. In each database which utilised Boolean operators, the terms in each column were searched using “OR”, then these results were combined using “AND”. In databases which did not support this function, combinations from each column were searched using “AND”. Table 3.1 shows the concepts which were searched using subject terms and key word searches. Citation searching was carried out from the studies eligible for inclusion. The database searches were fully updated on 15.9.16. From this date, searches were kept up to date through database alerts, hand searching of journals and social media.

Table 3.1. Subject terms and key words used in searches

Person	Condition	Intervention	Type of study
adolescen*	"language impairment"	vocabulary	intervention
teenage*	"language disorder"	"word finding"	treatment
"young pe*"	"language delay"		therapy
"young adult"	"language difficult*"		instruction
	"language disabilit*"		teaching

3.2.2 Study eligibility criteria

Criteria for the inclusion of studies in the systematic review were:

- Intervention efficacy or intervention effectiveness studies
- Experimental studies of any methodology recognised on the hierarchy of evidence (Greenhalgh, 1997; 2014)
- Age range 11:0 – 16:11
- Language difficulties of any aetiology
- A focus on enhancing oral receptive and/or expressive vocabulary skills in the study's aims
- Written in the English language.

In order to capture all relevant studies, the search was not restricted to peer-reviewed articles as long the studies met all the above criteria.

3.2.3 Data extraction

An adapted Cochrane Group data extraction form was used to screen for eligibility and to record exclusion codes. Abstract screening and full-text eligibility assessment was carried out by a second reviewer. There were three discrepancies between first and second reviewers on abstract screening, which were resolved once full texts were examined, resulting in 100% agreement. The data extraction form was then used to assess included studies for quality and risk of bias.

3.2.4 Quality appraisal

Studies were awarded a classification according to the American Academy of Neurology Classification of Evidence Scheme: Therapeutic (AAN: Gronseth, Moses Woodroffe, & Getchius, 2011). Out of the several hierarchies of health-care evidence which exist, the AAN was chosen because its detailed criteria for assigning a level of quality, and it has been used in other systematic reviews in the field of speech and language therapy e.g. Ballard et al. (2004). In this scheme, Class I is the highest rating (RCTs with blind assessment, concealed allocation, clearly defined outcomes, and attrition accounted for). Class II includes RCTs lacking one criteria for Class I; Class III includes other controlled trials with blind assessment; and Class IV is the lowest rating for studies not meeting Class I, II, or III criteria. Detail about the quality of included studies was recorded according to study design, sample size, blinding of assessment, fidelity, control measures, and statistical validity. These features were chosen as being indicators of quality according to the AAN. For each study, the features were recorded as present, absent, or unclear, according to the criteria listed in Table 3.2.

Table 3.2. Quality rating indicators

	High quality	Low quality
Study design	Matching or randomisation used	Case study or case study series
Sample size	Over 10 in experimental group	10 or below in experimental group
Assessment	Outcome measures assessed by assessors blind to treatment status	Outcome assessors not blinded to treatment status
Fidelity	Fidelity measures used	No fidelity measures reported
Control measures	Control measures used	No control measures reported
Statistical validity	Statistical analysis used	No statistical analysis reported

3.2.5 Study characteristics

Outcomes of intervention were examined in relation to: age of participants; model of delivery used (individual, small-group, or whole-class), agent of change delivering the intervention; the setting; dosage; assessments; and type of intervention.

3.3 Results

3.3.1 Study selection: results

The search strategy yielded 1320 references. These were screened by title, and exclusion codes recorded. The remaining studies were screened by abstract, using the adapted Cochrane Group data extraction form, and exclusion codes recorded. Seventy-three studies remained for full-text eligibility assessment, of which 60 were excluded. Three references yielded by this systematic search (Lowe & Joffe, 2012; McNamara, 2014; National Behaviour Support Service (NBSS), 2015), were reports on studies which have since been published in peer-reviewed journals: therefore, for the purposes of this review, further information about NBSS (2015) and McNamara (2014), was taken from Murphy et al. (2017), and information about Lowe and Joffe (2012) was taken from Lowe and Joffe (2017). One reference (Joffe, 2011) was a published intervention manual and contained little detail about the research, and further information was obtained from Joffe et al. (in preparation) through contact with the author. Wright, Pring, & Ebbels. (in preparation) was cited in Ebbels et al. (2017), found during hand-searching of journals, and was obtained by contacting the authors. Thus 13 studies remained for inclusion. The study selection process is illustrated in Figure 3.1.

3.3.2 Quality appraisal: results

Study design

Five studies were randomised controlled trials where individuals or groups were randomised to treatment condition (Ebbels et al., 2012; Joffe, 2006; Joffe et al., in preparation; Murphy et al., 2017; Spencer, Clegg, Lowe & Stackhouse, 2017) and one used a matched-participants design (Hyde Wright et al., 1993). Three were case studies or case study series (Bragard et al., 2012; Cross, Blake, Tunbridge, & Gill, 2001; Haynes, 1992) and four used a within-subjects design (Lowe & Joffe, 2017; Sim, 1996; Sim, 1998; Wright et al., in preparation).

Sample size

Six studies had 10 or fewer participants, limiting their generalisability to a wider population; nonetheless, overall, the 13 studies yielded data on 778 participants, of whom at least 678 were aged 11 – 16 years (see section below on age of participants for more details). This sample size would afford some external validity if the studies were sufficiently homogeneous and of high quality.

Blinding of assessment

Studies in which outcome assessors are not blind to participants' treatment status are at risk of bias. Five studies (Ebbels et al., 2012; Joffe et al., in preparation; Lowe & Joffe, 2017; Spencer et al., 2017; Wright et al., in preparation) reported that assessors were blinded. Two stated that assessment was not blind (Bragard et al., 2012; Murphy et al., 2017), and in the remaining studies it was not clear.

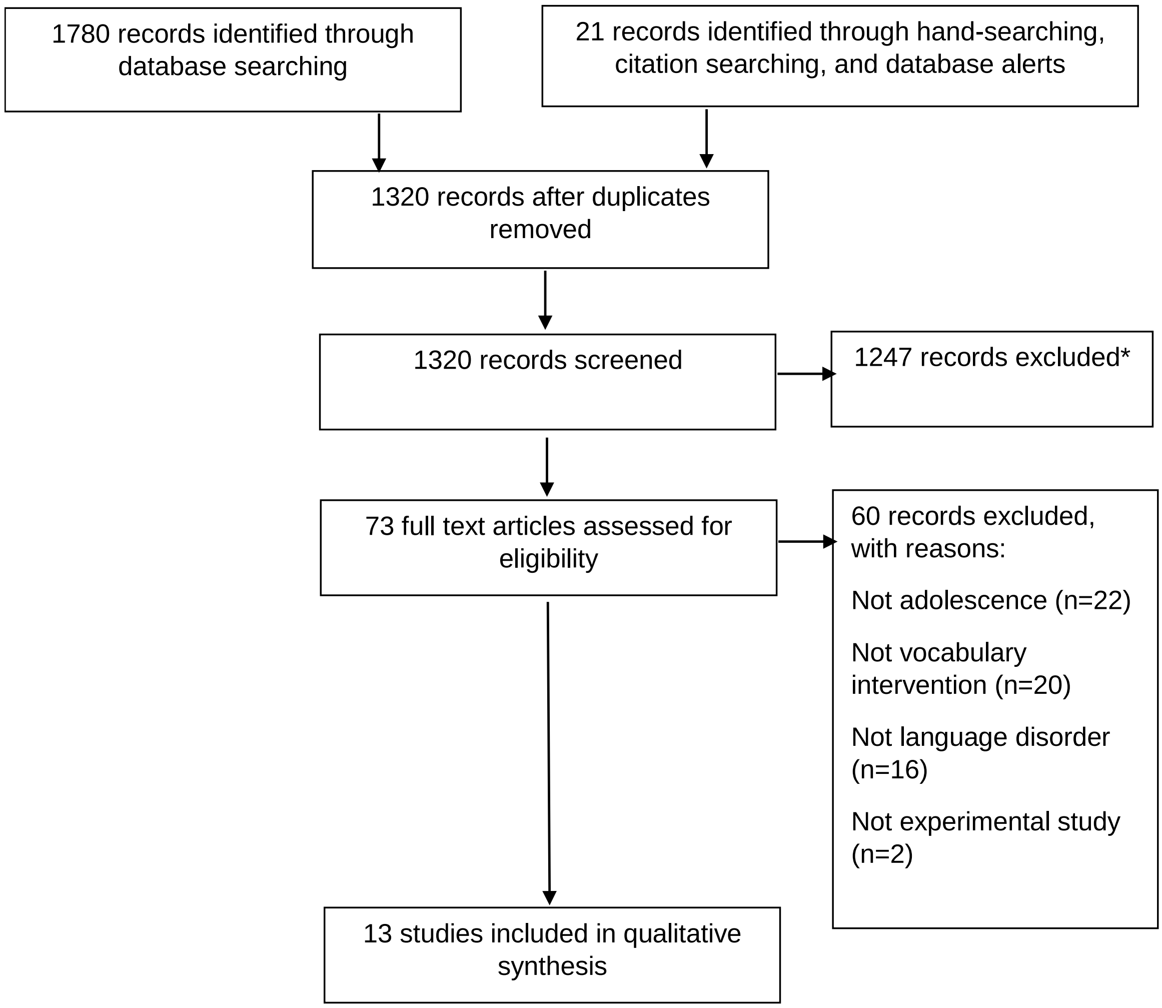

Figure 3.1. A flow chart of the review process

*Reasons for exclusion at the screening stage included: not adolescence; not vocabulary intervention; not experimental study (book review, call for papers or studies, whole book, conference programme, or editorial); original publication replaced by later publication in peer-reviewed journal; not in English.

Fidelity

Fidelity to treatment is important for intervention studies in order to minimise the influence of potential confounding variables. Robust fidelity measures strengthen the conclusions drawn by the authors. Only six studies reported that fidelity measures were taken, of which two (Ebbels et al., 2012; Joffe et al., in preparation) described their fidelity measures in detail.

Control measures

Three studies did not use any control measures (Cross et al., 2001; Sim, 1996; Sim, 1998). For the remaining studies, control measures varied considerably and are described in the discussion section.

Statistical validity

Ten studies used statistical analysis to support their findings: three did not (Cross et al., 2001; Sim, 1996; Sim, 1998).

Quality appraisal is summarised in Table 3.3. Studies are listed in the table in chronological order. According to the therapeutic AAN classification, three studies met criteria for class I (Ebbels et al., 2012; Joffe et al., in preparation; Spencer et al., 2017); two studies met criteria for class III (Lowe & Joffe, 2017; Wright et al., in preparation); and the remaining studies were rated as class IV, due to lack of blind assessment or lack of clarity regarding blind assessment.

3.3.3 Study characteristics: results

In this section, the included studies will be compared in relation to: language diagnosis of participants; age of participants; model of delivery used: agent of change delivering the intervention; the setting; dosage; assessment measures; and the type of intervention. Study characteristics are summarised in Table 3.4. Studies are listed in the table in chronological order.

Language diagnosis of participants

Inclusion criteria varied from study to study resulting in a range of diagnoses amongst participants. Five studies stated that participants had word-finding difficulties (Bragard et al., 2012; Cross et al., 2001; Ebbels et al., 2012; Haynes, 1992; Hyde Wright et al., 1993). Three reported low average receptive vocabulary levels (Lowe & Joffe, 2017; Murphy et al., 2017; Spencer et al., 2017). Other diagnoses included “speech and language difficulties” (Sim, 1996, p.136); “primary speech and language disorder” (Sim, 1998, p.84); “severe and complex difficulties in language and communication” (Joffe, 2006, p.209); “language disorder”, (Wright et al., in preparation) and “speech, language and communication needs” (Joffe et al., in preparation). Further detail on participants’ language profiles are included in section 3.4.

Age of participants

Seven studies included participants within the 11 – 16 age range only (N=648) Four studies included participants across different age ranges, but the ages of the participants are stated, so that it is known that 30 in total fell into the 11 -16 range. The remaining studies (Joffe, 2006; Wright et al., in preparation) included participants ranging from nine to 15 years of age, but mean ages only are stated, so it is not known exactly how many fell within the 11 – 16 age range. Where this was the case, group data for multiple ages was considered in the discussion section of this review.

Model of delivery

The model of intervention delivery used is one area of diversity in these studies. Five studies reported individual interventions, three used a small-group model, and four investigated a whole-class model of delivery. One study (Cross et al., 2001) was a single case study which involved both one-to-one and group intervention.

Agent of change

The term *agent of change* refers to the person who carries out an intervention and thereby effects change in the child's or adolescent's skills. The professional role of the agent of change in the studies reviewed also varied from study to study. Individual intervention was administered by a SLT in all cases. One of the small-group interventions (Joffe, 2006) was administered by speech and language therapy students, the second (Joffe et al., in preparation) was administered by teaching assistants, and the third (Spencer et al., 2017) by SLTs. Of the whole-class interventions, two were administered collaboratively by the class teacher and SLT (Sim, 1996; Sim, 1998), and two by class teachers (Lowe & Joffe, 2017; Murphy et al., 2017).

Setting

Six studies took place in a specialist school for children and/or adolescents with language disorder, one took place in a school with "special education classes" (Bragard et al., 2012, p.224), five in mainstream secondary schools, and one in a specialist childcare setting.

Table 3.3. Quality appraisal of intervention studies

Study	Randomisation of participants	Matching of participants	Sample size over 10 in experimental group	Blind assessment	Fidelity measures used	Control measures used	Statistical analysis used	AAN Class	Reason for AAN rating
Haynes (1992)	No	No	No	?	?	Yes	Yes	IV	Blind assessment not stated
Hyde Wright, Gorrie, Haynes, and Shipman (1993)	No	Yes	No	?	?	?	Yes	IV	Blind assessment not stated
Sim (1996)	No	No	Yes	?	?	No	No	IV	Blind assessment not stated
Sim (1998)	No	No	No	?	?	No	No	IV	Blind assessment not stated
Cross, Blake, Tunbridge, and Gill (2001)	No	No	No	?	?	No	No	IV	Blind assessment not stated
Joffe (2006)	Yes	No	Yes	?	?	Yes	Yes	IV	Blind assessment not stated
Bragard, Schelstraete, Snyers, and James (2012)	No	No	No	No	Yes	Yes	Yes	IV	Not blind assessment
Ebbels et al. (2012)	Yes	No	No	Yes	Yes	Yes	Yes	I	RCT
Murphy et al. (2017)	Yes	No	Yes	No	No	Yes	Yes	IV	Not blind assessment
Spencer, Clegg, Lowe, and Stackhouse, (2017)	Yes	No	Yes	Yes	Yes	Yes	Yes	I	RCT
Lowe and Joffe (2017)	No	No	Yes	Yes	Yes	Yes	Yes	III	Not randomised or matched
Joffe, Rixon, Hirani, and Hulme (in preparation)	Yes	No	Yes	Yes	Yes	Yes	Yes	I	RCT
Wright, Pring, and Ebbels (in preparation)	No	No	Yes	Yes	Yes	Yes	Yes	III	Not randomised or matched

Key: ? = Information not clear in paper.

Table 3.4. Summary of study characteristics

Study	Study design	Number of participants	Age of partici-pants in years and months (number aged 11–16)	Model of delivery and agent of change	Setting	Type of intervention	Dosage	Key conclusions	Limitations
Haynes (1992)	Case study series	2	10:1 and 11:5	1:1. SLT	Specialist language education setting	Semantic: elaboration vs definition	25 mins 3 times a week for 4 weeks	No demonstrable progress on bespoke assessment.	Words not matched. Study not completed.
Hyde Wright, Gorrie, Haynes, and Shipman (1993)	Between-groups (age-matched) experimental study	30	8:1 – 14:6 (12)	1:1. SLT	Specialist language education setting	Semantic vs phonological vs waiting control	30 mins semantic or 15-20 mins phonological 3 times a week for 5 weeks	Semantic therapy was more effective, measured by bespoke assessment.	Dosage of semantic therapy was higher than phonological therapy.
Sim (1996)	Within-subjects repeated measures	26	11 – 12	Whole class. Teacher	Specialist language education setting	Compensatory approach (including direct vocabulary teaching in class) pre- to post-comparison	In science lessons for four months	Word learning improved on bespoke assessment. Mutual trust required for effective multi-disciplinary collaboration..	No statistical information. No control measures.
Sim (1998)	Within-subjects repeated measures	10	12 – 13	Whole class. Teacher	Specialist language education setting	Compensatory approach (including direct vocabulary teaching in class); pre- to post-comparison	45 mins 3 times a week Duration not stated	Word learning improved on bespoke assessment. Multi-disciplinary collaboration can be effective.	No statistical information. No control measures.

Cross, Blake, Tunbridge, and Gill (2001)	Single case study	1	14	1:1 and small group. SLT	Specialist childcare setting	Phonological-semantic, word finding strategies, definition practice: pre- to post-comparison	One hour twice a week for one year	Progress on Figurative Usage subtest of TOWK.	No statistical information. No control measures. Incomplete reporting of results.
Joffe (2006)	RCT	54	10:0 – 15:3 (Not stated. Mean age 12:8)	Small group. SLT students	Mainstream secondary school	Semantic vocabulary intervention vs narrative	50 mins twice a week for 6 weeks	Progress on BPVS-2, ACE 6 – 11 non-literal comprehension, and CELF recalling sentences for both groups.	No control group.
Bragard Schel-straete, Snyers, and James (2012)	Case study series	4	9:6 – 13:9 (3)	1:1. SLT	Specialist language education setting	Semantic vs phonological	30 mins once a week for 5 weeks	Children with phonological deficit responded better to semantic therapy and vice versa, on bespoke assessment.	Small sample size. Ceiling effects. Not blind assessment.
Ebbels et al. (2012)	RCT	15	9:11 – 15:11 (14)	1:1. SLT	Specialist language education setting	Phonological-semantic: intervention vs waiting control	15 mins twice a week for 8 weeks	Progress on TAWF but not on TWFD.	Small sample size. Limited generali-sability to other schools.
Murphy et al. (2017)	RCT	203	11:11 – 13:11	Whole class. Teacher	Mainstream secondary school	VEP (Joffe, 2011) intervention vs waiting control	40 mins twice a week for 12 weeks	Progress on CELF-4 UK Word Classes (Expressive) subtest, and the BPVS-3.	No baseline period. Not blind assessment.
Spencer, Clegg, Lowe, and Stackhouse (2017)	RCT	35	12:1 – 13:11	Small group. SLT	Mainstream secondary school	Phonological-semantic: experimental vs control words; and intervention vs waiting control	One hour once a week for 10 weeks	Delayed intervention group made progress in word knowledge of experimental words.	Limited generali-sability to other schools.
Lowe and Joffe (2017)	Within-subjects repeated measures	15	13:3 – 14:1	Whole class. Teacher	Mainstream secondary school	Phonological-semantic vs routine teaching practice	50 mins 3 times a week for three weeks	Progress on bespoke assessment of borderline significance.	Ceiling effects.

Joffe, Rixon, Hirani, and Hulme (in preparation)	RCT	358	12 – 13	Small group. TA	Mainstream secondary school	Vocabulary (phonological-semantic) vs narrative vs combined vs waiting control	40-60 minutes 3 times per week for 6 weeks	No significant difference on standardised vocabulary assessment, but significant progress on bespoke assessment.	Not yet peer reviewed.
Wright, Pring, and Ebbels (in preparation)	Within-subjects repeated measures	25	9:4 – 16:1 (not stated: mean age 12:5)	1:1. SLT	Specialist language education setting	Phonological-semantic: experimental vs control words, and nouns vs verbs	30 minutes once a week plus 5 minutes once a week for 7 weeks	Greater progress with experimental than with control words on bespoke assessment.	Not yet peer-reviewed.

Key:

ACE 6 – 11	=	Assessment of Comprehension and Expression 6 - 11
BPVS-2	=	British Picture Vocabulary Scale, second edition
CELF	=	Clinical Evaluation of Language Fundamentals
SLT	=	Speech and language therapist
TA	=	Teaching Assistant
TAWF	=	Test of Adult/Adolescent Word Finding
TWFD	=	Test of Word Finding in Discourse
TOW	=	Test of Word Knowledge
vs	=	versus

Dosage

Where intervention was embedded within the classroom curriculum, it was not possible to estimate a dosage figure accurately. In those studies reporting individual intervention, intervention regime varied widely. Excluding Cross et al. (2001), which has an outlying cumulative intervention dosage of 52 hours, the cumulative intervention dosage ranged between 2.5 hours and 7.5 hours, with a mean of 4.55 hours. Dose frequency in studies reporting individual intervention ranged between one and three times a week, and intervention duration ranged between four and eight weeks.

Assessment

Eight studies used only bespoke word knowledge outcome measures (Bragard et al., 2012; Haynes, 1992; Hyde Wright et al., 1993; Lowe & Joffe, 2017; Sim, 1996; Sim, 1998; Spencer et al., 2017; Wright et al., in preparation). Of these, seven reported increased word knowledge of targeted words. Bespoke assessments measured vocabulary knowledge in diverse tasks: receptive (e.g. picture pointing tasks), expressive (e.g. naming, sentence production); definition production tasks, which involve expressive language skills but also indicate depth of word knowledge; and phonological knowledge (e.g. identifying syllable number).

Four studies used only standardised vocabulary assessment, in order to measure the impact of the intervention on independent word learning skills (Cross et al., 2001; Ebbels et al., 2012; Joffe, 2006; Murphy et al., 2017), and one study used both bespoke and standardised assessment (Joffe et al., in preparation). All of these report progress on some of the assessments used but not others. Again, there was a wide range of assessments used, each tapping different aspects of word knowledge. Examples have been given in section 2.2.1.

A further indication of generalisation to independent word learning skills would be to measure academic attainment, to evaluate the impact of the vocabulary intervention on wider access to the curriculum. None of the included studies addressed this.

Type of intervention

The type of intervention varied from study to study, but all took phonological and/or semantic approaches. Interventions included: semantic intervention (4 studies); comparison of phonological versus semantic intervention (2); and combined phonological-semantic intervention (7 studies). These will be explored further in the discussion section.

Overall, there was a large degree of methodological diversity amongst the studies, with a trend of increasing empirical rigour over time. Therefore, it was felt appropriate to review these studies through a narrative synthesis rather than a meta-analysis.

3.4 Discussion

This narrative review will appraise the included studies in relation to the type of intervention used: semantic intervention; comparison of phonological versus semantic intervention; and combined phonological-semantic intervention.

3.4.1 Semantic intervention

Four studies delivered semantic intervention. One of these (Haynes, 1992) used an individual model of delivery; two (Sim, 1996; Sim, 1998) used a whole-class model of delivery; and one used a small-group model of delivery (Joffe, 2006).

Haynes (1992) investigated the effectiveness of semantic vocabulary intervention, comparing an elaboration condition with a definition condition in individual intervention, with two boys aged 10 and 11 years. One boy's percentile rank on the BPVS (edition not stated) was 24, the other's 34, indicating age-appropriate receptive vocabulary, but both had expressive vocabulary difficulties, achieving 7th and 1st percentile ranks respectively on a word finding assessment (described in the paper as "German"; Haynes, 1992, p.4), and presenting with indicators of word-finding difficulty such as pausing while searching for a word, or making semantic or phonological naming errors. A list of 30 words was chosen according to the particular interests of each boy and used in the elaboration intervention condition. Each boy's word list acted as the control list for the other boy, in the definition intervention condition. In the elaboration condition, words were used in a context in which the boys were actively involved; in the definition condition, the words and their definitions were read aloud to the boys who listened passively. Dosage of intervention was 25 minutes, three times a week, over a period of four weeks. The outcome measure was a definition production task. The plan was to continue intervention, reversing the condition in which the words appeared; however, after four weeks, one boy had made minimal progress with the definition set of words, and the other boy had made no progress with either set (though statistical analysis was not used), so the study was discontinued. This decision appears to have been made on the basis of discontinuing ineffective intervention. The author acknowledged methodological weaknesses such that the word lists were not matched, and word knowledge baselines were not equated. As such, the value of this paper lies in its discussion of the issues around carrying out clinical research in real-life settings rather than the empirical evidence it provides.

The two papers by Sim (1996; 1998) described the development and evaluation of a "compensatory approach" (Sim, 1998, p.84) to the teaching of science vocabulary and concepts with 12 – 13-year-olds in a specialist language school. Neither study gives language assessment scores for the pupils but describes them as having speech and language difficulties (Sim, 1996) and primary speech and language disorder (Sim, 1998). Intervention took place in the classroom, and encompassed four elements: practical demonstration; language integrated into the teaching by all the staff involved; motivation created by the resources in the "mystical" environment of the science laboratory (Sim, 1998, p.86); and increased exposure by lengthening the duration of the topic. Children additionally received vocabulary support through individual speech and language therapy sessions. In Sim (1996), progress in vocabulary acquisition for a group of 26 students following one lesson was reported for four words, though the bespoke outcome measure "expressive vocabulary recognition" was not explained (Sim, 1996, p.142). In Sim (1998), progress for a group of 10 students following one topic (duration not stated) was reported for 13 words on measures of naming and semantic representation, using questions about the targeted words e.g. "Which of these items is a material?" (Sim, 1998, p.88) No information was given, however, about the relative impact of the classroom intervention compared to the individual speech and language therapy sessions, neither were any control measures nor statistical analysis used. The author presented these two papers as an opportunity to explore and promote multi-disciplinary collaboration in order to achieve curriculum differentiation.

Joffe (2006) conducted a RCT with a cohort of 54 adolescents aged 10:0 - 15:3. The participants had “severe and complex difficulties in language and communication” (Joffe, 2006, p.209), defined as scoring 85 or below on a range of standardised assessments including the BPVS-2, the Clinical Evaluation of Language Fundamentals, third edition (CELF-3: Semel, Wiig, & Secord, 2000), and the Assessment of Comprehension and Expression 6 - 11 (ACE 6 - 11: Adams, Crooke, Crutchley, Hesketh, & Reeves, 2001). Participants were randomised into two groups to receive intervention delivered by student speech and language therapists in small groups in mainstream secondary schools, for two 50-minute sessions a week over a six-week period. One group received semantic vocabulary intervention, which included categorising words through mind maps, as well as the use of synonyms, antonyms, multiple meanings, and definitions; and the other group received narrative intervention which included story structure, story description and inferential understanding. Both groups made significant progress on the BPVS-2, the Recalling Sentences subtest of the CELF-3, and the Non-Literal Comprehension subtest of the ACE 6 - 11. These results suggested a generalisation effect of intervention, but there were no differential effects between the narrative intervention and the vocabulary intervention.

With only one of these studies (Joffe, 2006) demonstrating enhancement in vocabulary skills in an empirically sound design, and with both vocabulary and narrative groups in this study showing enhanced vocabulary skills, the evidence for the effectiveness of semantic-only therapy in the adolescent age group is limited.

3.4.2 Comparison of phonological versus semantic intervention

Two studies attempted to establish the relative merits of phonological versus semantic intervention in enhancing the expressive vocabulary skills of children with language disorder. Hyde Wright et al. (1993) compared the effect of phonological and semantic intervention on naming ability, working with 30 children who had word-finding difficulties aged 8:1 – 14:6. Twelve of these children were aged 11 or over. All the children had standard scores 85 and below on the TWF. In a matched-group design, children received individual intervention three times a week over a period of five weeks, one group receiving phonological intervention and the other group receiving semantic intervention. The authors found that semantic intervention was significantly more effective than the phonological information in improving the naming of untrained pictures. The dosage of semantic intervention (approximately 30-minute sessions), however, was higher than that of the phonological intervention (approximately 15- to 20-minute sessions), so the result could be accounted for by increased dosage rather than type of intervention.

Using a similar intervention, Bragard et al. (2012) reported a case series of four children with word-finding difficulties aged 9:6 – 13:9. Three of these children were aged 11 or over. The children scored on the 6th, 1st, 18th, and 1st percentile respectively on the picture naming subtest the Evaluation du Langage Oral (Khomsi, 2001). The four children presented with differing linguistic strengths and weaknesses; two showing semantically-based word-finding difficulties, and two showing phonologically-based word-finding difficulties. Phonological intervention for 24 words was compared with concurrent semantic intervention for 24 words. Progress in naming these words was compared with a control set of 24 words which received no intervention. How the words were allocated to experimental or control conditions was not described. Children received 30 minutes' individual intervention once a week over a period of five weeks. Outcome measures included picture naming, phoneme segmentation, initial phoneme recall, semantic associations, and definition production. The authors interpreted the results such that the children with a semantic deficit responded better to phonological intervention, and that the children with a phonological deficit responded better to semantic intervention, positing that this was due to intervention supporting within-child strengths. However, the pattern of results is not so clear-cut as to provide firm evidence for this conclusion, and as this is a small case-series design, without blind assessment, the authors acknowledged that these findings need replication.

Thus, the evidence provided by these two studies does not clarify the relative merits of phonological versus semantic intervention with the adolescent age group.

3.4.3 Combined phonological-semantic intervention

Seven studies investigated a combined phonological-semantic intervention approach. Three studies delivered this using an individual model of delivery (Cross et al., 2001; Ebbels et al., 2012; Wright et al., in preparation); two delivered the intervention in small groups (Joffe et al., in preparation; Spencer et al., 2017); and two delivered it in a whole-class model (Lowe & Joffe, 2017; Murphy et al., 2017).

Cross et al. (2001) reported on a single case study of a 14-year-old boy who had a complex profile of language disorder and emotional, behavioural, and learning difficulties, in a specialist childcare setting which provided "foster care, education, speech and language therapy, psychotherapy and social work for children and families with complex special needs" (Cross et al., 2001, p.320). At baseline, the boy had scaled scores on subtests of the TOWK as follows: Synonyms 3, Figurative Usage 3, Word Definitions 6, and Multiple Contexts 7. The vocabulary component of the intervention entailed developing phonological and semantic word-finding strategies, and word definition skills. Dosage was a one-hour individual speech and language therapy session once a week over a period of one year, which included vocabulary intervention as well as other speech and language targets, and in addition the participant received weekly small-group intervention targeting social skills. The participant's scaled score on the Figurative Usage subtest of the TOWK was reported to have risen from 3 at pre-intervention to 5 at post-intervention; however, post-intervention scores in the Synonyms, Word Definitions and Multiple Contexts subtests were not reported. Furthermore, no control measures were undertaken and no statistical analysis was reported, so it is difficult to distinguish between the effects of the intervention, other input, or the effect of maturity. Thus, although this paper describes the value of multi-disciplinary collaboration, it provides weak empirical evidence of effectiveness.

Stronger evidence for the phonological-semantic approach in individual intervention was provided by Ebbels et al. (2012), in a RCT in a specialist language setting. Participants were aged 9:11 –

15:11, and all but one of these were aged 11 or over. The participants (N=15) all had word-finding difficulties, with a mean standard score on the TAWF of 63 (range 44 – 81). Although the title of this paper implies semantic-only intervention, inspection of the intervention schedule reveals that it did contain opportunities to practise phonological word-finding strategies as well as semantic strategies. Individual intervention was delivered to seven participants 15 minutes twice a week over a period of eight weeks, and progress on the TAWF and TWFD was compared with a waiting control group of eight participants. The authors reported significant progress for the experimental group, but not for the control group, and concluded that this indicated a generalisation effect of intervention, although no progress was made on the TWFD. This study has a high quality-rating, and although it had a sample size of only seven in the experimental group, which limits the generalisability of the results, the findings give some support to the use of a phonological-semantic approach in individual intervention in a specialist language setting.

Wright et al. (in preparation) implemented a within-subjects pre-post study design with 25 participants in the same specialist language setting as Ebbels et al. (2012). Ages ranged between 9:4 and 16:1 (*M* = 12:5) but it is not stated how many were within the 11 – 16 age range. The group mean standard score on the BPVS-2 was 75.9 (*SD* = 15.1). Participants received individual intervention with their usual SLT, following a manualised phonological-semantic intervention for 10 words (five nouns and five verbs), for 30 minutes once a week over a period of seven weeks. Two target words were introduced in each session, with an additional individual revision session of five minutes once a week, consisting of a game to recap on all words introduced so far. Two sets of words were matched by frequency, and randomly assigned to treatment or control conditions, with one set acting as experimental words, and the other set acting as a control set for each participant. Progress was measured on bespoke tasks involving lexical decision, definition (multiple choice), definition (production), and sentence production. On all tasks, participants made significantly greater progress with experimental than with control words; furthermore, on the more linguistically complex tasks (sentence production and definition production), participants showed greater gains on nouns than verbs. This study has a larger sample size than Ebbels et al. (2012) in the experimental group, and although conclusions cannot be drawn about generalisation of intervention to independent word learning skills, or to other settings, the findings further support the use of a phonological-semantic approach in individual intervention in a specialist language setting.

Two studies have explored phonological-semantic intervention using a small-group model of intervention delivery (Joffe et al., in preparation; Spencer et al., 2017).

Joffe et al. (in preparation) conducted a large RCT involving 358 12 – 13-year-olds in mainstream secondary schools. The mean standard score for this group on the BPVS-2 was 85.21 (*SD* = 12.28). Intervention comprised the VEP (Joffe, 2011), which was developed from the programme used in Joffe (2006) to include greater detail and a phonological component. Intervention was delivered in small groups of two to six students by trained teaching assistants, for 40-60 minutes, three times a week over a period of six weeks. Participants were randomised into four groups: vocabulary; narrative; combined (narrative and vocabulary); and waiting control. No statistically significant progress was made on standardised assessments of vocabulary from pre- to post intervention. A significant group by time interaction effect indicated that the vocabulary group made more progress on a bespoke vocabulary idiom awareness measure in comparison to the control group. The combined narrative/vocabulary group also performed significantly better over time than the control group on the bespoke idiom awareness task, as well as on a bespoke definition production task. This study provides some evidence of the effectiveness of phonological-semantic intervention on idiom awareness, and stronger evidence for the effectiveness of a combined narrative/vocabulary intervention in enhancing idiom and general expressive vocabulary knowledge, in a small-group model in a mainstream setting, delivered by trained teaching assistants with a manualised programme. Performance on standardised vocabulary tests and receptive vocabulary tasks proved more resistant to change.

The study by Spencer et al. (2017) also supports the effectiveness of vocabulary intervention in a small-group model within mainstream secondary schools. These researchers included 35 12 – 13-year-olds who had low vocabulary levels, and who attended a mainstream secondary school in an area of social disadvantage, using a matched-groups delayed intervention design. Participants' mean standard score on the BPVS-3 was 81.69 (*SD* = 9.51). The intervention, carried out by SLTs, for one hour once a week for a period of 10 weeks, comprised phonological-semantic intervention for 10 cross-curricular verbs, and progress was compared with 10 control verbs matched for phonological complexity and frequency. The mean number of sessions attended was 7.42 for the intervention group, and 6.63 for the control (delayed intervention) group. Progress was measured using a bespoke depth of word knowledge assessment measure. The intervention group did not make significant progress in experimental word knowledge compared with control word knowledge, though the control group did, following their delayed intervention. Combining the results of the two groups, significant progress was made relative to zero in knowledge of the experimental words, but not the control words. The mean number of words learnt was 1.17 which although a small gain, was a large effect size (η^2_p = .42). The study took place in a single school, and the authors noted that factors in the school, such as behaviour management, were critical to the outcomes of intervention.

The remaining two studies (Lowe & Joffe, 2017; Murphy et al., 2017) focussed specifically on enhancing vocabulary skills by applying a phonological-semantic approach within a mainstream whole-class setting. Lowe and Joffe used a within-subjects design with a class of 15 students, whose mean scaled score on the Receptive One-Word Picture Vocabulary Test (Brownell, 2000) was 7.7 (*SD* = 2.5), and whose mean scaled score on the Recalling Sentences subtest of the CELF-4 UK was 3.6 (*SD* = 2.7). Their teacher taught 10 science curriculum words using phonological-semantic activities, such as word maps, and 10 words using routine teaching practice, which consisted of semantic activities such as matching written words to definitions. The outcome measure was a bespoke definition production task. The inclusion of high-frequency words resulted in ceiling effects and limited the potential of this study to demonstrate increase in word knowledge. Once the highest frequency words were omitted from analysis, progress in the five lowest frequency experimental words compared to the five lowest frequency words taught through routine teaching practice was of borderline significance. Furthermore, comments elicited from the students and their teacher through interview and questionnaire revealed that they viewed the word-learning activities favourably, demonstrating the feasibility of phonological-semantic intervention through a whole-class model of delivery.

Murphy et al. (2017) also investigated whole-class vocabulary intervention, using a RCT with 203 participants aged 11:11 – 13:11, attending mainstream secondary schools in areas of socio-economic disadvantage in the Republic of Ireland. Sixty-one percent of participants had a BPVS-3 standard score greater than -1.25 SD below the mean, and the group mean was 83.72 (*SD* = 13.03). An adapted VEP (Joffe, 2011) was delivered by 12 English teachers to 128 participants in a whole-class model, and progress was compared with 75 waiting controls. Murphy and colleagues reported significant improvement for the experimental group following intervention on standardised scores in the Word Classes (Receptive), Word Classes (Expressive), and Word Definitions subtests of the CELF-4 UK, and on the BPVS-3. However, the waiting control group also made significant progress on the Word Classes (Receptive) and Word Definitions subtests, so improvements on these two measures cannot be accounted for by the intervention. Nonetheless, following their delayed intervention, the waiting control group did make significant progress on the Word Classes (Expressive) subtest and the BPVS-3, whereas progress on these two subtests during the baseline period had been non-significant, thereby adding strength to the evidence for the effectiveness of phonological-semantic vocabulary intervention in a mainstream secondary whole-class setting, for both receptive and expressive vocabulary skills measured on standardised tests. For the experimental group, there was no baseline period, so the effects of maturation could not be completely ruled out.

These seven studies investigating combined phonological-semantic intervention, although methodologically diverse, provide initial evidence for the effectiveness of phonological-semantic intervention in increasing word knowledge.

3.4.4 Generalisation to independent word learning

Four studies reported progress following semantic or phonological-semantic intervention on standardised assessment. One of these studies was a single case study with no control measures (Cross et al., 2001). It could be argued that the control in this study was comparison with the normative mean; however, these authors did not support their conclusions with statistical analysis. The remaining studies reporting improvement on standardised outcome measures (Ebbels et al., 2012; Joffe, 2006; Murphy et al., 2017) demonstrated higher internal validity due the use of control measures and statistical analysis, and therefore provide stronger evidence of a generalisation effect, though it should be noted that these studies did not demonstrate significant improvement on all the standardised tests they used.

Although these four studies suggested some generalisation effect of intervention to independent word learning, none of them used any curriculum assessments as an outcome measure. Therefore, even those that demonstrated some enhancement of participants' vocabulary skills were not in a position to assess whether this has had a positive impact on academic attainment. Further, improvement on standardised assessment does not measure the potential functional impact of intervention, for example on a student's confidence or attitude towards word learning.

3.4.5 Summary of discussion

Overall, the available evidence for the effectiveness of intervention designed to enhance the vocabulary skills of adolescents is at best mixed.

Evidence for semantic-only intervention is inconclusive, as is the evidence for the relative merits of phonological versus semantic intervention in the adolescent age group. Evidence is stronger for a combined phonological-semantic approach to intervention with this age group, although not robust due to the wide variability in study designs. Some evidence (Joffe et al., in preparation) suggests that outcomes are better when the intervention is embedded in a wider language context such as a narrative approach.

Bespoke outcome measures have shown more positive results than standardised measures (e.g. Joffe et al., in preparation; Spencer et al., 2017; Wright et al., in preparation), even though often only modest gains are made. This is to be expected, as author-created measures are weighted towards the content and target of the intervention, whereas standardised measures are more psychometrically robust yet more conservative (Marulis & Neuman, 2010). Studies reporting progress on standardised assessment, which would suggest a treatment effect on independent word learning, have found progress on some assessments but not others (Ebbels et al., 2012; Murphy et al., 2017). A wider goal, given the importance of vocabulary knowledge for long-term outcomes, would be to assess the impact of intervention on academic, social, and emotional outcomes. None of the included studies used such outcome measures.

The evidence needs to be considered in the light of a wide range of variables. The diagnosis of the participants, and consequently the purpose of the intervention, was confined in some cases to participants with word-finding difficulties, and in other cases included a wider remit to include those with low receptive vocabulary levels. The participants receiving individual intervention in specialist settings may have had more severe and complex language disorders than cohorts of participants recruited from mainstream schools, in which intervention was delivered in small groups or a whole-class model. The factors influencing the choice of model of delivery, and frequency and duration of dosage were not fully explored in each study. The lack of homogeneity between studies thus makes it difficult to amass converging evidence applicable to particular populations and settings.

An added obstacle faced by researchers is the challenge of conducting effectiveness studies in real-life contexts, where extraneous factors such as teacher or teaching assistant variables and time-tabling constraints may contaminate the purity of the intervention. Taking a pragmatic outlook, which acknowledges these challenges and differences, the tentative evidence collated by this review encourages confidence in the potential for a phonological-semantic approach to intervention with the adolescent age group, with the caveat that there is further work to be done.

The types of intervention approach did not diverge widely from those used in research with primary school age children (section 2.2), comprising phonological-semantic techniques presented in an age-appropriate way. However, as social and educational demands change and intensify during adolescence, perhaps further consideration needs to be given to other factors such as the most effective frequency and duration of intervention, and model of delivery (individual, small-group, or whole-class), as well as the preferences of the students themselves.

3.5 Limitations of the review

There are a number of limitations to this review. First, only studies in English were included, possibly excluding some relevant research. Second, the terminology used for language difficulties has varied widely in the research community, the speech and language therapy community, and the teaching community. To overcome this, a wide range of search terms was used to maximise the yield of studies, enabling confidence that relevant studies were found. Even so, the inclusion criteria varied from study to study resulting in a collection of studies with participants of differing diagnoses. The advent of a common terminology when describing language disorder (Bishop et al., 2017) will assist in enabling comparison between studies in the future. Thirdly, only 13 studies were found that met criteria for inclusion, and due to the lack of statistical analysis in several of them, and a wide degree of heterogeneity between studies, it was felt inappropriate to carry out a meta-analysis. This reflects the fact that research in this field is in its infancy, and limits the potential of the review to identify a strong body of converging evidence. It is hoped that this narrative review will result in greater understanding of the current evidence base and stimulate further research.

3.6 Conclusion and suggestions for future research

The aim of this systematic review was to synthesise the evidence for effective vocabulary interventions in adolescents with language disorder. As this is a relatively new area of research, evidence is emerging from methodologies at all levels on the hierarchy of evidence. Thirteen studies met criteria for inclusion in this review, and although they all used a phonological and/or semantic approach to intervention, there was wide disparity in terms of assessment measures, participant characteristics, and methodologies, as well as varying degrees of quality, producing a limited amount of converging evidence. Only three studies were of high enough quality to obtain a class I AAN rating.

From this back-drop, evidence is beginning to emerge of the effectiveness for a phonological-semantic approach to intervention in enhancing the vocabulary skills of adolescents who have language disorder, justifying this choice for practitioners. There is initial evidence for individual intervention in specialist schools, and for small-group and whole-class intervention in mainstream settings, but, as findings in one setting are not necessarily replicable to other settings, more research is needed. The evidence must be considered in the light of the participants' diagnoses, the aims of the intervention, and the outcome measures used; for example, the cognitive and language profiles of participants, whether expressive or receptive vocabulary skills are being targeted, and whether the aim is to demonstrate increased knowledge of targeted vocabulary items, independent word learning, or longer term academic success.

Hence, the evidence needs to be strengthened through replicated, robust, high-quality peer-reviewed research. Questions remain regarding the most effective aspects of intervention, the most effective model of intervention, the influence of the agent of change, and the recommended dosage of intervention.

The current systematic review revealed two studies investigating the use of phonological-semantic activities in a universal model in a mainstream secondary school setting. Murphy et al. (2017) implemented a structured programme within English classes, and Lowe and Joffe (2017) investigated the feasibility of incorporating phonological-semantic activities into the delivery of the curriculum. Extending this research, the experimental study of the present thesis, reported on in Chapters 6, 7, and 8, investigates the use of phonological-semantic activities with curriculum words, implemented by teachers, and embedded into syllabus content.

Summary of Chapter 3

The aim of the systematic review of the literature, reported on in the current chapter, was to ensure a thorough appraisal of the evidence for vocabulary intervention focussing on adolescents with language disorder. Previous reviews have shown that a variety of intervention approaches can successfully increase students' vocabulary knowledge; however, none of them investigated vocabulary intervention specifically for secondary school age students with language disorder.

A systematic search of 14 databases and other sources yielded 1320 studies, of which 13 met inclusion criteria. Inclusion criteria were: intervention effectiveness studies with a focus on enhancing oral receptive and/or expressive vocabulary skills in the study's aims; participants in the age range 11:0 – 16:11 with receptive and/or expressive language difficulties of any aetiology.

There was a high degree of diversity between studies. Types of intervention varied from study to study: semantic intervention (4 studies); comparison of phonological versus semantic intervention (2); and combined phonological-semantic intervention (7). The strongest evidence for effectiveness was found with a combined phonological-semantic approach. The evidence suggested a potential for all models of delivery (individual, small-group, and whole-class). No study investigated the use of phonological-semantic activities incorporated into the delivery of the mainstream secondary school curriculum, strengthening the rationale for the experimental study of this thesis.

The review highlighted that few studies provided detailed descriptions of the content and procedure of intervention, and also revealed little information about what type of vocabulary teaching currently takes place in the mainstream secondary school classroom. Therefore, the purpose of the next chapter (Chapter 4) is to add a clinical and educational perspective to the rationale for the intervention study by surveying current teaching and speech and language therapy practice.

Chapter 4

Current teaching and speech and language therapy practice:

A survey

Overview

The introduction to the current chapter reprises themes from previous chapters, and expands the rationale for a survey of current teaching and speech and language therapy practice with regard to vocabulary instruction. The methods used to conduct the survey are described in section 4.3. Results are reported in section 4.4, which is followed by a discussion in section 4.5. Limitations are discussed in section 4.6, and conclusions in section 4.7.

4.1 Introduction and rationale

Chapters 2 and 3 discussed approaches to vocabulary teaching in universal, small-group, and individual models of delivery. It was found that approaches to universal vocabulary teaching frequently take a semantic and literacy perspective, whereas for vocabulary intervention with children who have language disorder, evidence favours a phonological-semantic approach (section 2.2.4). The evidence comes mainly from studies of primary school age children, and the intervention has often been delivered in small groups or individually, in a specialist language educational setting. There is less research focussing on the adolescent age group, and less research investigating a whole-class model of vocabulary intervention. In addition, there is little evidence that specific vocabulary instruction routinely takes place in the classroom, placing children and adolescents with language disorder at a disadvantage.

Therefore, the goal of this thesis is to investigate whether phonological-semantic vocabulary instruction is effective in enhancing the vocabulary skills of adolescents with language disorder, when it is embedded into the delivery of the mainstream secondary school curriculum.

To measure the effectiveness of complex interventions, a randomised control trial is considered to provide the most reliable evidence (Greenhalgh, 1997; 2014). Nonetheless, other levels of evidence offer valid contributions to the evidence base (Brighton, Bhandari, Tornetta, & Felson, 2003). Craig et al. (2014) recommended that a randomised control trial should be preceded by a thorough appraisal of the current state of knowledge, ensuring that any interventions developed meet criteria for acceptability and validity. Initial stages of an investigation should identify the evidence base, establish firm protocols for assessment and intervention, and act as a springboard towards a larger study. This is to strengthen the applicability of the larger study, building on and improving previous research.

This guiding principle for research is reflected in clinical practice through the National Health Service (NHS) principle of Patient and Public Involvement (National Institute of Health and Care Excellence (NIHCE), 2013) which advocates involving patients and other stakeholders in their choice of intervention. To adhere to these principles, and in addition to the theoretical rationale described in previous chapters, an important aim of the experimental study in this thesis was that it evaluated intervention which was closely aligned to current teaching and SLT practice, in order to ensure that it was acceptable to practitioners, and that implementation in real life contexts was feasible.

Review of the literature reveals little information about how vocabulary support is provided from either a teaching or a speech and language therapy perspective. Lindsay et al. (2002) surveyed 133 speech and language therapy managers in the UK with the aim of quantifying speech and language therapy services to education, during a time of widespread policy change. The survey showed that speech and language therapy resources within the secondary age group were limited in comparison with the pre-school and primary school age groups. The impact of resource limitations on the working practices of SLTs was shown by Pring, Flood, Dodd, and Joffe (2012). Pring et al. surveyed the working practices of 516 paediatric SLTs, and found a trend for SLTs in the UK to spend more time training agents of change (27% of their time) than on face to face contact with clients (22% of their time).The age of children with whom respondents worked ranged from infants through to secondary school, though findings were reported by client group rather than age group, so it was not possible to separate out the working practices of SLTs working with the secondary school age group from those working with younger age groups. Furthermore, the level of speech and language therapy provision has been found to be inconsistent across the UK. Pring (2016) examined whether levels of speech and language therapy provision for children under 18 years of age were related to social deprivation indices across 29 London boroughs. The results of this survey confirmed the findings of Bercow (2008) that large inequalities in speech and language therapy provision exist. The overall picture is one of limited speech and language therapy availability in the secondary school age group in the UK, with a trend for more indirect intervention (working through another agent) than direct intervention (face-to-face), though there is large variability in levels of provision.

None of these surveys collected information about which therapeutic interventions were used. One further survey (Roulstone, Wren, Bakopoulou, & Lindsay, 2012) provided some information on teaching and SLT practice for children and young people with language disorder. Roulstone and colleagues surveyed 33 SLT managers, 13 educational psychologists, and 15 managers of specialist advisory teaching teams. Responses were categorised into broad groups of intervention approach. Some of these were commercially available resources, and some were local approaches, the titles of which gave little indication of content, e.g. “package for secondary schools” (Roulstone et al., p.332). Overall, the survey found few intervention approaches to be confined to utilisation with a particular age group, client group, or model of delivery; but, further, little overlap was found between the approaches used by the educationalists and those used by the SLTs. This points to a potential for increased collaboration between these professionals. This survey provided a useful overview of specialist teaching, educational psychology, and SLT practice, but did not elucidate specifically what vocabulary approaches were in use with the secondary school age group, nor did it seek information from mainstream classroom teachers.

As the current thesis is concerned with the vocabulary approaches used by mainstream secondary school teachers (MSSTs) and SLTs, it is clear that more detailed information is needed about what instructional methods and interventions are used. There are several publications promoting universal vocabulary instruction approaches (e.g. Beck et al., 2013; Ripley, Barrett, & Fleming, 2001), and also a number of practical vocabulary resources with the child or adolescent with language disorder in mind, such as “Word Aware” by Parsons and Branagan (2014) and “The Vocabulary Enrichment Intervention Programme” by Joffe (2011), but it is not known to what extent these approaches are actually used in the classroom.

Vocabulary instruction became an even more pressing issue, since the publication of the secondary school national curriculum (Department for Education (DfE), 2014), which contains an explicit requirement of teachers to “teach vocabulary actively” (DfE, 2014, p.11). Therefore, it was timely to address the issue of current teaching and speech and language therapy practice, to address the gaps in previous research. Hence, the current chapter describes a survey which aimed to canvas the views of mainstream teachers and practising SLTs directly, focusing on the adolescent age group, and to elicit information specifically about vocabulary intervention. It was intended that narrowing the focus in this way would yield richer and more detailed information about the intervention approaches used, adding a valuable dimension of acceptability and ecological validity to the intervention study.

In summary, while there is a range of practical resources to support the practice of SLTs and educational professionals who work with children and adolescents who have vocabulary deficits, there is a lack of detailed information about which types of intervention or models of intervention delivery are used in mainstream secondary schools. Therefore, the present survey of current practice was carried out among secondary school teachers and SLTs in order to gain a sound clinical and educational perspective for the study of vocabulary intervention in Chapter 6.

4.2 Aims

The aim of the survey was to gather information from SLTs and teachers in the UK about their current practice concerning vocabulary intervention within mainstream secondary schools. The research questions to be addressed by the survey were:

1. What model of intervention delivery is used (universal, small-group, or individual) with adolescents for whom vocabulary intervention is recommended?
2. What types of vocabulary intervention do SLTs use with adolescents who have language disorder attending mainstream secondary schools?
3. What types of vocabulary teaching do teachers use with adolescents who have language disorder in the mainstream secondary school classroom?

The following hypotheses were proposed:

1 That specific vocabulary intervention for adolescents in mainstream secondary schools takes place in a targeted or specialist model of service delivery i.e. on a small-group or individual basis whereby students are withdrawn from the classroom.

2 That SLTs use a phonological-semantic approach to vocabulary intervention with adolescents with language disorder, and that MSSTs use a semantic-only approach.

Ethical approval for the study was received from the School of Health Sciences Research Ethics Committee, City, University of London, reference number: PhD/14-15/10. See Appendix 4A for the indemnity letter pertaining to ethical approval.

4.3 Methods

An online questionnaire was chosen as the method for eliciting information from SLTs and teachers, as it had advantages of cost and convenience (Keane, Smith, Lincoln, Wagner, & Lowe, 2008) over focus groups or interviews; it was anonymous, which encouraged the giving of frank views; and it reached larger numbers than focus groups or interviews could have done in the available timescale.

4.3.1 The questionnaire

The questionnaire was created using an online survey tool, Qualtrics (Qualtrics LLC, 2017). Qualtrics was chosen as it is a comprehensive survey tool to which City, University of London, subscribes. Its functions include a choice of survey formatting and distribution options, a range of question types, and inbuilt options for data collating and reporting. Content validity of the survey was assessed by piloting an initial version of the questionnaire with four teachers and three SLTs, and inviting their written feedback on the clarity of the questions and the structure of the questionnaire. Positive feedback was received regarding the content, and the length of time it took to complete. Minor amendments were made in order to reduce ambiguity.

The questionnaire was preceded by a paragraph explaining the background to the research, following a template recommended by the Senate Research Ethics Committee, City, University of London. This was followed by the statement: *Yes, I give my consent to take part in this survey, and for my responses to be used anonymously in the dissemination of the research.* The tick box adjacent to this statement was a mandatory field such that if it was not ticked, no further questions were visible to the respondent. There were nine questions for all respondents, and an additional three for MSSTs only (questions 2, 3, and 4). Five questions were multiple choice; one was a binary choice; three had a Likert scale format; and three were open-ended. For multiple choice questions, there was a free-text field for participants to fill in details if *other* was selected; and for Likert scale questions, there was a free-text field to add further information.

The questions, and their rationales, were as follows:

1 *What is your job role?* (Multiple choice) The purpose of this question was to elicit any differences in the responses to subsequent questions between professional roles.

2 *If you are a mainstream secondary school teacher, what subject do you teach?* (Multiple choice) The purpose of this question was to elicit any differences in approach between teachers of different subjects.

3 *How many lessons, over how many weeks, do you spend on one topic?* (Free text) Responses to this question were intended to assist in planning the intervention study.

4 *On average, how many minutes in any one lesson is given to teaching the new words of the lesson?* (Free text) Responses to this question were intended to assist in planning the intervention study.

5 *In which region do you work?* (Multiple choice) The purpose of this question was to establish whether responses were representative of the whole of the UK, and whether any responses were received from outside the UK.

6 *Approximately what percentage of the students, aged 11 – 16 years, with whom you work have a vocabulary deficit?* (Multiple choice) The purpose of this question was to gain an indication of the prevalence of students with low vocabulary levels.

7 *(a) How confident are you at teaching vocabulary to students aged 11 – 16 with language impairment?* [5] (Likert scale) *(b) Please give your reasons.* (Free text) The purpose of this question was to elicit any differences in confidence between job roles, and to gain an indication of the need for continuing professional development.

8 *(a) How important do you think it is for students aged 11 – 16 to be able to learn new vocabulary?* (Likert scale) *(b) Please give your reasons.* (Free text) This question would gauge the likely level of support for implementing any findings from the intervention study.

9 *(a) What model of delivery do you use for vocabulary teaching/therapy to students aged 11 – 16?* (Multiple choice) *(b) What factors influence your decision about which model of delivery to use?* (Free text) The purpose of this question was to elicit what the preferred options were for practitioners, and what obstacles were faced.

10 *(a) What strategies do you use/recommend to help students learn and remember new words and their meaning?* (Multiple choice) A list of strategies was provided, the full text of which can be found in Appendix 4B. Twenty strategies were listed, taken either from the literature or observed in the researcher's clinical practice. In addition, a box for *other* was provided (free text). Respondents were asked to rate their usage on a scale of *never, seldom, sometimes, often,* and *always. (b) Which strategy do you feel is the most effective?* (Free text) This was to obtain detailed information about practitioners' preferred intervention strategies.

11 *(a) Would you like to develop your knowledge about how to provide effective vocabulary intervention for secondary school students with language impairment?* (Binary choice) *(b)*

[5] This survey took place in 2015 before the term *language disorder* came into wider use following the Delphi exercise mentioned in section 1.4.1. The original wording of the survey (*language impairment*) is maintained here, with no intention of distinction from the term *language disorder.*

Please state in which specific areas you would like to develop your knowledge. (Free text) The purpose of this question was to obtain further insight into reasons for practitioners' confidence, and the likelihood of practitioners being willing or able to incorporate the researched intervention into their practice.

12 *Please add any further comments that you feel were not captured in this questionnaire.* (Free text) This was to enable participants to give any views that were not elicited elsewhere.

The full text of the questionnaire can be found in Appendix 4B.

4.3.2 Participants

Inclusion criteria were that participants were either qualified teachers or qualified SLTs. The sample size was determined by how widely the survey could be distributed and the response rate. Although the target recipients of the questionnaire were practitioners in the UK, its online format meant that it was also accessible to practitioners in other countries. There were 259 responses to the survey, of which 175 were fully completed, making a completion rate of 68%.

4.3.3 Procedure

The survey was distributed through teaching and speech and language therapy professional networks, websites, and publications, including:

- "Bulletin" (The professional magazine of the RCSLT)
- Basecamp (RCSLT online forum)
- Education Twitter accounts e.g. SEN Magazine, Secondary Education Magazine, Times Educational Supplement
- Twitter accounts of City, University of London; School of Health Sciences; and the Division of Language and Communication Science
- National Association of Professionals concerned with Language Impairment in Children (NAPLIC) newsletter and website
- Teaching Times http://www.teachingtimes.com/home.htm
- Teach Secondary http://www.teachsecondary.com/
- Special Educational Needs Joint Initiative for Training (SENJIT) http://www.ioe.ac.uk/research/16081.html
- The Communication Trust newsletter
- Direct emails to schools in two London borough councils, two county councils, and two metropolitan councils in the UK chosen at random.
- Individual contacts of the researcher for distribution through professional networks.

Every effort was made to maximise distribution of the survey, throughout an eight-month period between 17.2.15 and 13.10.15. Responses were anonymous, although geographical location of each respondent's internet protocol (IP) address was recorded by Qualtrics.

4.3.4 Data analysis

Quantitative responses were collated and inputted to SPSS 22 (IBM Corp., 2013) for statistical analysis. To examine associations between job role and responses, Pearson's chi-square tests of independence were used where possible. Where assumptions were not met for this test due to small cell counts, categories were collapsed to produce 2 x 2 tables from which to calculate a Fisher's exact statistic. This is explained further in the relevant sections (sections 4.4.6 and 4.4.10.2).

Responses to free-text questions were collated and inputted into NVivo 11 software (QSR International, 2017) for qualitative analysis. As this was a small body of data, elicited from a finite number of structured questions, a simple approach to analysis of respondents' comments was taken, using a combination of qualitative content analysis and thematic coding (Flick, 2014). The questions in the questionnaire were taken as the starting categories for coding under a content analysis approach, for example "reasons for confidence". Within each category, a thematic coding approach was used to assign codes to individual responses. As themes emerged, these were cross-checked with earlier responses, and codes adjusted where appropriate. This approach enabled common and recurring themes to be identified within each category. To establish the reliability of the coding, a SLT, who had not been involved in the development of the questionnaire, checked the coding of all responses. Out of 885 coded responses, there were eight disagreements, equating to a percentage agreement of 99.1%. In four cases, the disagreement was due to an omission of coding to a relevant category; the other four were resolved through discussion.

4.4 Results

For each question, firstly the quantitative data are reported, then a sample of comments representative of the salient themes within the responses to each question. Summaries of the results are integrated into the discussion section (section 4.5).

4.4.1 Job role of survey respondents (222 responses)

Nearly two-thirds of respondents were SLTs (N=134), and just over a fifth were MSSTs (N= 48). Nine respondents identified more than one job role, three of whom were dually qualified teachers and SLTs (SLT/T). Where more than one job role was identified, the specialist role was counted. Table 4.1 shows the job roles of respondents who completed the survey. Inspection of the data reveals a similar attrition rate across the professional roles.

Table 4.1. Job roles of survey respondents

Professional job role	Started		Completed	
	Percentage	Count	Percentage	Count
Mainstream secondary school teacher (MSST)	21.6%	48	21.1%	37
Special school teacher (Spec Sch T)	3.6%	8	4.6%	8
Special educational needs coordinator (Senco)	4%	9	4%	7
Specialist teacher (Spec T)	10.4%	23	10.9%	19
Speech and language therapist (SLT)	60.4%	134	59.4%	104
Total	100%	222	100%	175

The term m*ainstream secondary school teacher* (MSST) refers to teachers who teach a specific subject to classes of students in secondary school. *Special school teachers* (Spec Sch Ts) work in schools which are attended by students for whom a mainstream setting is not indicated, for example because of a learning difficulty. Every mainstream school in the UK has a *special educational needs coordinator* (Senco: sometimes now also known as the *special educational needs and disability coordinator*, or SENDco) who has received post-graduate training and provides support for students and staff who work with students who have an additional need such as cognition and learning, communication and interaction, social, emotional and mental health, or sensory and physical needs. *Specialist teachers* (Spec Ts) have received specialist training in an area of need such as SLCN or specific learning difficulties. They often work in a peripatetic capacity, supporting students and staff in a number of mainstream schools.

4.4.2 Geographical region of respondents (221 responses)

Twenty-eight percent of respondents (N=62) worked in London, and 17% in the South East (N=38). There were some respondents from all other areas in the UK except Northern Ireland, as well as nine responses (4.1%) from outside the UK. The answers are tabulated in Table 4.2.

Table 4.2. Geographical region in which respondents worked

Region	Percentage	Count
London	28.10%	62
South East	17.20%	38
West Midlands	7.70%	17
East Midlands	7.70%	17
North East and Cumbria	6.80%	15
South West	6.80%	15
North West	6.30%	14
Wales	4.10%	9
Yorkshire and the Humber	4.10%	9
Scotland	2.70%	6
East of England	2.70%	6
South Central	1.40%	3
Channel Isles/Isle of Man	0.50%	1
Northern Ireland	0.00%	0
Outside the UK (Australia (3), New Zealand (1), USA (1), Republic of Ireland (1), Austria (1), Sweden (1)	4.1%	9
Total	100%	221

4.4.3 **Subjects taught** (52 responses)

This question was visible only to those who ticked the *mainstream secondary school teacher* option. Results are tabulated in Table 4.3. Where teachers listed more than one subject (N=11), their first selection is counted here. A quarter were English teachers, with a small sample from all other subjects. This perhaps reflects the interest which English teachers have in vocabulary, but because of small numbers of responses from teachers, it was not valid to examine differences in responses to subsequent questions between the teachers of different subjects.

Table 4.3. Subjects taught

Subject	Percentage	Count
English	26.9%	14
Science	13.7%	7
History	11.5%	6
Modern foreign languages	9.6%	5
Maths	5.8%	3
Religious Studies/Citizenship	5.8%	3
Geography	3.8%	2
Physical Education	3.8%	2
Art	3.8%	2
Music	3.8%	2
Technology	3.8%	2
Drama	3.8%	2
Health and Social Care	1.9%	1
Business Studies	1.9%	1
Total	100%	52

MSSTs were also asked how many lessons, over how many weeks, they spent on one topic. However, responses to this question varied so widely that it was apparent that the question had been ambiguous, or that curriculum schedules differed widely amongst subjects. For example, some teachers reported that they taught 2 - 3 lessons per week, whereas some reported that they taught 24 lessons per week. Therefore, no further analysis of this data took place.

4.4.4 Time given to teaching new words (46 responses)

This question was visible only to MSSTs. Forty-five respondents stated between 0 and 25 minutes per lesson. The remaining respondent stated 60 minutes. Excluding this outlier, the average number of minutes spent on teaching new words each lesson was 9.4 minutes.

4.4.5 Percentage of students with a vocabulary deficit (214 responses)

This question was designed to find out to what extent respondents were working with students with low vocabulary levels. Responses are illustrated in Figure 4.1. As might be expected, a higher proportion of students on SLTs' caseloads were reported to have vocabulary difficulties (as indicated by the blue bars) compared to the students in MSSTs' classes (as indicated by the red bars). A large proportion of students with whom Sencos work did not seem to have vocabulary difficulties. Again, this might be expected, as the role of the Senco is wider than that of SLCN.

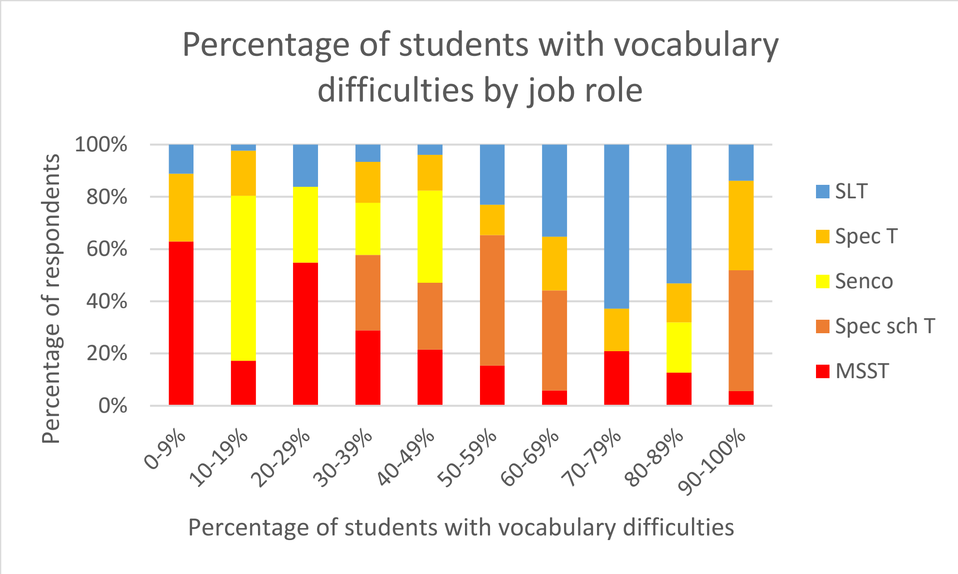

Figure 4.1. Percentage of students with vocabulary difficulties by job role

4.4.6 Confidence in teaching vocabulary to students with language disorder aged 11 – 16 (205 responses)

Results indicated that there was a spread of confidence in vocabulary teaching across job roles, with 72.1% of all respondents indicating that they were quite or very confident (see Table 4.4). To examine differences in the confidence levels of SLTs and MSSTs, the responses *not at all* and *not very* were collapsed into one category, and *quite* and *very* were collapsed into another category. Using this 2 x 2 tabulation, 85.1% of SLTs stated that they were quite or very confident, compared with 53.3% of MSSTs, a significant difference (Fisher's exact $p < .001$). The slight difference between these figures and the figures in Table 4.4 is due to the way SPSS handles missing data.

Table 4.4. Confidence in teaching vocabulary to students with language disorder aged 11 – 16

Rating	MSST N=45	Spec Sch T N=8	Senco N=9	Spec T N=22	SLT N=121	Total N=205
Not at all confident	6.3%	0%	0%	4.3%	0%	1.8%
Not very confident	37.5%	25.0%	22.2%	8.7%	12.7%	18.5%
Quite confident	41.7%	62.5%	55.6%	43.5%	58.2%	53.2%
Very confident	8.3%	12.5%	22.2%	39.1%	19.4%	18.9%
Missing	6.3%	0%	0%	4.3%	9.7%	7.7%

This question included a free-text field for respondents to give reasons for their level of confidence. Responses are recorded here verbatim i.e. exactly how they were written by the respondent. Two respondents gave reasons for being *not at all confident*, and both cited lack of training as a reason for this:

> *"No education on how to work with these students, no material." (*respondent number 162: MSST)

Forty-one respondents felt that they were *not very confident* in teaching vocabulary to students aged 11 – 16 with language disorder. SLTs often felt that engagement with teachers was a barrier:

> *"It is not easy to obtain specific vocabulary from the teachers in order to support / deliver vocabulary support."* (131: SLT)

Service constraints and time constraints were also common themes amongst SLTs:

> *"Don't feel I am in school often enough to target vocabulary that will be really relevant."* (206: SLT)

Another recurrent theme within the responses of SLTs was that they had more experience with primary school age children than secondary school age students:

> *"It is difficult to know how to alter vocabulary learning techniques from primary to secondary students to be the most effective and there are few resources out there to use." (59: SLT).*

Teachers also cited lack of experience and time constraints, as well as lack of knowledge and the differentiation required to meet the needs of all the students in their class:

> *"Specialist teacher but more experience with primary."* (92: Spec T)
>
> *"Unsure how to teach them the language required for the subject in the time available and then make sure it is retained for the next lesson."* (139: Spec T)
>
> *"Not even quite sure what "language impairment" means."* (127: MSST)
>
> *"So many different and specific needs of students in very mixed classes."* (113: MSST)

Some responses given by those who reported that they were *quite confident* suggested that the practitioner felt that their knowledge and experience was sufficient, but that they faced barriers to the implementation of vocabulary teaching strategies. These barriers included obstacles to collaborative working, and service or time constraints:

> *"I understand the theory around vocabulary teaching and I understand how the secondary school I work in operates but I am never quite sure that advice given in the school is followed."* (32: SLT)
>
> *"I know the theory of best practice at teaching vocabulary but as a SLT working primarily in an advisory role I don't often get the chance to complete one to one or small group work." (*51: SLT)

The theme of collaborative working also appeared in the responses of those who felt *very confident*, with additional emphasis on post-graduate training on the part of both SLTs and teachers. Collaboration appeared to be valued by both professions, with successful collaboration contributing to confidence. Additional themes related to the use of outcome measures which demonstrated the impact of intervention, and continuing professional development (CPD). For example:

> *"I work in collaboration with a SLT."* (157: Spec T)

> *"Teamwork with educators." (1: SLT).*

> *"I am the head of a speech and language unit in a mainstream secondary school and have completed a great deal of training (Elklan[6], CPD courses, and currently completing a postgraduate in speech and language) since taking up the post 3 years ago.*" (153: Spec T).

> *"Use of outcome measures which include quantitative and qualitative styles of measurement."* (16: SLT).

> *"I have attended various courses and am familiar with a wide range of interventions which I use in my therapy."* (25: SLT)

4.4.7 The importance of learning new vocabulary (202 responses)

One SLT rated vocabulary as *not very important*; all others of any job role rated vocabulary as *quite important* or *very important*, with the majority (86%) rating vocabulary as *very important*. The significance of differences between the job roles could not be examined because of small frequency counts (Table 4.5).

Table 4.5. The importance of learning new vocabulary

Rating	MSST N=43	Spec Sch T N=8	Senco N=9	Spec T N=21	SLT N=121	Total N=202
Not at all important	0%	0%	0%	0%	0%	0%
Not very important	0%	0%	0%	0%	0.7%	0.5%
Quite important	12.8%	0%	11.1%	0%	3.0%	5.0%
Very important	78.8%	100%	88.9%	91.3%	86.6%	86.0%
Missing	8.5%	0%	0%	8.7%	9.7%	8.6%

The SLT who rated learning vocabulary as *not very important*, reported that she had few students on her caseload with vocabulary difficulties (0 – 9%), and reported time constraints along with the challenges of working with this age group:

> *"Don't see them regularly enough to help. Difficult to help across the curriculum."* (221: SLT)

[6] Elklan: a training package for those working with children and adolescents who have SLCN (Elks & McLachlan, 2008)

For those who rated vocabulary as *quite important* or *very important*, the most common reason given (111 responses) was related to curriculum access and academic success. For example:

"Vocabulary is key to understanding, especially in Science." (196: MSST)

Some respondents explained the importance of vocabulary with reference to its link with reading comprehension.

"Vocabulary skills are strongly linked with language and reading comprehension. Students with strong vocabulary skills are going to be able to access the curriculum." (7: SLT)

Another common reason (35 responses) related to the association between vocabulary knowledge and socialisation, with many respondents linking academic success with emotional well-being:

"To be able to function in society, participating fully in a variety of situations and to have confidence in themselves." (103: SLT)

"Secondary aged students are bombarded with new vocabulary across as many as 12 subjects at KS3[7] *and around 8 subjects at KS4*[8]*. It can be overwhelming and there is a risk that students with language impairment will disengage and switch off. There can also be a detrimental effect on their self-esteem."* (180: Spec T)

Frequently, responses took the perspective that vocabulary is a skill which facilitates access to society and the world of work (43 responses)

"It is vital that students can express themselves clearly, confidently and accurately - vocabulary gives them this ability. If a student is word poor - I feel it severely limits their options for the future." (185: MSST)

"So they can progress with confidence onto their exams, progress into the workplace, survive the complex language landscape of the adult world..." (210: Senco)

4.4.8 Models of delivery for vocabulary teaching/therapy to students aged 11 – 16 (188 responses).

Respondents were able to tick more than one option in this question. Results indicated that a range of models was used by all professions, as shown in Table 4.6. Figures do not add up to 100% because many respondents listed more than one model. No clear preference emerged for a particular model.

A free text field was provided for respondents to list other models. Answers included:

[7] Key Stage 3 (ages 11 – 14 years)
[8] Key Stage 4 (ages 14 – 16 years)

- Whole-class strategies with no access to speech and language therapy support (13 responses)
- Small group or individual intervention with a specialist teacher (5)
- Training (4)
- Service level agreement (1)
- Work with literacy leads (1)
- Individual help in class with teaching assistant (TA) (1)
- Peer tutoring (1).

Table 4.6. Models of delivery used for vocabulary teaching/therapy to students aged 11 – 16

Model of intervention delivery	MSST N=37	Spec Sch T N=8	Senco N=7	Spec T N=16	SLT N=108	Total N=177
Team teaching	23.3%	75.0%	28.6%	43.5%	37.5%	35.6%
Whole-class strategies from SLT delivered by teacher	25.6%	62.5%	28.6%	47.8%	65.2%	53.2%
1:1 with teaching assistant (TA)	23.3%	62.5%	28.6%	47.8%	46.4%	41.5%
Small group with TA	27.9%	50.0%	71.4%	60.9%	49.1%	46.8%
1:1 with SLT	16.3%	75.0%	14.3%	47.8%	58.9%	46.3%
Small group with SLT	14.0%	12.5%	0.0%	39.1%	57.1%	42.0%

4.4.9 Factors influencing choice of intervention delivery model (142 responses)

A free-text field was provided for answers to this question. Responses by count are illustrated in Figure 4.2. Many respondents aimed to offer a range of models according to student need, but faced barriers in achieving this.

The most commonly cited influencing factor was the availability of the SLT (46 comments). From the SLT perspective this was viewed as a lack of time to allocate to the school caseload, and from the teaching perspective this was viewed as a lack of specialist support:

> *"My role is consultative and I have 12 schools for 2 days/week with a caseload of 70. Training others is my only option."* (26: SLT)

> *"Lack of provision by SLTs and specialist teachers. No support once a pupil starts in Year 7 by October half term for the rest of their time in mainstream school."* (166: Senco)

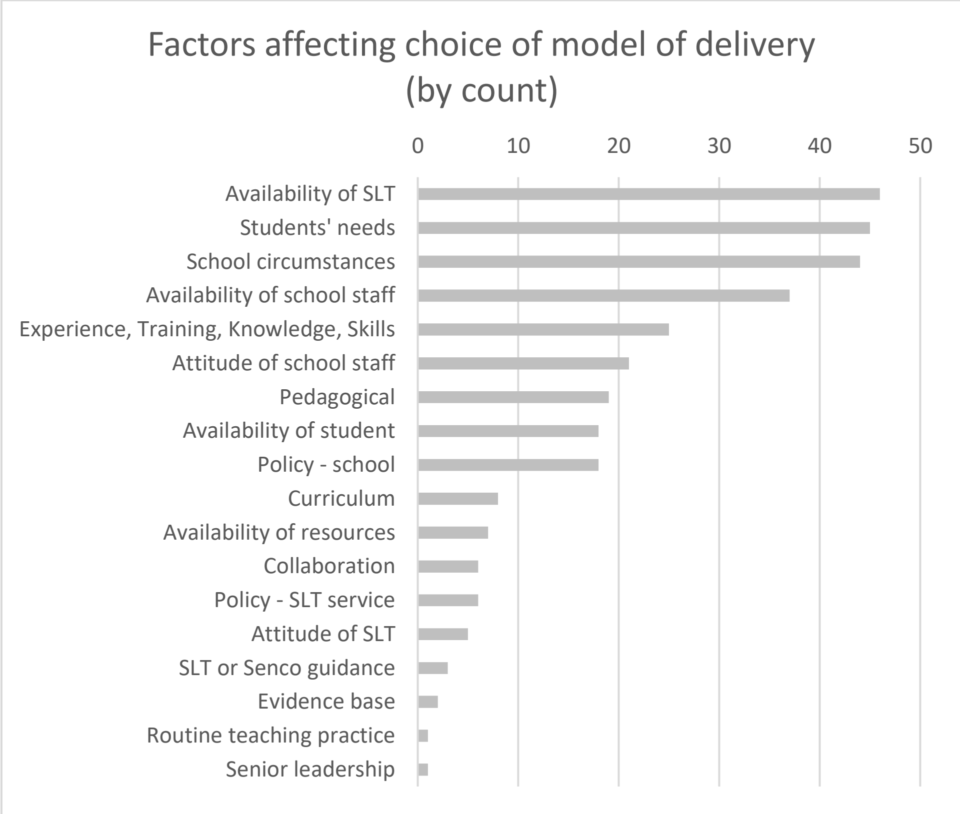

Figure 4.2. Factors influencing choice of intervention delivery model

Other frequently cited factors included: making decisions according to student need (45), adapting to school circumstances (44), and availability of school staff (37):

> *“The teaching is very much dependent upon the cohort of pupils in school at the time and also knowledge of the individual pupils.”* (211: Spec Sch T)

> *“Needs of the student: some may require individual support (provided by trained TA or SLT being observed by TA) in order to learn strategies before practising using them in the group and in the classroom.”* (128: SLT)

> *“Working with school ensuring what we offer fits in with what they are able to put in place.”* (75: SLT)

> *“The learners are taught English and Maths in a small group by a specialist teacher so vocabulary teaching is part of the lesson planning. For mainstream subjects it depends on the individual's specific difficulties and timetabling opportunities.”* (126: Spec T)

> *“Availability of TAs in school. There are none that I can use to repeat the individual and small group work that I do. Ideally, I would carry out the activities and the teaching assistant would repeat outside the class and use strategies inside the class.”* (76: SLT)

> *“Whole class where it is possible to train teachers but they have many demands on their time for meetings, curriculum changes etc.”* (187: SLT)

The level and quality of support provided was noted by some respondents to be dependent upon the experience, knowledge, and training of individual practitioners (25 comments), as well as their attitude (21 comments):

> *"Team teaching and the provision of strategies depends on the level of training the school has received previously, and how receptive they are to this kind of working."* (25: SLT)
>
> *"Not all TAs are SLT trained. I have not been trained with specific SLT strategies."* (148: MSST)
>
> *"Confidence and motivation of teaching assistants despite training."* (173: SLT)

Some practitioners felt that the pedagogy of how vocabulary should be taught governed the choice of model (19 comments):

> *"Holistic approach and consistency in the approach so the child has the chance to over learn and not confuse matters."* (55: SLT)

Factors limiting practitioners' choice of model of delivery seemed to range from very practical considerations such as the availability of the students (18 comments) to matters of policy or management strategy (18 comments):

> *"Timetables - which lessons can they be withdrawn from."* (153: Spec T)
>
> *"Availability of students on day SLT visits school (i.e. timetabling)."* (171: SLT)
>
> *"What has been decided by senior management or SEN."* (50: MSST)
>
> *"Mainly I am driven by the school's wishes e.g. I am directed by the Senco."* (12: SLT)

4.4.10 Strategies used to support word learning (179 responses)

A key purpose of the questionnaire was to ascertain current practice with regard to which specific intervention techniques and strategies practitioners use. A list of strategies was provided, the full text of which can be found in Appendix 4B. Respondents were asked to rate their usage of each strategy on a scale of *never, seldom, sometimes, often,* and *always*.

4.4.10.1 Popularity of strategies used

Both professions, and all job roles within the teaching profession, used the full range of strategy options. The most popular strategies were: to give definitions, to ask students to say words aloud, to repeat the words often, to use the word in a spoken sentence, and to give examples of word usage in multiple contexts. The percentage of respondents indicating *never, seldom, sometimes, often* and *always* for these strategies is depicted in Figure 4.3. The data are shown with job roles combined.

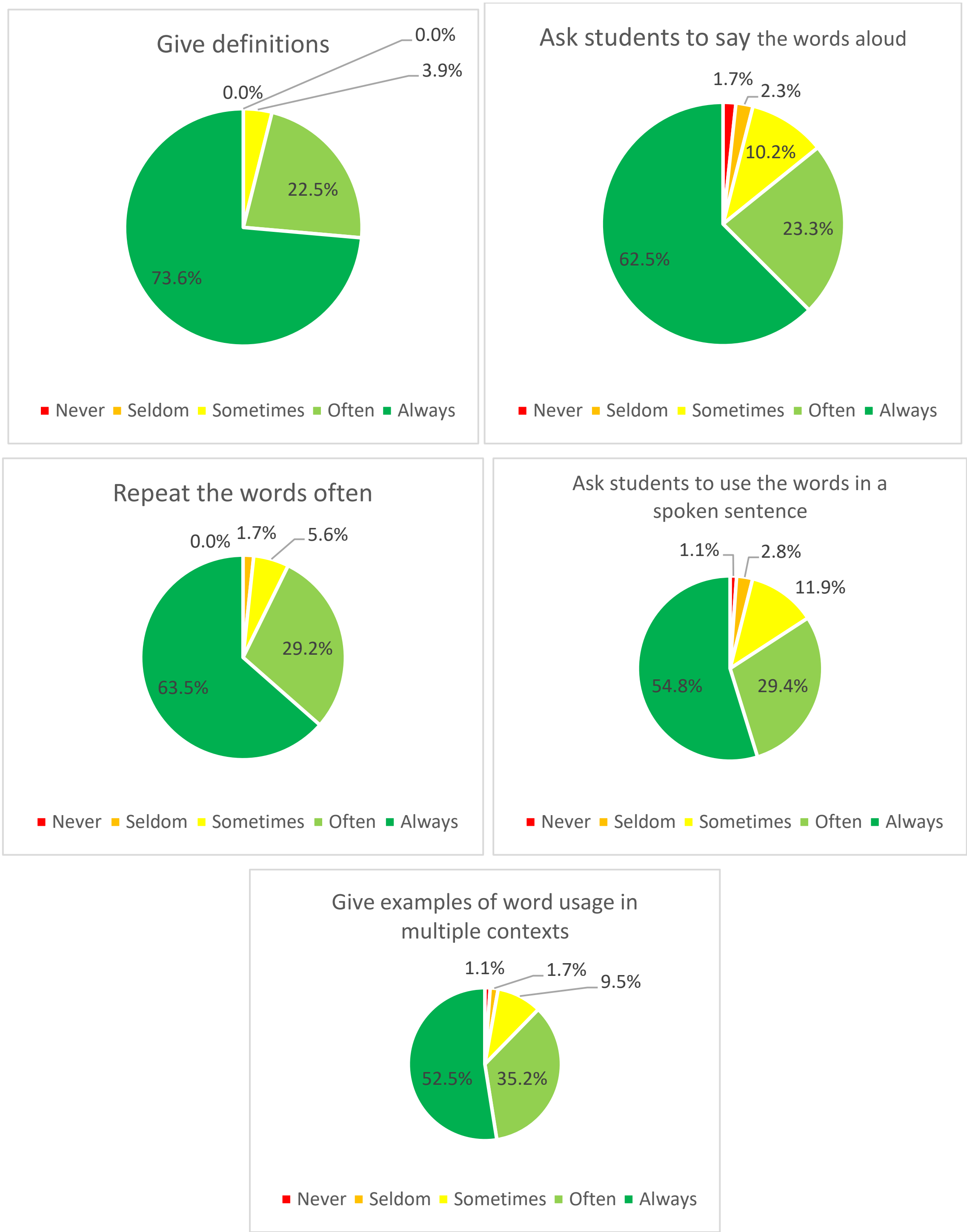

Figure 4.3. Most frequently used strategies to support word learning (all job roles)

The strategies used the least were a "must should could" approach to identify essential key words, and asking students to self-rate their own word knowledge. The term *must should could* is short-hand for the identification of the words which all students must learn; the words which most students should learn; and the words which some students could learn. The data are shown in Figure 4.4 with job roles combined.

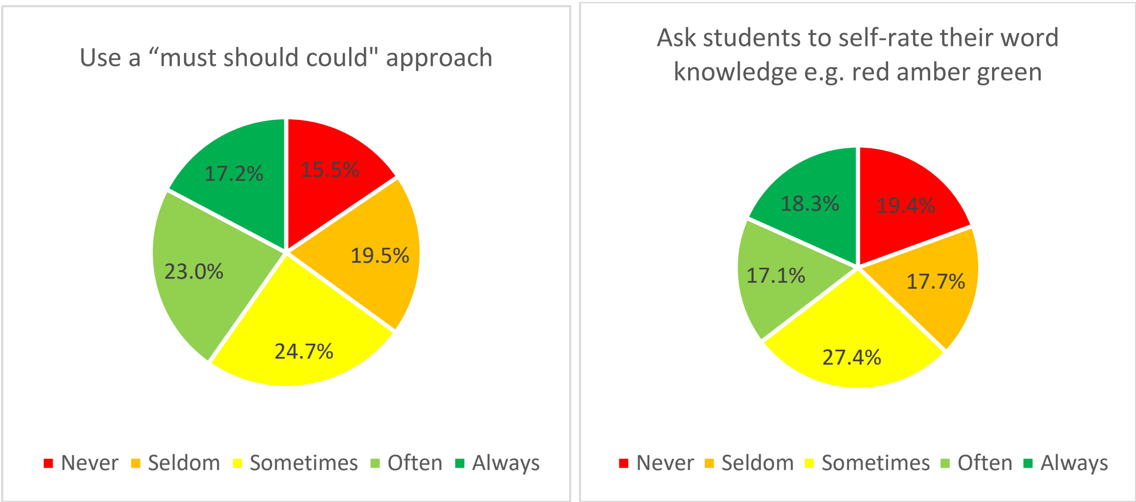

Figure 4.4. Least frequently used strategies to support word learning (all job roles)

4.4.10.2 Comparison of strategies used by SLTs and MSSTs

Due to the small numbers of questionnaire responses from special school teachers, Sencos, and specialist teachers, cell frequency counts were too low to conduct chi-square tests of independence to examine associations between all job roles and strategies used. Therefore, in order to examine differences between SLTs and MSSTs, data from special school teachers, Sencos, and specialist teachers were excluded from statistical analysis, but these data can be found in Appendix 4C. As there were still small frequency counts in many of the cells, the *never* and *seldom* categories were collapsed, and the *sometimes, often,* and *always* categories were collapsed. This produced 2 x 2 tables from which to calculate a Fisher's exact statistic which enabled differences between SLTs and MSSTs to be examined.

Strategies where there was no difference between SLTs and MSSTs

All SLTs and MSSTs gave definitions for new words *sometimes, often,* or *always,* therefore no statistic could be computed. See Table 4.7.

Table 4.7. SLTs' and MSSTs' use of the strategy “Give definitions”

			Give definitions		
			never_seldom	sometimes_often _always	Total
Job Role	MSST	Count	0	39	39
		% within Job Role	0%	100%	100%
	SLT	Count	0	104	104
		% within Job Role	0%	100%	100%
Total		Count	0	143	143
		% of Total	0%	100%	100%

There was no significant difference between SLTs and MSSTs in their use of the following strategies: *list key words in lessons plans* (p = .356); *use a “must should could” approach* (*p* – 1.000); *repeat the words often* (*p* = 1.000); *give examples of word usage in multiple contexts* (*p* =

.061); *teach students how to derive meaning from the morphology of the word* (p = .098); *ask students to say the word aloud* (p = 1.000); *ask students to use the word in a spoken sentence* (p = .393); and *ask students to write the word* (p = .238). See Tables 4.8a to 4.8h.

Table 4.8a. Strategies where there was no significant difference between SLTs and MSSTs: List key words in lesson plans

			List key words in lesson plans		
			never_seldom	sometimes_often_always	Total
Job Role	MSST	Count	2	36	38
		% within Job Role	5.3%	94.7%	100%
	SLT	Count	13	89	102
		% within Job Role	12.7%	87.3%	100%
Total		Count	15	125	140
		% of Total	10.7%	89.3%	100%

Table 4.8b. Strategies where there was no significant difference between SLTs and MSSTs: Use a "must should could" approach

			Use a "must should could" approach		
			never_seldom	sometimes_often_always	Total
Job Role	MSST	Count	14	24	38
		% within Job Role	36.8%	63.2%	100%
	SLT	Count	38	61	99
		% within Job Role	38.4%	61.6%	100%
Total		Count	52	85	137
		% of Total	38.0%	62.0%	100%

Table 4.8c. Strategies where there was no significant difference between SLTs and MSSTs: Repeat words often

			Repeat words often		
			never_seldom	sometimes_often_always	Total
Job Role	MSST	Count	1	37	38
		% within Job Role	2.6%	97.4%	100%
	SLT	Count	2	103	105
		% within Job Role	1.9%	98.1%	100%
Total		Count	3	140	143
		% of Total	2.1%	97.9%	100%

Table 4.8d. Strategies where there was no significant difference between SLTs and MSSTs: Give examples of usage in multiple contexts

			Give examples of usage in multiple contexts		
			never_seldom	sometimes_often_always	Total
Job Role	MSST	Count	3	36	39
		% within Job Role	7.7%	92.3%	100%
	SLT	Count	1	104	105
		% within Job Role	1.0%	99.0%	100%
Total		Count	4	140	144
		% of Total	2.8%	97.2%	100%

Table 4.8e. Strategies where there was no significant difference between SLTs and MSSTs: Teach students how to derive meaning from morphology

			Teach students how to derive meaning from morphology		
			never_seldom	sometimes_often_always	Total
Job Role	MSST	Count	16	22	38
		% within Job Role	42.1%	57.9%	100%
	SLT	Count	27	76	103
		% within Job Role	26.2%	73.8%	100%
Total		Count	43	98	141
		% of Total	30.5%	69.5%	100%

Table 4.8f. Strategies where there was no significant difference between SLTs and MSSTs: Ask students to say the word aloud

			Ask students to say the word aloud		
			never_seldom	sometimes_often_always	Total
Job Role	MSST	Count	2	37	39
		% within Job Role	5.1%	94.9%	100%
	SLT	Count	5	98	103
		% within Job Role	4.9%	95.1%	100%
Total		Count	7	135	142
		% of Total	4.9%	95.1%	100%

Table 4.8g. Strategies where there was no significant difference between SLTs and MSSTs: Ask students to use the word in a spoken sentence

			Ask students to use the word in a spoken sentence		
			never_seldom	sometimes_often_always	Total
Job Role	MSST	Count	3	36	39
		% within Job Role	7.7%	92.3%	100%
	SLT	Count	4	99	103
		% within Job Role	3.9%	96.1%	100%
Total		Count	7	135	142
		% of Total	4.9%	95.1%	100%

Table 4.8h. Strategies where there was no significant difference between SLTs and MSSTs: Ask students to write the word

			Ask students to write the word		
			never_seldom	Sometimes_often_always	Total
Job Role	MSST	Count	2	37	39
		% within Job Role	5.1%	94.9%	100%
	SLT	Count	13	90	103
		% within Job Role	12.6%	87.4%	100%
Total		Count	15	127	142
		% of Total	10.6%	89.4%	100%

Strategies used more often by MSSTs than SLTs

MSSTs used two strategies significantly more than SLTs *sometimes, often,* or *always*: these were *list key words on the board* (p = .041); and *ask students to use the word in a written sentence* (p = .034). See Table 4.9a and 4.9b.

Table 4.9a. Strategies used more often by MSSTs than SLTs: List key words on the board

			List key words on the board		
			never_seldom	sometimes_often_always	Total
Job Role	MSST	Count	1	37	38
		% within Job Role	2.6%	97.4%	100%
	SLT	Count	16	86	102
		% within Job Role	15.7%	84.3%	100%
Total		Count	17	123	140
		% of Total	12.1%	87.9%	100%

Table 4.9b. Strategies used more often by MSSTs than SLTs: Ask students to use the word in a written sentence

			Ask students to use the word in a written sentence		
			never_seldom	sometimes_often_always	Total
Job Role	MSST	Count	3	35	38
		% within Job Role	7.9%	92.1%	100%
	SLT	Count	25	79	104
		% within Job Role	24.0%	76.0%	100%
Total		Count	28	114	142
		% of Total	19.7%	80.3%	100%

Strategies used more often by SLTs than MSSTs

SLTs used the following strategies significantly more than MSSTs *sometimes, often,* or *always: display words with a visual image* ($p < .001$); *ask students to look words up in a dictionary or glossary* ($p = .017$); *encourage students to think of personalised experience relating to the word* ($p < .001$); *develop self-awareness by asking students to identify unknown words* ($p < .001$); *ask students to self-rate their own word knowledge* ($p < .001$); *give students their own vocabulary book to record new words and their meanings* ($p < .001$); *teach students how to derive meaning from context* ($p = .009$); *teach semantic feature analysis* ($p < .001$); and *teach phonological awareness* ($p < .001$). See Tables 4.10a to 4.10i.

Table 4.10a. Strategies used more often by SLTs than MSSTs: Display key words with visual image

			Display key words with visual image		
			never_seldom	sometimes_often_always	Total
Job Role	MSST	Count	8	30	38
		% within Job Role	21.1%	78.9%	100%
	SLT	Count	3	101	104
		% within Job Role	2.9%	97.1%	100%
Total		Count	11	131	142
		% of Total	7.7%	92.3%	100%

Table 4.10b. Strategies used more often by SLTs than MSSTs: Ask students to look words up in dictionary

			Ask students to look words up in dictionary		
			never_seldom	Sometimes_often_always	Total
Job Role	MSST	Count	11	28	39
		% within Job Role	28.2%	71.8%	100%
	SLT	Count	11	92	103
		% within Job Role	10.7%	89.3%	100%
Total		Count	22	120	142
		% of Total	15.5%	84.5%	100%

Table 4.10c. Strategies used more often by SLTs than MSSTs: Relate to student's own experience

			Relate to student's own experience		
			never_seldom	sometimes_often_always	Total
Job Role	MSST	Count	13	25	38
		% within Job Role	34.2%	65.8%	100%
	SLT	Count	10	94	104
		% within Job Role	9.6%	90.4%	100%
Total		Count	23	119	142
		% of Total	16.2%	83.8%	100%

Table 4.10d. Strategies used more often by SLTs than MSSTs: Encourage students to identify unknown words

			Encourage students to identify unknown words		
			never_seldom	sometimes_often_always	Total
Job Role	MSST	Count	11	28	39
		% within Job Role	28.2%	71.8%	100%
	SLT	Count	5	98	103
		% within Job Role	4.9%	95.1%	100%
Total		Count	16	126	142
		% of Total	11.3%	88.7%	100%

Table 4.10e. Strategies used more often by SLTs than MSSTs: Ask students to rate their own knowledge

			Ask students to rate their own knowledge		
			never_seldom	sometimes_often_always	Total
Job Role	MSST	Count	24	14	38
		% within Job Role	63.2%	36.8%	100%
	SLT	Count	28	75	103
		% within Job Role	27.2%	72.8%	100%
Total		Count	52	89	141
		% of Total	36.9%	63.1%	100%

Table 4.10f. Strategies used more often by SLTs than MSSTs: Give students their own vocabulary book

			Give students their own vocabulary book		
			never_seldom	sometimes_often_always	Total
Job Role	MSST	Count	22	16	38
		% within Job Role	57.9%	42.1%	100%
	SLT	Count	15	90	105
		% within Job Role	14.3%	85.7%	100%
Total		Count	37	106	143
		% of Total	25.9%	74.1%	100%

Table 4.10g. Strategies used more often by SLTs than MSSTs: Teach how to derive meaning from context

			Teach how to derive meaning from context		
			never_seldom	sometimes_often_always	Total
Job Role	MSST	Count	16	22	38
		% within Job Role	42.1%	57.9%	100%
	SLT	Count	20	82	102
		% within Job Role	19.6%	80.4%	100%
Total		Count	36	104	140
		% of Total	25.7%	74.3%	100%

Table 4.10h. Strategies used more often by SLTs than MSSTs: Teach semantic feature analysis

			Teach semantic feature analysis		
			never_seldom	sometimes_often_always	Total
Job Role	MSST	Count	20	18	38
		% within Job Role	52.6%	47.4%	100%
	SLT	Count	3	102	105
		% within Job Role	2.9%	97.1%	100%
Total		Count	23	120	143
		% of Total	16.1%	83.9%	100%

Table 4.10i. Strategies used more often by SLTs than MSSTs: Teach phonological awareness

			Teach phonological awareness		
			never_seldom	sometimes_often_always	Total
Job Role	MSST	Count	15	23	38
		% within Job Role	39.5%	60.5%	100%
	SLT	Count	6	99	105
		% within Job Role	5.7%	94.3%	100%
Total		Count	21	122	143
		% of Total	14.7%	85.3%	100%

Other strategies used

A free-text field was provided to record which other strategies were used. There were 35 responses to this question.

Eight (seven SLTs, one SLT/T) listed examples of semantic strategies e.g.

> *"Word webs to note related words, generating antonyms and synonyms of the word."* (7: SLT)

Seven (five SLTs, two Spec Ts) made reference to phonological-semantic links e.g.

> *"Word maps created with the pupil to visually link semantic and phonological information."* (187: SLT)

Five (all SLTs) mentioned the use of published resources e.g.

> *"I often use Elklan's vocabulary strategies also - word webs and maps etc. I also recommend Victoria Joffe's Vocabulary Enrichment Programme."* (25: SLT)

Five (all SLTs) mentioned that it depended on the agent of change, e.g.

> *"I use most of these strategies in my own sessions, but I would be quite selective about which strategies I recommended for others to use. Some of these strategies are quite technical and more suited to individual sessions."* (25: SLT)

Some reiterated the given strategies with an innovative mode of implementation, e.g.

> *"I get students to use PowerPoint to create their own dictionaries, including a definition in their own words, a picture and an example of the word used in a sentence."* (114: MSST)

4.4.10.3 Selection of the most effective strategies for vocabulary teaching (158 responses)

A free text field was provided for answers to this question. Table 4.11 shows which strategy respondents felt were the most effective, by percentage within job role. Figure 4.5 illustrates the data by count, with responses collapsed across job roles. Where the strategies listed did not exactly match a strategy listed in the survey, they were coded and assigned categories according to the process described in section 4.3.4.

The strategy listed by MSSTs most commonly as the most effective was asking students to say the word in a spoken sentence (41%), followed by writing the word in a sentence (22%), and visual support (19%). Two out of four special school teachers (50%) also thought that asking students to say the word in a spoken sentence was effective, along with saying the word aloud. Two out of five (40%) of Sencos felt that the most effective strategies were: asking students to say the word in a spoken sentence; phonological awareness; and revision/practice. Specialist teachers and SLTs listed a wider range of strategies than MSSTs, special school teachers, and Sencos. The strategies listed most frequently by specialist teachers were the use of visual support (26%) and phonological awareness (26%). For SLTs, teaching semantic features was the most commonly listed (28%), followed by repeating the words often (21%), saying the word in a spoken sentence (19%), using visual support (18%), and phonological awareness (18%). The wording of the strategy *repeat the words often* was intended to mean *the practitioner repeats the word often*, but some responses suggest that it may have been interpreted by respondents to mean *student repeats the word often*. Where respondents explicitly stated student repetition, this was counted under *say the word*. Where respondents stated *using the word*, this was counted under *say the word in a sentence*.

Most respondents who answered this question listed more than one strategy, with some (19) stating that a combination was most important:

> *"All of the strategies need to be used with other strategies. None are effective in isolation. Depends on pupil and teacher."* (32: SLT)
>
> *"A combination and constant repetition to embed." (20: Senco)*

Responses under "other" in Figure 4.5 were listed by one person each, and included: *STAR approach (structure, theme, action, review); games; using colour; ten words per term; train/model for school staff; word grid (word, definition, sound structure, icon); pre- teaching a small selection; looking at words in depth; whole staff approach; frequent vocabulary tests; spelling; identify key words; structured routine and repetitive approach; compare and contrast activities; teacher using the word in a sentence; visual timetables; reading forwards and backwards; look-say-cover-write-check at home; cloze activities; drilling of words; hear the word in isolation.* While some of these may be similar to the strategies given, they are listed here separately (verbatim) if the respondent's wording was not sufficiently clear to match them to a given strategy.

Table 4.11. Most effective strategies for vocabulary teaching within job roles (percentage)

Most effective strategy (by percentage, within job role)	**Job role**				
	MSST N=32	**Spec Sch T N-4**	**Senco N=5**	**Spec T N=19**	**SLT N=98**
Ask student to say the word in a sentence	41	50	40	11	19
Repeat words often	3	25	20	11	21
Teach semantic features	0.3			21	28
Use visual support	19	25	20	26	18
Teach phonological awareness	0.3		40	26	18
Give examples of usage in multiple contexts	10			11	16
Give definitions	10			11	15
Combination/all	0.1	25	20	16	13
Personalise to student's own experience			20	5	16
Ask students to say the word aloud	13	50		11	10
Ask students to identify unknown words	3			5	10
Teach how to derive meaning from context	3			11	9
Ask students to write the word in a sentence	22	25			4
Link semantic with phonological information				16	7
Depends on student		25			9
Write key words on board		25			8
Use a "must should could" approach					8
Teach how to derive meaning from morphology	0.3				6
Ask students to write the words	0.6			11	4
Ask students to self-rate own knowledge					6
Use of a dictionary	0.3				4
Students have their own vocabulary book	0.3			11	2
Revision/practice			40	5	2
Multi-sensory				11	3
Student creates own definition					4
Have clear target vocabulary				5	3
All that foster independent word learning				5	3
Depends on context		25		5	1
Write key words in lesson plans					3
Depends on SLT/teacher				5	1
Check understanding					2
Interactions with words					2
Change to keep interest		25			1
Link to known/other words					2
Encourage interest in words					2
Other	25	75	0	5	9

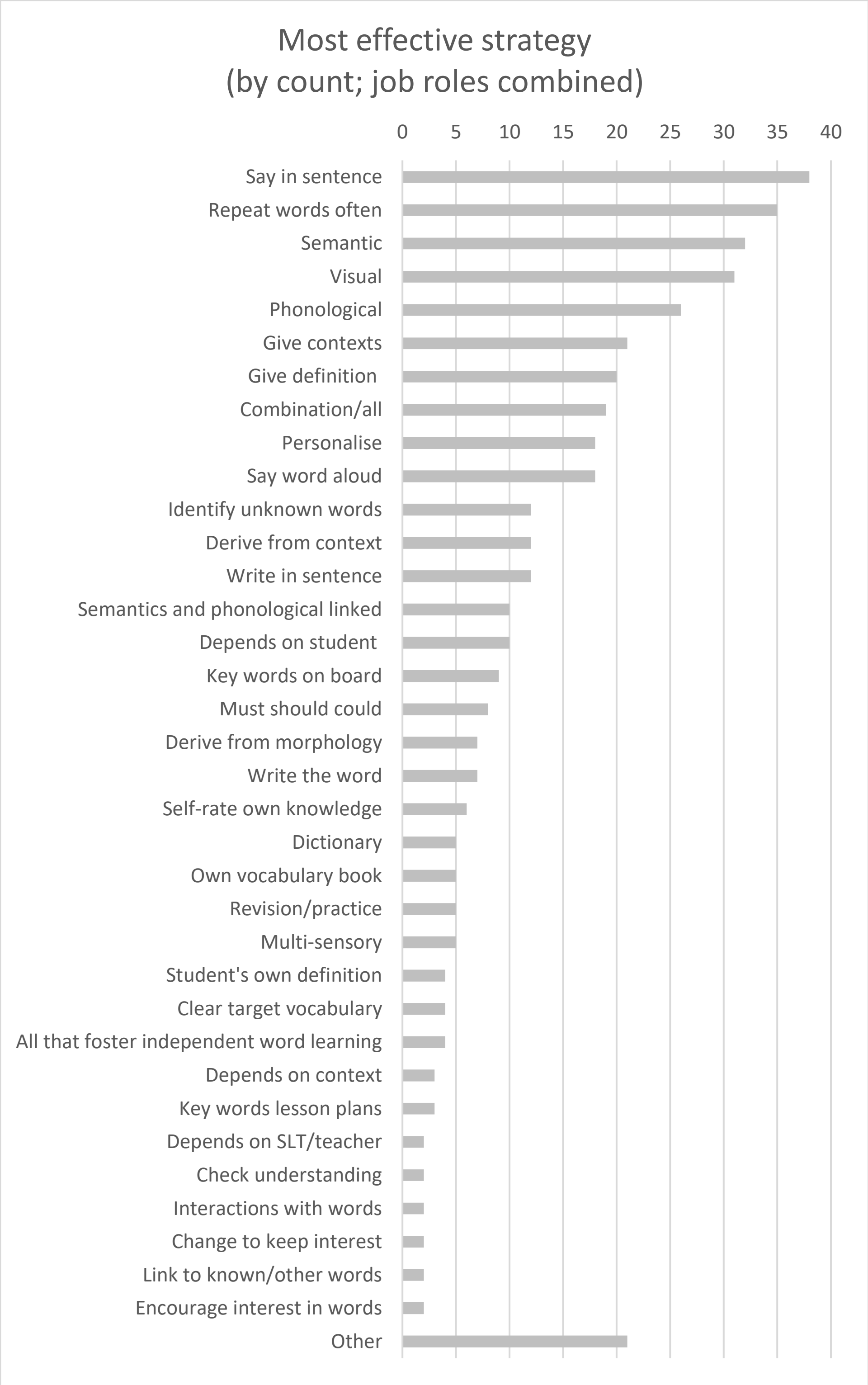

Figure 4.5. Most effective strategies for vocabulary teaching by count; job roles combined

4.4.11 Developing knowledge about effective vocabulary intervention for secondary school students with language impairment (178 responses)

A high proportion (87.5%) of practitioners said that they would like to develop their knowledge. Pearson's chi-square indicated that there were no significant differences between the five job roles (χ^2 (4) = 6.138, p = .183); however, as 40% of the cells had an expected count of less than 5, this result may not be valid. Therefore, Fisher's exact statistic was computed for MSSTs and SLTs only, confirming that there was no significant difference between these two professions in their wish to develop knowledge in this field (p = .085).

4.4.11.1 Specific areas for development (123 responses)

There was a wide range of topics mentioned in this section, as depicted in Figure 4.6.

Some respondents (18 comments) referred to strategies in a general sense; others (15 comments) listed specific strategies they were interested in:

> *"Strategies for secondary classroom teachers to do this effectively in subject lessons."* (209: Senco)

> *"How to teach morphological understanding, how to derive meaning from context, teaching phonological awareness."* (179: MSST).

A request for more knowledge about whole-class intervention came from teachers and SLTs alike (25 comments):

> *"Supporting teaching staff with more whole-class approaches and strategies."* (14: SLT)

> *"Supporting students in a whole class setting without specialist support."* (113: MSST)

Likewise, both SLTs and teachers, especially those with a role in special needs, wanted to know more about how to achieve successful partnership working (23 comments):

> *"Would be interested to know how to partner with teachers to do whole-class work."* (7: SLT)

> *"How to support teaching staff to include it in their delivery rather than specialist and withdraw."* (20: Senco)

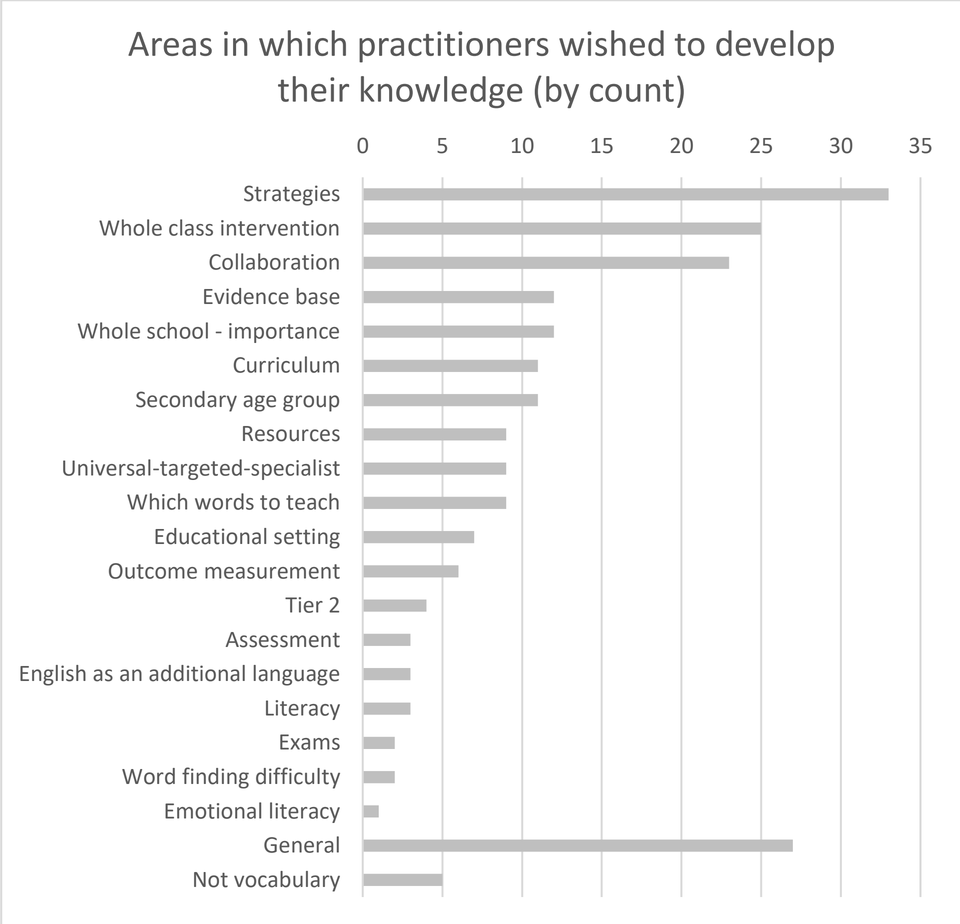

Figure 4.6. Specific areas for development

Key: Tier 2 = cross-curricular words (Beck et al, 2013). See section 2.1.1.

Some practitioners were interested in knowing more about the evidence base with regard to vocabulary intervention (12 comments):

> *"The evidence for teacher/TA input to support versus SLT-led intervention."* (46: SLT)

Some respondents wanted to know how to convince classroom teachers of the importance of vocabulary support in the classroom. Some of these felt that a key element in achieving this was effective liaison with senior management (12 comments):

> *"Whole class intervention: how do you get secondary teachers and teaching assistants on board to embed effective vocabulary learning strategies into their teaching practice?"* (169: SLT)

> *"I would like to know how to convince senior management of the importance of this as any innovation which is not supported top down is very hard work."* (67: Spec T)

Other areas listed included:

- Vocabulary and the curriculum (11 comments):
  "Curriculum vocabulary learning, particularly KS4." (97: SLT)

- Adapting strategies for the secondary age group (11 comments):

"Specific intervention programmes that can be delivered in a secondary context." (154: SLT)

"Any that encourage interest in words and don't feel too "school-y" (The young people I work with are generally anti-social and school-refusers and have no self-esteem)." (15: SLT)

- Resources (9 comments):
  "How to support older students within the classroom setting in developing their learning and memory of vocabulary. I currently adapt Word Aware[9] but would be great to have a more secondary focused set of tools." (184: Spec T)

- Universal – targeted – individual model of delivery (9 comments):
  "Would like to know more about the most efficient and effective models of service delivery." (167: SLT/T)

- Which words to teach (9 comments):
  "It would be helpful to have resources specific to curriculum topics, possibly focusing on the most important words. My knowledge of what vocabulary to do is always dependent on what the teacher tells me." (186: SLT)

- The challenges of the educational setting (7 responses):
  "Less about actual practical strategies, more about others' experiences implementing successful whole-school approach. Very confident in own abilities, but aware of limitations of this in fast-paced mainstream setting with many different teachers and LSA[10]." (121: SLT)

- Outcome measurement (6 comments):
  "Incorporating it into the curriculum and measuring effectiveness." (68: SLT)

- Tier 2 words (4 comments):
  "I would also like to increase my knowledge of useful word lists and prioritising words, especially Tier 2 words." (167: SLT/T)

- General - a desire for continued professional development in the wider sense (27 comments):
  "Although I am very aware of the difficulties and use a variety of strategies there are always some of the students I am teaching that struggle with learning new words. I am always open to learning new techniques." (126: Spec T)

  "Need to know more as an SLT about what knowledge and skills teachers are already trained in." (46: SLT)

- Areas other than vocabulary (5 comments), e.g.:

[9] Word Aware: a resource for developing vocabulary in "primary, elementary and middle school" (Parsons & Branagan, 2014. p.7).
[10] Learning Support Assistant: another term for Teaching Assistant.

“Autism.” (137: Spec Sch T)
“Dyslexia.” (162: MSST).

4.4.12 Further comments (47 responses)

A range of views was elicited, with key themes emerging of service and school constraints, collaborative working, and the challenges of providing support in secondary school settings. Themes are listed in Figure 4.7, and are encapsulated in the two responses below:

“There are a range of practical difficulties when working on vocabulary in a mainstream secondary school which I do not find in primary. If there are only 1 or 2 students in a class, teachers are less inclined to spend time with me (generally but not always - there are some very engaged teachers). Trying to get strategies used across lessons is hard due to the time constraints / demands on the service i.e. if I went into all lessons for one student there would be many other students not receiving therapy. I would therefore want clear research about the effectiveness of such interventions so I know it is a good use of time and will be effective...it is easier (guilt wise) to spend more time on a student if you know it is likely to be effective, and those students who have waited will also be getting a good quality service.” (4: SLT)

“I work in a specialist secondary school, not a mainstream secondary school, which is not a category in your study. You might be better off asking the teachers what methods they use in the classroom to teach vocabulary, and how they monitor this learning as most secondary schools have very little SLT input, and when it is there, the recommendations remain just pieces of paper in the pupils’ notes because the teachers have not got time to prepare specialist materials. Perhaps speech therapists need to have some input in teacher training regarding language learning and phonological awareness. But everyone has their separate profession and after 40 years in the trade it seems never the twain shall meet. When you look at all the teaching materials that are put out by private companies, or even the 'teaching of phonics' by the state it is so confusing it's no wonder students with language disorder get left behind. I believe that in secondary school there is a big brain development that takes place in adolescence so that if there were a repetition of some information that was not grasped in primary school these students could catch up. But in secondary school the basics are no longer taught so the students get left behind at both ends. I find that most language impaired students can't read very well or at all so they can't catch up easily, yet the mystery of transforming squiggly marks on a page into speech sounds which humans make is no longer taught. I hope your research has a practical outcome for the students’ sake.” (53: SLT/T)

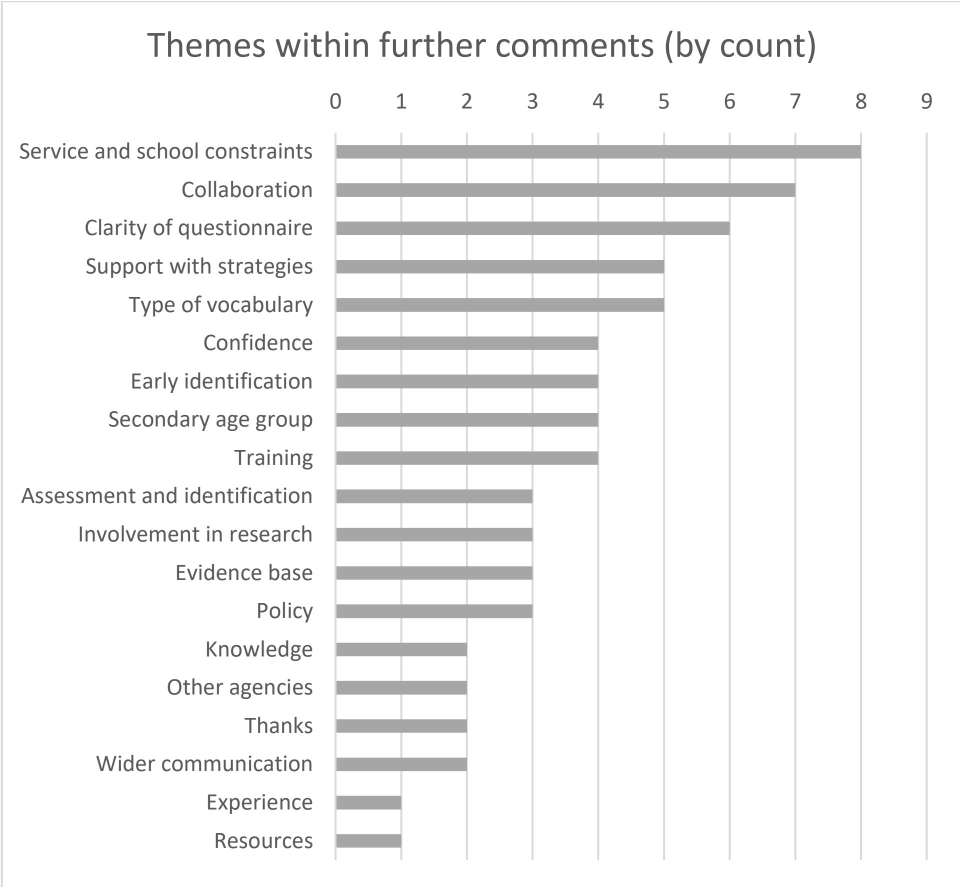

Figure 4.7. Themes within further comments

4.5 Discussion

The current chapter reports on an online survey which elicited information from speech and language therapy and teaching practitioners about their current practice of teaching vocabulary to adolescents with language disorder in mainstream secondary schools. The purpose of the survey was to gain a sound clinical and educational perspective on usual teaching and therapy practice to support the intervention study of vocabulary intervention in Chapter 6.

Practitioners from a range of regions within the UK were represented, with nine responses from other countries. This comprised 48 MSSTs, eight special school teachers, nine Sencos, 23 specialist teachers, and 134 SLTs. This is a very low return rate from teachers of 0.03%, given an estimated 140,000 secondary school teachers in England alone (DfE, 2011), but a better return rate from SLTs of 27.5%, calculated from figures in Pring et al. (2012) and Roulstone et al. (2012) that 7.1% of 6,860 paediatric SLTs work predominantly in secondary schools. The SLT return rate approaches the average response rate to online surveys of 33% reported by Nulty (2008). Hence, the responses to the current survey cannot be taken to be representative of the teaching profession, but the higher return rate from SLTs suggests greater external validity of the SLT profession’s responses.

4.5.1 The importance of vocabulary

Most (87%) of practitioners felt it was very important for students aged 11 – 16 to be able to learn new vocabulary (section 4.4.7). The most commonly given reason related to curriculum access and academic success, with other prominent reasons relating to the impact of vocabulary on socialisation, emotional well-being, and employment potential. These comments concur with the literature on long-term outcomes of children with language impairment, for example Stothard et al. (1998) and Clegg et al. (2005), which was discussed in Chapter 1. These results point to a high level of potential support for implementing recommendations following the findings of the intervention study.

4.5.2 Confidence and collaboration

The survey indicated that there is a higher percentage of students with vocabulary difficulties on SLTs' caseloads compared to the students in MSSTs' classes. This is to be expected, although because of the subjective self-rating format, responses may represent the level of practitioners' awareness of vocabulary needs rather than fact. Less contact with students who have vocabulary needs could be one reason why MSSTs reported less confidence in supporting students' vocabulary than SLTs, who have greater contact with students who have vocabulary needs. This gives them more opportunity to develop skills in vocabulary support, thus increasing their confidence. Levels of confidence also appeared to be influenced by training and multi-disciplinary collaboration: those who reported lack of confidence cited lack of training and barriers to multi-disciplinary working, whereas those who reported more confidence felt that training and successful collaboration contributed to their confidence. Some SLTs reported that they had the appropriate knowledge, but found it difficult to achieve successful partnership working with teachers. Conversely, some teachers were aware of their lack of knowledge but reported limited access to specialist support.

These comments indicated that there was a desire within both professions to collaborate with the other, but that practical obstacles impeded progress. This finding echoes the results of Glover, McCormack, and Smith-Tamaray (2015). In their study, with 14 teachers and six SLTs who worked with five to 11-year-olds, in one education region of New South Wales in Australia, a desire for more training, resources, and opportunities for collaboration was expressed. But, as Merritt and Culatta (1998, p.49) noted, "Collaboration is neither automatic nor easy to execute as it encompasses significant professional challenges." Since the NHS Reorganisation Act in 1974, public sector SLTs in the UK have traditionally been employed within the NHS, whereas teachers are employed by schools, creating a divide at strategic level and consequent differing priorities. At an operational level, the comments of respondents mirrored the views of Ehren (2002) (section 2.3.1) in terms of the limited amount of time which teachers and SLTs have for planning, and the logistics of timetabling joint planning opportunities. Changing patterns of commissioning in recent years, including an increase in funding of speech and language therapy by schools and local authorities, have made some inroads in relation to this issue, whereby strategic-level joint working is in place which facilitates joint working at an operational level. Indeed, McKean et al. (2017) described successful collaborative practice at an operational level in the context of a successful partnership at strategic level. This was a qualitative study in which 33 professionals concerned with SLCN provision were interviewed from eight schools in one local authority and its NHS partner in the UK. Adequate resources and positive attitudes were reported. However, these findings pertained to a single area in the UK, with contributions from just four SLTs; and, furthermore, it is implied that the schools involved in the research were primary schools. This research needs replication in order to explore the extent and effectiveness of collaborative practice in different contexts.

4.5.3 Models of intervention delivery

One of the purposes of the survey was to explore what model of intervention delivery was used in mainstream secondary schools. It was hypothesised (hypothesis 1) that specific vocabulary intervention for adolescents in mainstream secondary schools takes place in a small-group or individual model of service delivery. Responses showed that vocabulary intervention was delivered through a range of universal, small-group, and individual models, by all professional roles, therefore this hypothesis was not supported. The wording of the question, *What model of delivery do you use to teach vocabulary to students aged 11 – 16 years?* could have led to some ambiguity, as some respondents appeared to have answered it according to what their individual practice was, rather than what model of practice was utilised within their setting. In addition, it would have been appropriate to include the option *Whole-class strategies with no access to speech and language therapy support*, as this was stated by 13 respondents as another model which they employed.

A long list of factors influencing which model to choose was generated by respondents, indicating that SLTs and teachers have to take many things into consideration when providing intervention in school. While some practitioners were able to make needs-led decisions, others were impeded by barriers which resulted in resource-led decisions. The most commonly cited influencing factor was the availability of the SLT. The SLTs citing this factor reported a lack of time to devote to their school caseload, and from the teachers' perspective this barrier was perceived as a lack of specialist support. These comments reflect a national picture of limited specialist speech and language support in secondary education in the UK (Bercow, 2008; Lindsay et al., 2002). However, some responses implied the presence of a greater amount of speech and language therapy provision, allowing more opportunities for teacher-SLT collaboration. It is possible that in some areas, but not all, speech and language therapy resources at secondary level have developed in recent years, resulting in the variability of speech and language therapy provision reported by Pring (2016).

4.5.4 Vocabulary support strategies

In order to ascertain which specific intervention techniques and strategies practitioners used in practice, a list of strategies was provided in the questionnaire, and respondents were also given a free-text field to add other strategies. It was hypothesised (hypothesis 2) that SLTs would use a phonological-semantic approach to vocabulary intervention with adolescents who have language disorder, whereas MSSTs would use a semantic-only approach to vocabulary instruction. To investigate this, the strategy of teaching phonological awareness was listed in the survey (the full wording was: *teach phonological awareness of the words (initial sound, syllable, and rhyme) e.g. phonological-semantic word maps, word grids, sound-and-meaning bingo).* Results provide support for hypothesis 2, with 94.3% of SLTs indicating that they taught phonological awareness *sometimes, often*, or *always*, compared with 60.5% of MSSTs, a significant difference.

It was of interest that SLTs used semantic feature analysis significantly more often than MSSTs, with 97.1% of SLTs indicating that they taught semantic feature analysis *sometimes, often*, or *always*, compared with 47.4% of MSSTs. While many of the strategies used by teachers were semantic in nature, such as teaching students how to derive meaning from context or asking students to look words up in a dictionary, this result would suggest that fewer teachers than SLTs consciously incorporate semantic feature analysis into their teaching, in terms of expressly discussing features such as function, location, attribute, and category.

The strategies which MSSTs employed more often than SLTs were listing key words on the board, and asking students to use the word in a written sentence. This is unsurprising, given the centrality of literacy to the secondary curriculum. According to the Secondary National Curriculum, "teachers should develop pupils' reading and writing in all subjects to support their acquisition of knowledge" (DfE, 2014, p.10).

Inspection of Figures 4.3 and 4.5 reveals some mismatch between the most frequently used strategies and the strategies which respondents felt were the most effective. The most frequently used strategy was giving definitions, whereas this strategy did not feature highly as an effective strategy from any of the professional roles. This could be a function of reporting bias, in that Figure 4.5 is based on 179 responses, of whom only 158 answered the question about the most effective strategy. Alternatively, it could indicate that it is common practice to define a word first, and then to follow this up by examining word meaning in more depth using other strategies – a practice supported by research which shows that providing definitions alone is not sufficient (Justice et al., 2005; Nash & Snowling, 2006) (section 2.2.2).

4.5.5 Continuing professional development

The majority of respondents (87.5%) indicated that they would like to develop their knowledge in the field of vocabulary intervention. The most frequently requested areas related to which strategies to use, how to deliver vocabulary support in a whole-class context, and how to achieve successful teacher-SLT collaboration. However, these areas were the explicit focus of the questionnaire, which could have introduced bias. Nonetheless, the survey illustrates a desire amongst practitioners to overcome barriers such as service or time constraints, lack of knowledge or training, and lack of opportunities for collaboration. It highlighted the commitment of practitioners to meet the needs of adolescents with language disorder, which provides a strong endorsement from a stakeholder perspective for the intervention study which follows in Chapter 6.

4.6 Limitations

The limitations to this research will now be evaluated.

Validity

Even though the questionnaire was trialled amongst a small number of teachers and SLTs prior to being launched, it became apparent that some of the questions were still ambiguous. For example, MSSTs were asked how many lessons, over how many weeks, they spent on one topic, but responses to this question varied so widely that it was apparent that the question had been interpreted in different ways, therefore results were not valid. A further example is the wording of the strategy *repeat the words often*. This was intended to mean *practitioner repeats the word often* but it appeared to have been interpreted by some respondents to mean *student repeats the word often*.

Bias

Only interested parties will have prioritised time to fill in the survey, so results are biased towards those with experience of, or interest in, vocabulary or speech, language and communication needs.

Sample size

The number of questionnaires received from MSSTs (N=48) is a very small return rate (estimated 0.03%) and so responses to the current survey cannot be taken to be representative of the teaching profession, though the higher return rate from SLTs (N=134: estimated 27.5%) provides greater external validity for the SLTs' responses. In addition, only 175/259 (68%) questionnaires were fully completed. This could have been because the introduction to the questionnaire did not explain that the web-page would be open for two weeks after commencement, so it is possible that some respondents, having been unable to complete it at one sitting, did not realise that they could come back to it for completion later. Explaining this in the introduction would possibly have increased the completion rate.

Any inferences or generalisations should, therefore, be made with caution. Nonetheless, in comparison to Glover et al. (2015), which had a sample size of N=20, and McKean et al. (2017) which had a sample size of N=33, the larger sample size of the current survey (N=259) adds credibility to its findings. Furthermore, both Glover and McKean sampled one geographical area only, whereas the current survey sampled the whole of the UK. However, due to differences in recruitment methods, comparisons of percentage return rates are difficult to make. Although Glover states that 11/156 (7%) schools and six out of 36 (17%) of SLTs took part, neither Glover et al. nor McKean et al. stated the total number of education professionals invited, so it is not possible to calculate a percentage return rate.

Notwithstanding these limitations, although responses do not reveal such a positive picture as that presented by McKean et al. (2017), the results of the survey mirror the findings of Ehren (2002) and Glover et al. (2015), providing support for the intervention study in Chapter 6.

4.7 Conclusion

Review of the literature revealed little about what type of vocabulary teaching currently takes place in the mainstream secondary school classroom in the UK; therefore, the survey described in the current chapter sought to discover more about how vocabulary support is typically provided for adolescents with language disorder in mainstream secondary schools. Two strands of enquiry were pursued: firstly, to find out what types of intervention are currently used by teachers and SLTs in practice; and secondly, to find out what model of intervention delivery is used. Review of vocabulary interventions in the literature (Chapter 2) found that most clinical studies have investigated a phonological-semantic approach, whereas most educational studies have investigated a semantic-only and literacy-based approach. The survey results provide some evidence that this parallels current practice, showing that SLT practitioners taught phonological awareness as a strategy for developing vocabulary skills more often than MSSTs. Results also suggest that teachers were more likely to use semantic (though not specifically semantic feature analysis) and literacy approaches.

Another comparison of note revealed by the survey concerns the model of intervention delivery used. Vocabulary research has explored small-group and individual models of delivery more frequently than a whole-class model (Chapter 3). This might suggest that a whole-class model is used less often in practice; however, this was not reflected in the outcomes of the survey, which suggest that both speech and language therapy and teaching professions use whole-class models of delivery in their practice as well as small-group and individual models. This emphasises the urgency of researching vocabulary intervention specifically for adolescents with language disorder in the whole-class setting.

Comments made in the survey indicated that members of both professions wished to know more about the evidence for effective vocabulary strategies, and how to achieve successful collaboration in order to implement these strategies in a whole-class setting within the mainstream secondary curriculum. This emphasises the ecological validity of the intervention explored in Chapter 6.

Summary of Chapter 4

A survey was conducted to establish a knowledge base about how vocabulary support is typically provided by teachers and SLTs for adolescents with language disorder in mainstream secondary schools. There were 259 responses to the survey, of which 175 were fully completed. Both speech and language therapy and teaching professions were found to use a range of universal, small-group, and individual models of delivery in their current practice, with SLTs teaching phonological awareness as a strategy for developing vocabulary skills more often than MSSTs. The survey thus underlines the need to investigate the effectiveness of a phonological-semantic approach in the mainstream secondary school classroom, and provides a sound clinical and educational perspective for an intervention study. The development of assessment and intervention protocols for the intervention study are described in Chapter 5, and the study itself is reported on in Chapters 6, 7, and 8.

Chapter 5

The development of assessment and intervention protocols: A pilot study

Overview

This chapter describes the rationale behind word selection, and the assessment and intervention choices for the main experimental study of the current thesis (Chapter 6). It describes a pilot study in which the assessments and intervention activities were trialled and explains how the protocols were developed. Following a brief introduction (section 5.1), section 5.2 provides an overview of the pilot study design. Section 5.3 gives the rationale for the selection of experimental and control words, and section 5.4 describes the development of a bespoke assessment to assess knowledge of these words. Section 5.5 outlines the standardised language assessments used in the pilot study. Section 5.6 describes the development of a bespoke assessment to measure progress in independent word learning ability. In section 5.7, each intervention activity is described in detail along with its rationale. Section 5.8 reports the results in increases in participants' word knowledge following the pilot intervention. Section 5.9 describes the refinements made to assessments and intervention activities after they had been piloted.

5.1 Introduction

The main experimental study of the current thesis is an intervention study examining the effectiveness of classroom vocabulary intervention for adolescents with language disorder. The purpose of the pilot study, reported on in the current chapter, was to enable the researcher (a speech and language therapist) to trial word selection, assessment and intervention protocols. Further details of all aspects of recruitment, word selection, assessments and intervention activities specific to the intervention study are given in Chapter 6.

5.2 Design of the pilot study

The pilot study took place in the summer term of 2015. One mainstream secondary school identified six Year 8 students in one science class, who had low vocabulary levels according to school attainment records. The students were aged 12:0 to 12:10 (*M* = 12:4, *SD* = 4 months). Written consent was gained from head teacher, science teacher, parents and students. At baseline, the researcher assessed these students on 16 words from a science topic, "Breathing and Respiration", and on eight control words from a future topic "Genetics and Inheritance", using a bespoke author-created word knowledge assessment. Standardised language assessments were also administered, as well as a bespoke author-created assessment of independent word learning ability. The 16 "Breathing and Respiration" words were divided into two lists of eight, matched as far as possible by phonological complexity and frequency. One list of eight words acted as experimental words, which were taught to the students in a small group by the researcher, using the proposed word-learning activities. The students attended the group sessions for the first twenty minutes of each science lesson during the topic "Breathing and Respiration," for eight consecutive lessons over three weeks. The other eight "Breathing and Respiration" words acted as active control words, taught by the teacher during science lessons using usual teaching practice. The eight words from "Genetics and Inheritance" acted as passive control words receiving no intervention or exposure. At the post-intervention timepoint, the word knowledge assessment and independent word learning assessments were re-administered by a blind assessor. Following the pilot study, adjustments were made to the assessment and intervention protocols as necessary.

5.3 Word selection

Two options for the choice of experimental words were considered: cross-curricular words or subject-specific words. Beck et al. (2013) advocated the use of a tiered system of word classification, which was explained in section 2.1.1. Beck and colleagues emphasised the importance of explicitly teaching cross-curricular (Tier 2) words, as these words have maximum functionality across the curriculum. For this reason, it would have been clinically and pedagogically appropriate to use Tier 2 words for the experimental and control words in the current study. Empirically, Tier 2 words chosen by the researcher, would have had the advantage that experimental words could be matched more easily for frequency, phonological complexity, and imageability with control sets of words. However, this study was reliant upon the participation of teachers within their lessons. Teachers have an obligation to teach the curriculum, and each topic has a list of subject-specific key words which are central to the teaching of the topic. The purpose of this study was to explore how vocabulary intervention can be embedded into a topic syllabus, and it was felt that the teaching of Tier 2 words might have necessitated teaching in isolation from the topic, thereby not meeting the aims of the study. It was also felt that it would be harder, and more artificial, for teachers to incorporate an additional set of words into their lessons as well as the key words they needed to teach within the topic. This could adversely affect the motivation of the teachers to take part in the study and possibly impact on fidelity to the intervention protocol. Furthermore, there would be a potential for students to receive exposure to both experimental and control cross-curricular words in other subjects and even outside school. It was, therefore, decided that the experimental words would be Tier 3 words: subject-specific words, selected from the topic syllabus to be taught within the timeframe of the study.

The subject-specific words were chosen from science, because science is a core (compulsory) subject in the UK secondary school curriculum (DfE, 2014), and is noted for its high content of subject-specific vocabulary, much of which is abstract or technical (Woodward & Noell, 1991). The decision to use science is supported by a focus on science vocabulary in previous literature (e.g. Dockrell et al., 2007; Joffe, 2011; Sim, 1998). Forwood (2014) researched the science vocabulary knowledge of Year 7 and 8 students in Australia (age 12 – 14 years), comparing those presenting with a language learning disability (N=20) with TD students (N=159). She noted that those with language learning disability found science vocabulary more challenging than their TD peers, and that this was coupled with a negative attitude towards science.

Previous studies that have compared the learning of two or more sets of words have ranged from one word in each set (Best, Dockrell, and Braisby, 2006b) to 40 words in each set (Easton et al., 1997). Some studies have used larger numbers of words than this, for example Snow et al. (2009), which involved intervention of 120 words over a full academic year, measured by a subset of 40. In the pilot study, eight experimental words were used, to fit in with the number of lessons over which the topic “Breathing and Respiration”, would be taught. Clinical observation, backed up by discussion with the science teacher in the pilot study, indicated that 10 would be a reasonable number of words to be taught in one science topic, and that an assessment containing 10 experimental plus 20 control words would be of a manageable duration for participants. Therefore, for the intervention study, 10 was chosen as the number of experimental words.

In the pilot study, experimental and control words were matched as far as possible by phonological complexity and frequency. The matching of experimental and control words for the intervention study is described fully in section 6.6.

5.4 Word knowledge assessment

5.4.1 Rationale behind the pilot word knowledge assessment

As the intervention targeted sets of curriculum words, a bespoke non-standardised tool to measure increases in word knowledge was required. It was felt that an assessment tool was needed which would thoroughly explore changes in the extent of semantic representation, or depth of word knowledge (see section 1.5.1). As was described in section 2.2.1, a receptive vocabulary assessment which did not involve expressive skills, such as a picture pointing task, would have provided information regarding the participants’ breadth of word knowledge, but such multiple-choice tasks do not provide detailed insight into semantic representations. A word knowledge assessment was therefore devised by the researcher consisting of a definition production task.

In a definition production task, the participant is required to describe the meaning of a word, yielding information about the participants’ depth of understanding. Definition production tasks have been used to assess semantic representations in several previous studies, using a scale to indicate depth of word knowledge (Clegg, 2014; Curtis, 1987; Justice et al., 2005; McGregor et al., 2013; Throneburg et al., 2000). Such a scale was first proposed by Dale (1965: p.898), as follows:

“1 I never saw the word before
2 I know there is such a word but I don’t know what it means
3 The twilight zone: a vague contextual placing of the word
4 We have pinned the word down. We know it. We would recognise it again if we saw it, and we are likely to remember it.”

This has been adapted many times (Beck et al., 2002; Curtis, 1987; Elks & McLachlan, 2008). Further to this, some studies (Lubliner & Smetana, 2005; St. John & Vance, 2014) have used a traffic light system to represent levels of knowledge, a concept familiar to many students: “If you don't know the word at all color the light red. If you have heard of it but aren't sure what it means color it yellow. If you know the word and can use it in a sentence color it green" (Lubliner & Smetana, 2005, p.173).

In the pilot study, these systems were combined and adapted to create a *red-amber-green* scale. It was felt that stages 1 and 2 of Dale's (1965) classification system, and the red and yellow stages of Lubliner and Smetana (2005), did not indicate any difference in depth of knowledge; these were, therefore, collapsed into one stage, denoted *red* in the pilot study. *Amber* was used for the equivalent to Dale's stage 3, in which the student can describe something about what the word means but without precision. *Green* was used for the equivalent to Dale's stage 4 and Lubliner and Smetana's green stage, in which the student can explain what the word means, in the context in which it has been taught, and can use it in a sentence.

5.4.2 Scoring of the pilot word knowledge assessment

Students were awarded a score of 1 for an *amber* response and 2 for a *green* response. Thus, the maximum score in each word list of eight words was 16.

5.4.3 Validity of the pilot word knowledge assessment

Validity of the pilot word knowledge assessment was measured by correlating the baseline word knowledge assessment scores with the students' scores on the Vocabulary subtest of the Wechsler Abbreviated Intelligence Scale, second edition (WASI-2 V: Wechsler, 2011), which is also a definition production task. Because of the small sample size (N=6), Spearman's rho was used. There was a significant positive correlation between the baseline word knowledge assessment scores and WASI-2 V raw scores (Spearman's $r = .82$, $p = .046$), which justified the use of the assessment.

5.4.4 Administration of the word knowledge assessment

Pre-intervention assessment was administered by the researcher, following an administration protocol with a flow chart of questions and prompts. The post-intervention assessments were administered by a blind assessor, a specialist speech and language teacher who was familiar with this type of assessment, using the same administration protocol.

5.5 Language and cognitive profiling

In the pilot study, information about the language and cognitive profiles of participants was gained through the use of three standardised assessments:

- the Vocabulary subtest of the Wechsler Abbreviated Intelligence Scale, second edition (WASI-2 V: Wechsler, 2011);
- the British Picture Vocabulary Scale, third edition (BPVS-3: Dunn, Dunn, Sewell & Styles, 2011); and
- the Listening Recall subtest of the Working Memory Test Battery for Children (WMTBC: Gathercole & Pickering, 2001).

The rationale behind the choice of these assessments is detailed in section 6.7.1.

The group mean WASI-2 V standard score of pilot study participants was 88 (*SD* = 9.5); for the BPVS-3, mean standard score was 83 (*SD* = 11.6); and for the Listening Recall subtest of the WMTBC, mean standard score was 94 (*SD* = 18.0).

5.6 Independent word learning ability

Because there are too many words to teach each one individually (Beck et al., 2013; Nagy & Herman, 1987), an additional aim of the vocabulary intervention was to include instruction which would develop transferable word-learning skills (section 2.2.4.4).

5.6.1 Development of a bespoke independent word learning assessment

An assessment was devised by the researcher using principles from Beck et al. (2013) and Lubliner and Smetana (2005), to assess: (i) the students' ability to identify words they did not understand; (ii) their ability to derive the meaning of these words; and (iii) their knowledge of strategies to use when confronted with an unknown word.

Three passages were taken from Joffe (2011) chosen for their age-appropriacy, optimum length, and inclusion of words which had the potential for derivation of meaning from morphological and contextual clues. The passages were printed in Arial size 16 font and were shown to the student one by one, with the following introduction:

> *"We're going to have a think about learning new words. I'm going to read you two short passages. Listen carefully. There may be some words that you have never heard of before and do not understand. That is OK. I will ask you to try and work out what the word means."*

Each passage was read aloud by the assessor, who followed it along with her finger while reading, to avoid any complications caused by reading difficulties. After each passage, the assessor asked:

> *Are there any words in there you've never heard before?* [11]

Students could say or point to any words they did not understand. The assessor asked:

> *What do you think .... might mean?*

Once the student had said what they thought the word might mean, the assessor asked.

> *What makes you think that?*

General praise and encouragement were given, but specific feedback about responses was not given. The students were then asked:

> *If you don't understand a word, what can you do to find out what the word means?*

After their first answer, the students were asked:

[11] At subsequent time points, the assessor asked "Are there any words in there you don't understand?"

Can you think of anything else you can do?

until they had no further ideas.

5.7 The intervention activities

5.7.1 Summary of rationale for the intervention

Chapter 1 described the complex process of word learning in adolescence: how new words are linked to prior knowledge and added to an existing lexicon; how phonological and semantic representations are extended and strengthened; and how components such as literacy and metalinguistic awareness come into play. Chapters 2 and 3 synthesised the evidence for vocabulary instruction with children and adolescents who have language disorder. Learning to derive meaning from context as well direct definitional instruction was shown to be important in developing independent word-learning skills. It was explained that the value of adding phonological instruction to semantic instruction is particularly pertinent for children and adolescents who have language disorder, in order to strengthen links between phonological representation and semantic representation. Despite this, whole-class vocabulary teaching approaches were not found to include explicit phonological instruction.

The intervention in the experimental study, underpinned by the evidence base, and drawing on the researcher's clinical experience as a SLT, aimed to incorporate many of the components of word learning in specific word-learning activities, to be delivered in the classroom by the teacher. This eclectic approach to intervention supported adolescents' word learning by building on strengths as well as supporting their weaknesses. For example, participants with phonological weaknesses but semantic strengths, as well as those with semantic weaknesses but phonological strengths could have the opportunity to benefit. The inclusion of elements which drew on visual skills, metalinguistic awareness, memory skills, and motivation aimed to reach students with a wide range of cognitive and language profiles. Importantly, the word-learning activities contained repeated opportunities for students to say the words aloud, a critical element in developing accuracy of phonological representation and in linking phonological form with semantic representation. Literacy was supported throughout all intervention activities by accompanying speech with the written word, to assist in the development of the "literate lexicon" (Nippold, 1988; p.29).

An intervention protocol adhering to these principles was devised, and was trialled by the researcher in the pilot study as follows.

5.7.2 Content of intervention

The intervention consisted of seven components, piloted by the researcher with participating students in the small group setting:

- Self-rating checklist;
- Visual image displayed with written word;
- Word detective;

- Word map;
- Word wise quickie;
- Sound and meaning bingo;
- Vocabulary book.

Examples of all the intervention activities are in the appendices to chapter 6 (see section 6.8.1). Each intervention activity will now be described, with a rationale for its inclusion and examples of where it has been used in previous research.

5.7.2.1 Self-rating checklist (Appendix 6O)

At the beginning of the intervention, students were given a self-rating checklist. The experimental words were listed on one sheet, against three columns headed with a sad face (representing no knowledge of word meaning), a non-committal face (representing some knowledge), and a smiley face (representing secure knowledge). The researcher read the words aloud to the students, who then rated their own knowledge of the words individually by ticking the appropriate column. The self-rating checklist was done once at the beginning of the topic, and once at the end of the topic so that students could review their own learning.

Rationale: The aim of the self-rating checklist was to exploit the increasing metalinguistic awareness in adolescence (section 1.3). Lubliner and Smetana (2005) included a self-rating component in their intervention, to raise children's awareness of their own word knowledge. The self-rating checklist was also intended to increase motivation by alerting the students to which words they needed to learn, and enabling them to evaluate their own learning at the end of the topic.

5.7.2.2 Visual image displayed with written word (Appendix 6Q)

An image representing each experimental word along with the written word, each on an A4 laminated sheet, was displayed throughout the intervention.

Rationale: Henry and Botting (2017)'s review of working memory and language impairment suggests that the visual modality may be stronger than the auditory modality for many children with language disorder. In much of the literature emanating from America in the 1980s, visual representation is part of what was known as the keyword method (e.g. Pressley, Levin, & McDaniel, 1987). Steele and Mills (2011) also recommend the use of visual support.

5.7.2.3 Word detective (Appendix 6R)

The researcher displayed a word detective prompt card and used it as she modelled how to discover information about a new word. Words were introduced in context by reading aloud a piece of text from a lesson PowerPoint (Microsoft, 2016) presentation, and the researcher modelled what to do when encountering a new word. The concept of being a word detective was taken from Joffe (2011), and the word detective prompt card was devised as a mnemonic to remind the students of four key strategies for finding out the meaning of a new word. The first two strategies comprised clues to work out the meaning of the word from accompanying information:

firstly, to look for morphological clues in the structure of the word, and secondly to look for contextual clues in the sentence or paragraph containing the word. The last two strategies comprised skills of self-directed enquiry; asking another person, and using a dictionary.

Rationale: The introduction of words in a context creates a natural incentive of needing to know what words mean (Miller & Gildea, 1987). As described in section 2.1, direct instruction in how to derive meaning from context is advocated by Beck et al. (2013), and has been found effective in younger children by Justice et al. (2005), and Nash and Snowling (2006). The idea of being a word detective has been used successfully with older children by Joffe et al. (in preparation) (section 3.4.3).

5.7.2.4 Word map (Appendix 6S)

A word map was used to introduce new concepts, forming a framework for exploring the meaning of the words. Out of all the activities, the word map was intended to be the one where the majority of the teaching of new curriculum content would occur.

A word is written in the centre of the word map. On one side of the word, lines lead to spaces in which to write: the number of syllables; the initial phoneme; and words which rhyme with or sound like the word. This latter space also allows for discussion about morphology and linking with other similar words through examining the root, prefix, and suffix. On the other side, lines lead to spaces in which to write or draw: the function of the object; its location; its constituent parts; what category it belongs to; and something that personalises the word to the student's own experience. Drawing is used as much as possible to provide visual support, and to allow those with literacy difficulties to demonstrate their knowledge. The researcher did the word maps initially on the board as a whole group activity, but once the students were familiar with them, they were used flexibly, for example on printed sheet in pairs, individually, or as homework.

Rationale: A word map facilitates exploration of the phonological form of a word as well as the semantic features of the word, and ensures that phonological and semantic information is connected (section 1.5.4). The word map necessitates frequent repetition of the word, slowing down speech rate, and segmentation of the word to highlight phonological features of the word. Making the phonological features more salient supports PSTM and phonological processing, which are areas of difficulty in many children with language disorder (section 1.5). Making phonological features more salient has been shown to improve accuracy of word production in both TD children and children with language disorder (Ellis Weismer & Hesketh, 1998). A word map also provides opportunities to consciously reflect on the inherent properties of words, such as its morphology, thus developing metalinguistic awareness. Morphological instruction was integral to the studies of Snow et al. (2009) and Lesaux et al. (2014), described in section 2.3.2.3.

Various versions of word map have been used (Elks & McLachlan, 2008; Joffe, 2011; St. John & Vance, 2014). The Elks and McLachlan (2008) version was chosen for the current study, as it contained fewer spaces for semantic and phonological connections than other versions known to the researcher, and thus was judged more manageable for teachers to become familiar with and integrate into lessons in a short time-frame.

5.7.2.5 Word wise quickie (Appendix 6U)

An activity known as a word wise quickie (Elks & McLachlan 2008) was used as a lesson starter or finisher to revise words. The word wise quickie is a short verbal activity in which students are given a word: they think of a meaning, think of a sound (i.e. the number of syllables, initial phoneme, or a rhyme), and use the word in a spoken sentence. A prompt card was used as a mnemonic or to display.

Rationale: The word wise quickie provides another opportunity to link phonological with semantic information, and can be used as a revision activity, which keeps the words primed in the students' memories. It fosters the generation of the student's own definitions, rather than mere learning of definitions by rote, and cements new knowledge within existing knowledge, an approach recommended by Dockrell et al. (2007). It also provides a requirement for students to say the word aloud. Lesaux et al. (2014) and Beck et al. (2013) provide opportunities in their intervention for students to say the words, and Dockrell et al. (2007) emphasise the importance of this, in response to the fact that in their study, in which expressive word use was not explicitly required, production did not progress as well as comprehension. Saying words aloud keeps the word active in the phonological loop component of the working memory model (Baddeley, 2000), facilitating processing and transfer to long-term memory. It also activates the motor planning function of the speech processing system, which further strengthens the phonological representation of the word (Stackhouse & Wells, 1997).

5.7.2.6 Sound and meaning bingo (Appendix 6V)

Sound and meaning bingo was played as a revision activity for all the experimental words. In sound and meaning bingo, the experimental words are written on the board and students each choose a given number of them to write in a grid. A sound and meaning clue for a word is given, and students put their hand up if they have this word in their grid. Examples of clues for *kinetic* might be: "It begins with k and means movement energy" or "It rhymes with frenetic and is the type of energy created by a rolling ball". One student with their hand up is asked to say the word aloud, which checks that everybody is thinking of the right word, and students who have it in their grid cross it off. Play continues until one of the students has crossed off all their words and calls bingo.

Rationale: Bingo is an activity used by many teachers, and should therefore be easily integrated into existing teaching practice. It is usually delivered semantically only, by giving definition clues, whereas sound and meaning bingo adds the phonological element to the clues given. Sound and meaning bingo provides further opportunity to link phonological with semantic information, to keep the words primed in the students' memories, and for students to say the words aloud. Sound and meaning bingo also adds a dimension of fun and competition, increasing the motivation of students to engage with the word-learning process. Sound and meaning bingo was used by Lowe and Joffe (2017).

5.7.2.7 Vocabulary book

In the pilot study, each student was given their own vocabulary book, indexed with the alphabet. In this they wrote each experimental word on the page corresponding to the initial letter of the word, placed a dot under each syllable, and drew or wrote their own understanding of what the word meant.

Rationale: The vocabulary book or key word sheet provide an opportunity to develop metalinguistic skills, further opportunity to link phonological and semantic information, and allow students to personalise their knowledge of the word in relation to their own experiences. Personalisation creates a feeling of ownership rather than passive learning. The use of vocabulary books is recommended by Beck et al. (2013) and has been shown to be effective in young adult second language learners (Walters & Bozkurt, 2009).

Table 5.1 summarises which aspects of word learning are targeted by each of the activities.

<u>Table 5.1. Aspects of word learning targeted by the intervention activities</u>

		Aspect of word learning						
		Independent word learning	Semantic representation	Phonological processing	Literacy	Linking to prior knowledge	Metalinguistic awareness	Motivational
Intervention activity	Self-rating checklist	✓			✓		✓	✓
	Visual image displayed with written word		✓		✓			
	Word detective	✓	✓	✓	✓	✓		
	Word map	✓	✓	✓	✓	✓	✓	
	Word wise quickie		✓	✓	✓	✓	✓	
	Sound and meaning bingo		✓	✓	✓		✓	✓
	Key word sheet	✓	✓	✓	✓	✓	✓	✓

5.8 Results of the pilot study

Group mean scores for word knowledge are shown in Table 5.2.

Table 5.2 Group mean scores for word knowledge in the pilot study

	Pre-intervention ***M***	**Post-intervention** ***M***
Usual teaching practice words out of 16	2.3	2.2
Experimental words out of 16	2.3	5.6
No-intervention words out of 16	2.6	2.8

Because of the small sample size, and the fact that the purpose of the pilot study was to trial and adjust assessment and intervention protocols, no statistical analysis was carried out on these data. Nonetheless, visual inspection of the data suggested that increase in knowledge of experimental words was numerically greater than increase in knowledge of usual teaching practice words and no-intervention words. This gave confidence in the value of the word-learning activities, and provided an impetus for the intervention study which follows in Chapter 6.

5.9 Refinement of assessment and intervention protocols

In the light of experience from the pilot study, amendments were made to assessment and intervention protocols for use in the intervention study as follows.

5.9.1 Further development of the word knowledge assessment

When using the word knowledge rating scale during the pilot study it was found that the criterion for the green stage was too broad, because it did not distinguish between a well-rounded knowledge of word meaning versus expressive use of the word. Although a definition production task is an expressive task, utilising and relying on expressive language skills, a definition production task does not necessarily demand production of the word itself, because it is possible to describe what a word means without saying the word. Understanding word meanings and using words expressively are distinct aspects of word knowledge, and are both important parts of the curriculum. Therefore, it was necessary to ensure that the word knowledge assessment specifically measured expressive use of the words as well as depth of understanding. Expressive vocabulary is sometimes measured through a confrontation picture naming task (e.g. Bragard et al., 2012; Zens et al. 2009), but this was thought to be inappropriate due to the abstract nature of many of the targeted words. Therefore, for the intervention study, a *green star* category was added to the existing word knowledge assessment, resulting in a three-point scale for *depth of word knowledge* and a binary scale for *expressive word use*.

The word knowledge assessment in the intervention study thus consisted of two separate scales, as follows:

1) Depth of word knowledge, primarily assessing semantic representation

2) Expressive word use, giving additional insight into phonological representation as well as semantic representation.

This is summarised in Table 5.3. A pre-requisite of being awarded an expressive word use score was that the participant had to achieve a score of 2 on the depth of word knowledge scale.

Table 5.3. Word knowledge assessment scoring system used in the intervention study

		Depth of word knowledge	**Expressive word use**
Red	Student does not demonstrate any knowledge of word meaning	0	
Amber	Student indicates some, but imprecise, understanding of word meaning	1	
Green	Student demonstrates clear understanding of meaning in the science context	2	
Green star	Student can use the word in a spoken sentence		1

5.9.2 Administration of the word knowledge assessment

On listening to the audio recordings of the pilot word knowledge assessments, it was apparent that there were some differences in the way the post-intervention assessment had been administered compared with its administration at pre-intervention; for example, prompts had not been given as often, thus not drawing out the maximum amount of knowledge from the participants. Therefore, the protocol and flow chart were improved to include a clearer explanation for administration and scoring, including examples for each rating.

The administration and scoring pertaining to the word knowledge assessment used in the intervention study are described in full in section 6.7.2.

5.9.3 Further development of the independent word learning assessment

The piloting of this assessment indicated that the use of a third passage yielded no information that could not be gleaned from the first two passages; therefore, for the intervention study, only two passages were used. No other changes were made.

The scoring and reliability of the independent word learning assessment is described in section 6.7.3.2.

5.9.4 Amendments to the intervention activities

The only change to the intervention activities concerned the use of vocabulary books. It was felt that with larger numbers of participants, spread across several classes in which every student would need their own vocabulary book, that this would be impracticable both for the researcher and for the teachers. Therefore, for the intervention study, a key word sheet (Appendix 6W) was devised to serve the same purpose, with 10 boxes and the alphabet down the centre. To complete an entry in the key word sheet, the student carries out the following tasks: writes the word in a box; places a dot under each syllable; draws or writes their own understanding of what the word means; and draws a line to link it with its initial letter.

Summary of Chapter 5

This chapter has described the process of word selection, and the rationale and development of a word knowledge assessment, a bespoke independent word learning assessment, and intervention activities. These assessments and intervention activities were piloted in a small study using a pre-post design, and appropriate refinements were made for use in the intervention study, reported on in the next chapter.

Chapter 6

The effectiveness of classroom vocabulary intervention for adolescents with language disorder:

Methods

Overview

This chapter describes the methodology of the main experimental study of this thesis. The introduction summarises the content of previous chapters, which provide the rationale for the study. Section 6.2 gives an overview of the study design. Section 6.3 states the aims, research questions, and hypotheses. Section 6.4 outlines ethical approval and the process of consent. Section 6.5 describes the rationale for recruitment, and gives details of schools, teacher participants, and student participants. Section 6.6 explains word selection and matching. Section 6.7 describes the measures used, the rationale for each assessment, and includes the assessment schedule. Section 6.8 outlines the experimental intervention, and gives information on teacher training, fidelity, dosage, and word exposure. Section 6.9 introduces the approach taken to data analysis.

6.1 Introduction and summary of rationale

Chapter 1 presented evidence that vocabulary skills are often at risk for children and adolescents with language disorder, and that vocabulary knowledge is a key predictor of academic progress (e.g. Nation & Snowling, 2004). In the longer term, language disorder continues to be associated with poorer outcomes in educational attainment, cognition, behaviour, social and emotional functioning, and employment well into adulthood (Johnson et al., 2010).

Several intervention studies, appraised in Chapter 2 (e.g. Motsch & Marks, 2015; Wilson et al., 2015) have presented evidence for a combined phonological-semantic approach to enhance the vocabulary skills of children with language disorder; an approach underpinned by theories of word learning (Bishop, 2014; Leonard, 1998; Stackhouse & Wells, 1997). Many of the researched interventions have been implemented with children aged five to 11 years, in small groups or individually, in specialist language settings. A systematic review of the literature (Chapter 3), found limited research with the adolescent age group, revealing emergent evidence for phonological-semantic intervention in individual or small-group models of delivery (e.g. Ebbels et al., 2012). Only a small number of studies have investigated phonological-semantic intervention in whole-class models of delivery (Boland, 2009; Lowe & Joffe, 2017; Murphy et al., 2017).

The survey in Chapter 4 found that a phonological-semantic approach was widely used in SLT practice with the secondary school age group, but that a semantic and literacy-based approach was more likely to be used by MSSTs. This latter finding is reflected in the evidence for vocabulary instruction at a universal level in the secondary school age range: however, the evidence relates to second language learning and social disadvantage (e.g. Snow et al., 2009, section 2.3.2.3) rather than language disorder.

The survey also highlighted the challenges of implementing therapy in mainstream secondary school settings: again, these findings are supported in the literature (Ehren, 2002). Individual or small-group interventions, which necessitate withdrawal from the classroom, have clinical, pedagogical, and practical disadvantages for some students, particularly as they enter adolescence. The available evidence for the effectiveness of universal vocabulary intervention suggests that teacher/SLT collaboration, enabling the delivery of intervention in the classroom, can have a positive impact on the vocabulary learning of young children with language disorder (Throneburg et al., 2000, section 2.3.2.1) though this research needs corroboration, and also needs extension to the older age group. Furthermore, Chapter 2 explained that many children with language disorder in the UK are educated in mainstream schools (Lindsay et al., 2005) and that specialist speech and language support typically decreases as children move from primary to secondary education (Bercow, 2008). For all these reasons, universal models of intervention delivery may, therefore, be especially pertinent to the secondary school setting.

The current study, building on the evidence of successful classroom approaches (Boland, 2009; Murphy et al., 2016; Snow et al., 2009), took phonological-semantic elements of intervention which are usually only delivered in individual or small-group models, and applied them to a universal model, to be implemented by teachers within the mainstream curriculum. In addition to the phonological-semantic activities, the intervention took a holistic perspective encompassing other factors critical to word learning. These included metalinguistic awareness, visual support, and linking word meaning to personal experience. In this thesis, the name given to this classroom vocabulary intervention is Word Discovery, because of the intrinsic opportunities it provides for students and teachers to explore word form, word meaning, and self-help word-learning strategies. Word Discovery represents a novel approach, extending the feasibility study by Lowe and Joffe (2017), because no other studies so far reviewed have investigated the effectiveness of curriculum vocabulary intervention for adolescents with language disorder, in which the intervention is embedded into a subject syllabus and is delivered by teachers. The intervention study described in the current chapter addresses this gap in the evidence base.

6.2 Overview of study design

The experimental study employed a within-subjects repeated measures design. Seventy-eight students aged 11 – 14 years, with low verbal ability according to school attainment records, participated from eight mainstream secondary schools in the UK. Participants' knowledge of 30 science words was assessed. In the first phase of the study, 10 active control words from one topic (topic 1) were taught by science teachers using usual teaching practice. Following this, teachers attended a training session. In the second phase, 10 matched experimental words from a subsequent topic (topic 2) were taught by the same teachers using Word Discovery activities, embedded into the teaching of the syllabus. Ten matched passive control words received no intervention. Word knowledge was assessed at four timepoints. Because it was a within-subjects study and the two teaching conditions were sequential, pre-intervention, post-intervention, and follow-up assessments for the experimental and control conditions occurred at different timepoints. See Table 6.1.

Table 6.1. Pre-intervention, post-intervention, and follow-up assessment points for experimental and control conditions

	Time 1	Time 2	Time 3	Time 4
Usual teaching practice condition	Pre-intervention	Post-intervention	Follow-up	Second follow-up
Experimental condition	Baseline	Pre-intervention	Post-intervention	Follow-up
No-intervention condition	Pre-intervention	Post-intervention	Follow-up	Second follow-up

Increases in knowledge of experimental, usual teaching practice, and no-intervention words were compared, and predictors of increases in word knowledge were explored. Student and teacher views of the intervention were sought. The planned study phases are depicted in Figure 6.1.

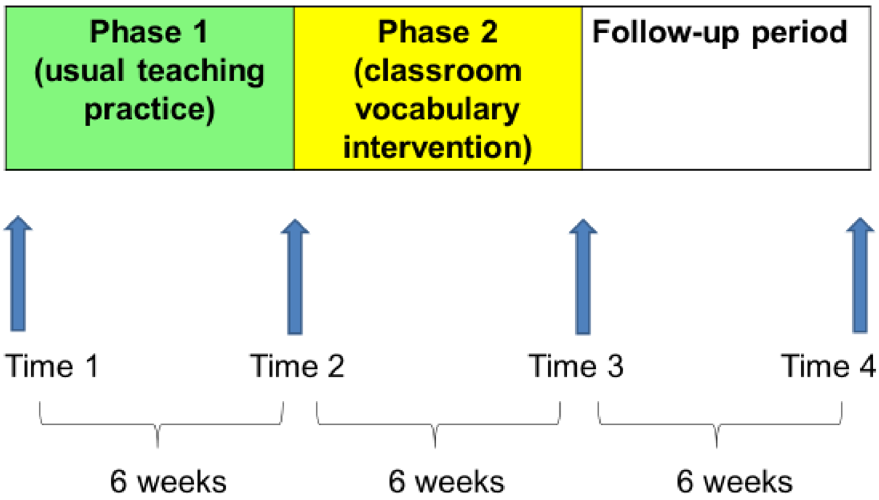

Figure 6.1. Overview of planned study phases

6.3 Aims of the study: research questions and hypotheses

The aims of the study were to explore the effectiveness of incorporating phonological-semantic techniques into classroom vocabulary teaching, with students of secondary school age. The word-learning activities were implemented in the classroom by the teacher, and the study measured the learning of specifically taught words as well as the development of independent word-learning strategies. In addition, the study explored whether students' increase in word knowledge in response to intervention was associated with their language and cognitive abilities. Lastly, the study evaluated the intervention from the student and teacher perspective.

The study aimed to answer the following research questions.

6.3.1 Increases in word knowledge

Research question 1 (RQ1): Does classroom vocabulary intervention, delivered by the teacher in a mainstream setting, increase the word knowledge of adolescents with language disorder?

The following hypotheses were proposed:

Depth of word knowledge

H1 The increase in depth of word knowledge for experimental words will be greater than for words taught through usual teaching practice.

H2 The maintenance in depth of word knowledge from post-intervention to follow up for experimental words will be greater than for words taught through usual teaching practice.

H3 There will be no significant change in depth of word knowledge of no-intervention words over time.

Expressive word use

H4 The increase in expressive word use of experimental words will be greater than for words taught through usual teaching practice.

H5 The maintenance in expressive word use from post-intervention to follow up for experimental words will be greater than for words taught through usual teaching practice.

H6 There will be no significant change in expressive word use of no-intervention words over time.

6.3.2 Independent word learning

Research question 2 (RQ2): Does classroom vocabulary intervention, delivered by the teacher in a mainstream setting, improve the independent word learning ability of adolescents with language disorder?

The following hypotheses were proposed:

H7 There will be significant progress on a standardised vocabulary assessment following topic 2 (Word Discovery intervention).

H8 There will be no significant increase in students' ability to derive the meaning of unknown words following topic 1 (usual teaching practice), but there will be a significant increase following topic 2 (Word Discovery intervention).

H9 There will be no significant increase in awareness of word-learning strategies following topic 1 (usual teaching practice), but a significant increase following topic 2 (Word Discovery intervention).

H10 The increase in students' science attainment will be greater following topic 2 (Word Discovery intervention) than following topic 1 (usual teaching practice).

6.3.3 Predictors of increases in word knowledge

Research question 3 (RQ3): Which language or cognitive characteristics predict the potential to respond to classroom vocabulary intervention?

The following hypotheses were proposed:

H11 There will be a relationship between existing receptive vocabulary levels and increases in word knowledge, such that students who have higher existing receptive vocabulary levels will demonstrate greater increases in experimental word knowledge than those with lower existing vocabulary levels.

H12 There will be a relationship between sentence recall ability and increases in word knowledge, such that students who have higher sentence recall ability will demonstrate greater increases in experimental word knowledge than those with lower existing sentence recall ability.

H13 There will be a relationship between verbal working memory and increases in word knowledge, such that students who have higher verbal working memory ability will demonstrate greater increases in experimental word knowledge than those with lower existing verbal working memory ability.

H14 There will be a relationship between phonological awareness and increases in word knowledge, such that students who have higher phonological awareness ability will demonstrate greater increases in experimental word knowledge than those with lower existing phonological awareness ability.

6.3.4 Acceptability of the intervention from the teacher and student perspective

Research question 4 (RQ4): What are the teachers' and students' views about the classroom vocabulary intervention?

The following hypotheses were proposed:

H15 Teachers' confidence in teaching vocabulary to adolescents with language disorder will increase following participation in the study.

H16 Students will prefer a whole-class model of vocabulary intervention delivery over a small-group or individual model.

In addition, qualitative data was collected regarding students' and teachers' views on the effectiveness of the word-learning activities.

6.3.5 Comparison of usual teaching practice and Word Discovery intervention

The construction of the study also allowed the researcher to gather data which would enable two comparisons between usual teaching practice and the experimental intervention: firstly, data was collected on what strategies teachers habitually used to teach curriculum vocabulary; and secondly, data was collected to establish whether the implementation of Word Discovery resulted in increased exposure to the words.

6.4 Ethical considerations

6.4.1 Ethical approval

Ethical approval for the study was received from the School of Health Sciences Research Ethics Committee, City, University of London, reference number: PR/LCS/PhD/15-16/01. See Appendix 6A for the indemnity letter pertaining to ethical approval.

6.4.2 The process of consent

School recruitment is described in section 6.5.1. Signed informed consent was firstly obtained from the head teacher and then from science teachers. All head teacher, teacher (T.), parent, and student consent forms were accompanied by an information sheet which explained that:

- All information provided would be confidential, and identifiable personal data would be anonymised;
- Participation was voluntary, and consent could be withdrawn at any time without prejudice;
- Recording and processing of data would be subject to the university's obligations under the Data Protection Act 1998.

See Appendix 6B for the information sheets and consent forms for head teachers, science teachers, parents, and students.

Student inclusion criteria are described in section 6.5.3.1. Parent information and consent forms were sent to the parent/guardians of students meeting the inclusion criteria by the Senco, with a covering note from school, through usual school correspondence channels. If no response was received within two weeks, a reminder was given, and a further two weeks allowed for return of the form. Once signed parent/guardian consent was obtained, signed student consent was sought at the first face-to-face contact between student and researcher, so that the content of the information and consent forms could be explained verbally, and so that all students had the opportunity to ask questions.

6.5 Recruitment and participant characteristics

6.5.1 Schools

The study was open to mainstream secondary schools (serving 11 – 16-year-olds) within the UK. This criterion was chosen as many students with language disorder are now educated in mainstream settings (Lindsay et al., 2005). A recruitment strategy combining convenience and purposeful sampling was adopted, with the aim of recruiting schools from a wide geographical and socio-economic spread within feasible travelling distance from the researcher's base. Recruitment of schools began in May 2015, and the last school was recruited in March 2016. Expressions of interest were invited from schools through professional networks, and in one case through a personal contact of the researcher. Through these channels, 27 expressions of interest were received, and details of the study were sent to the schools inviting a face-to-face meeting for further information sharing. None of these were schools with which the researcher had had any previous contact. Of these, 11 schools made no further contact. Three were declined by the researcher: one due to distance, one because it was not a mainstream school, and one because contact was made after the recruitment period. Eight further schools were cold-called by the researcher, and the telephone call was followed up with an email. One request for further details was received following this, but no further contact was made by any of these schools.

An initial meeting was held with 13 schools. The initial face-to-face meeting was between the researcher and a member of staff such as the special educational needs coordinator (Senco), who was willing to be a key link person for the research study within the school, thereby facilitating recruitment, assessment and liaison with other staff.

In two schools, the numbers of students meeting criteria was less than five, and so, for reasons of practicality, these schools were deferred in favour of schools with larger numbers of students; a further three of these schools declined, stating that they did not have the capacity to commit to the study. Thus, the final number of schools taking part in the study was eight. They were all non-selective mainstream secondary schools in England.

Demographic characteristics of the schools, as at the time of the study, are contained in Table 6.2. Information on type of establishment, age range, and number on roll, was obtained from Ofsted Inspection Reports (Ofsted, 2017). Published admission numbers (PANs), which give an indication of the number of students admitted each year in Year 7, were taken from schools' own websites. Ofsted overall effectiveness grades at the time of the study and free school meals information was obtained from Edubase2 (DfE, 2017b). Children are eligible for free school meals if their parents are in receipt of welfare benefits such as Income Support or Child Tax Credit (DfE, 2017c). An indication of the SES of each school population was also taken from the Index of Multiple Deprivation (Department for Communities and Local Government, 2015). This database ranks 32,844 Lower-layer Super Output Areas (neighbourhoods) in England on measures of deprivation based on seven domains, where one is the most deprived, and 32,844 is the least deprived. The seven domains are: Income; Employment; Education, Skills and Training; Health and Disability; Crime; Barriers to Housing and Services; and Living Environment. The ranks are divided into 10 equal groups to give a decile measurement, which describes the relative level of deprivation of a neighbourhood. Neighbourhoods in the first decile are amongst the 10% most deprived neighbourhoods in the country, and neighbourhoods in the tenth decile are amongst the 10% least deprived.

Apparent mismatches between the percentage of pupils entitled to free school meals and their school's decile of deprivation are the result of the school's location at the edge of a Lower-layer Super Output Area, where the catchment area includes a Lower-layer Super Output Area of a different decile of deprivation. For this reason, Pupil Premium status was also collected (see section 6.5.3.3).

Table 6.2. School characteristics

School	Type of establishment*	Age range	Number on roll	PAN	Gender	Ofsted rating	Geo-graphical region	% Free school meals	Decile of Deprivation according to Index of Multiple Deprivation
1	Free School	11-18 (Y7, 8)	242	120	boys	Not available†	Greater London	20.7	2
2	Free School	11-18 (Y7,8 ,9)	271	90	mixed	Good	South East	5.9	9
3	Community School	11-16	1,181	230	mixed	Outstanding	South East	8.3	8
4	Community School	11-18	1,205	210	mixed	Good	Greater London	22.8	6
5	Academy	3-19	2,524	210	mixed	Requires Improvement	North	31.0	9
6	Academy converter	11-18	1,200	180	mixed	Outstanding	Greater London	12.9	4
7	Academy converter	11-19	1,476	250	mixed	Good	East	7.7	8
8	Academy converter	11-18	1,513	210	mixed	Outstanding	Midlands	1.9	8

Key: PAN = Published Admission Number
*Types of establishment are explained on https://www.gov.uk/types-of-school accessed 25.8.17
† As a recently opened school, Ofsted rating was not available at the time of the study. In May 2017, Ofsted rating was Good.

6.5.2 Teacher participants

The inclusion criteria for teaching staff were that they were:

- Year 7, 8 or 9 science teachers;
- available to deliver the intervention for the duration of the study.

Thirty-four teachers were approached to take part in the study and were given consent forms, 29 of which were returned. Two teachers took part in the study without having returned their consent forms, despite reminders. One teacher (T.34) declined after having attended the training as he did not foresee being able to carry out all the intervention activities. Two further teachers did not return their consent forms and did not implement any of the word-learning activities. Reasons given included difficulty due to sharing the class with other teachers (T.13), and not being fully aware of the study (T.12, who had been unable to attend the training). One teacher (T.24) returned his consent form but did not implement the activities with his class. The researcher was unaware until the post-intervention timepoint that these teachers had not delivered the intervention. Figure 6.2 shows the flow of teachers through the study.

Twenty-five teachers delivered the intervention with all their classes which contained participating students. Five teachers delivered the intervention with some of their classes containing participating students, but not with other classes (T.1, T.11, T.22, T.25, T.26).

At Time 3, a teacher questionnaire was supplied to teachers either electronically or as a hard copy. A questionnaire was given to all 30 participating teachers, and 29 were returned (T.20 left school soon after Time 3 and could not be contacted). Although anonymity was offered, in practice this was not achieved because the teachers returned the questionnaires to the researcher by hand or via email. The questionnaire contained five questions seeking information about the teachers' gender, degree subject, years of teaching experience (overall and secondary), and amount of training in SLCN. Characteristics of participating teachers are contained in Table 6.3.

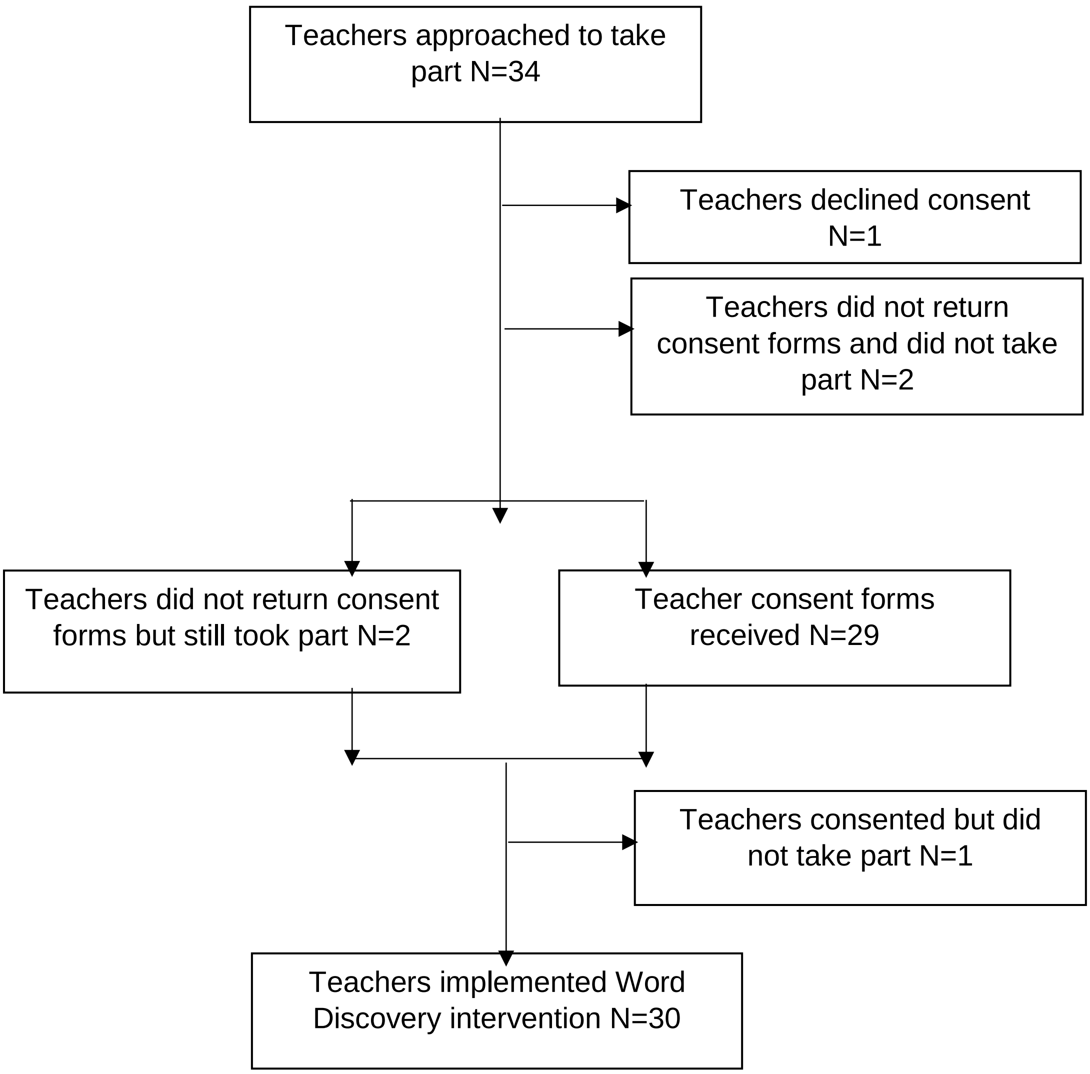

Figure 6.2. Flow of teacher participants through the study

Table 6.3 Teacher characteristics

Number of teachers	N=30	
Questionnaires returned	N=29	
Gender	N=30	m:f 9:21
Degree subjects studied	N=29	Biochemistry (6) Biochemistry and polymer engineering (1) Biological sciences (1) Biology (3) Biology and forensic science (1) Biology/marine biology (1) Biomedical sciences (1) Chemistry (1) Chemistry with patent law (1) Engineering (1) Food science (1) Mechanical engineering (1) Medicinal biochemistry (1) Pharmacology (1) Physics (2) Physics with secondary education (1) Psychology and forensic science (1) Science (1) Theoretical physics (1) Zoology/chemistry (1) Missing (1)
Number of years' overall teaching experience	N=30	Mean 7.4 years (range <1 – 25)
Number of years' experience teaching science in secondary school.	N=30	Mean 7.2 years (range <1 – 25)
Number of days' training in speech, language and communication needs.	N=29	Mean one day (range 0 – 4)

6.5.3 Student participants

6.5.3.1 Inclusion criteria

Inclusion criteria for student participants were that they:

- Attended a mainstream secondary school in the UK.
- Were in Key Stage 3 (KS3: Year 7, 8 or 9; age 11 – 14 years) in the academic year 2015 - 2016 or 2016 – 2017. This age group was chosen due to the importance of developing word-learning skills at a time in a child's life when the educational environment exposes them to increasingly complex and abstract words (Nippold, 2007). This age group was also appropriate for pragmatic reasons: once students are in Key Stage 4 (KS4: Years 10 and 11; age 14 – 16 years), there is more pressure on teachers and students to focus exclusively on the GCSE syllabus.
- Had a verbal standard score (SS) on school attainment records of below 85, and a nonverbal SS of equal to or higher than the individual's verbal score, but not below a SS of 70. Verbal and nonverbal attainment data were obtained from school records. For seven schools, this information was obtained from the Cognitive Attainment Test (GL Assessment). Students complete this assessment online, and the verbal measure (CATV) is literacy-based. One school did not use the Cognitive Attainment Test, so recruitment was based on the Access Reading Test (Crumpler & McCarty, 2006) administered at the beginning of Year 7. The Access Reading Test is a paper-based reading assessment yielding scores for literal comprehension, vocabulary, comprehension requiring inference or prediction, and comprehension requiring analysis, which are combined to obtain an overall SS. This school did not administer a nonverbal assessment, so nonverbal ability for these students was taken from the researcher's assessments at Time 1 (see section 6.7.1).

  Based on the close association between language disorder and literacy difficulties (McArthur et al., 2000), it was expected that these verbal and nonverbal criteria would identify students who had a language need in comparison with their peers, and which impeded their access to the school curriculum, including those with developmental language disorder as well as those with language disorder associated with another condition. A specified discrepancy between verbal and nonverbal ability was not required, in line with the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5: American Psychiatric Association, 2013) and Bishop et al. (2016), both of which describe language disorder relative to age, and place importance on the functional impact of impairment. Those with a verbal SS higher than their nonverbal SS were excluded from the current study, as this would suggest that language was a relative strength. Consistent with previous literature (e.g. McGregor et al., 2013; Starling et al., 2012) a nonverbal SS of 70 was used as a threshold for nonverbal ability in order to focus on children with language disorder rather than intellectual disability.

- Spoke English as a first language, or, if English was an additional language, had lived in the UK for at least two years, to allow for the acquisition of functional proficiency in English (MacSwan & Pray, 2005).

The purpose of these recruitment criteria was to obtain a cohort of participants with language disorder, whose characteristics were diverse enough to allow the exploration of relationships between response to intervention and language and cognitive profiles.

6.5.3.2 Sample size and flow of students through the study

Previous vocabulary intervention studies have indicated that a small to medium effect size may be expected; for example, Lubliner and Smetana (2005) reported an effect size of d = 0.53 (medium effect size) and Snow et al. (2009) reported an effect size of d = 0.21 (small effect size). Based on this expectation, a projected sample size was calculated using the G*Power programme (Faul, Erdfelder, Lang, & Buchner, 2007), resulting in a required sample size of 108. To allow for attrition, a target for recruitment was set at 120 participants. School recruitment continued until the number of potential participants meeting criteria reached this figure, and a varied geographical and demographic sample was obtained. A decision was taken to stop recruitment once eight schools were recruited, containing 103 consenting participants, because it became apparent that it was not logistically possible to admit any more schools to the study within the available timescale. To allow sufficient time and flexibility for the researcher to work effectively in each school, the study took place in two waves: four schools during the academic year 2015 – 2016, and four schools during the academic year 2016 – 2017.

From the eight participating schools, 232 students met criteria, for whom parental consent was received for 106 (46%). Two students declined consent, and one was absent for baseline assessment, leaving 103 students who were assessed at Time 1. For one of these students (student participant identity number (ID) 65), it was found that his teacher had already started to teach topic 1, therefore no further data were collected about him, and he was not assessed beyond Time 1. Three students (IDs 24, 62, 102) left school during the timescale of the study.

One teacher (T.34: teaching ID 50) declined further participation following the training, and one other teacher (T.26) felt that the activities were inappropriate for the high ability set in which the student (ID 80) was taught, though this teacher continued to take part with another class. Therefore IDs 50 and 80 were not assessed beyond Time 2.

During and after Time 3, the researcher became aware that some participants' teachers had opted out of participation (T.12, T.13, and T.24; IDs 43, 47, 52, 54, 55, 56, 58, 68), and that some teachers had done the intervention with some classes but not others (T.1, T.11, T.22, T.25, and T.26; IDs 10, 48, 59, 71, 73, 81). As data had already been collected on these students at three timepoints, it was decided to assess them at Time 4, to ensure that opportunities were not missed for collecting data that might be required.

Overall, 30 teachers delivered the intervention with a total of 83 students. Once all school data had been supplied to the researcher, it became apparent that four students had not met the specified criteria for recruitment. One student (ID 83) had only lived in the UK for one year; however, as she met all other criteria, she was retained in the study. Two students were found to have a CATV SS greater than 85 (IDs 89 and 91), but demonstrated difficulties on at least one of the assessments administered at Time 1, and so they were also retained in the study. One further student (ID 13) who was found to have a CATV SS greater than 85 demonstrated age-appropriate skills on all assessments at Time 1. This student was therefore excluded from analysis. The language and cognitive profiles of participating students are described further in section 6.7.1.6.

One student (ID 64) withdrew from the study prior to Time 3 assessment, and the researcher became aware that one student (ID 44) had changed classes, and so had not been assessed on the correct set of words. Two students (IDs 31 and 96) were absent at one or more timepoints. Thus, the number of students included in the analyses, for whom there are data at all four timepoints is 78. Figure 6.3 shows the flow of student participants through the study.

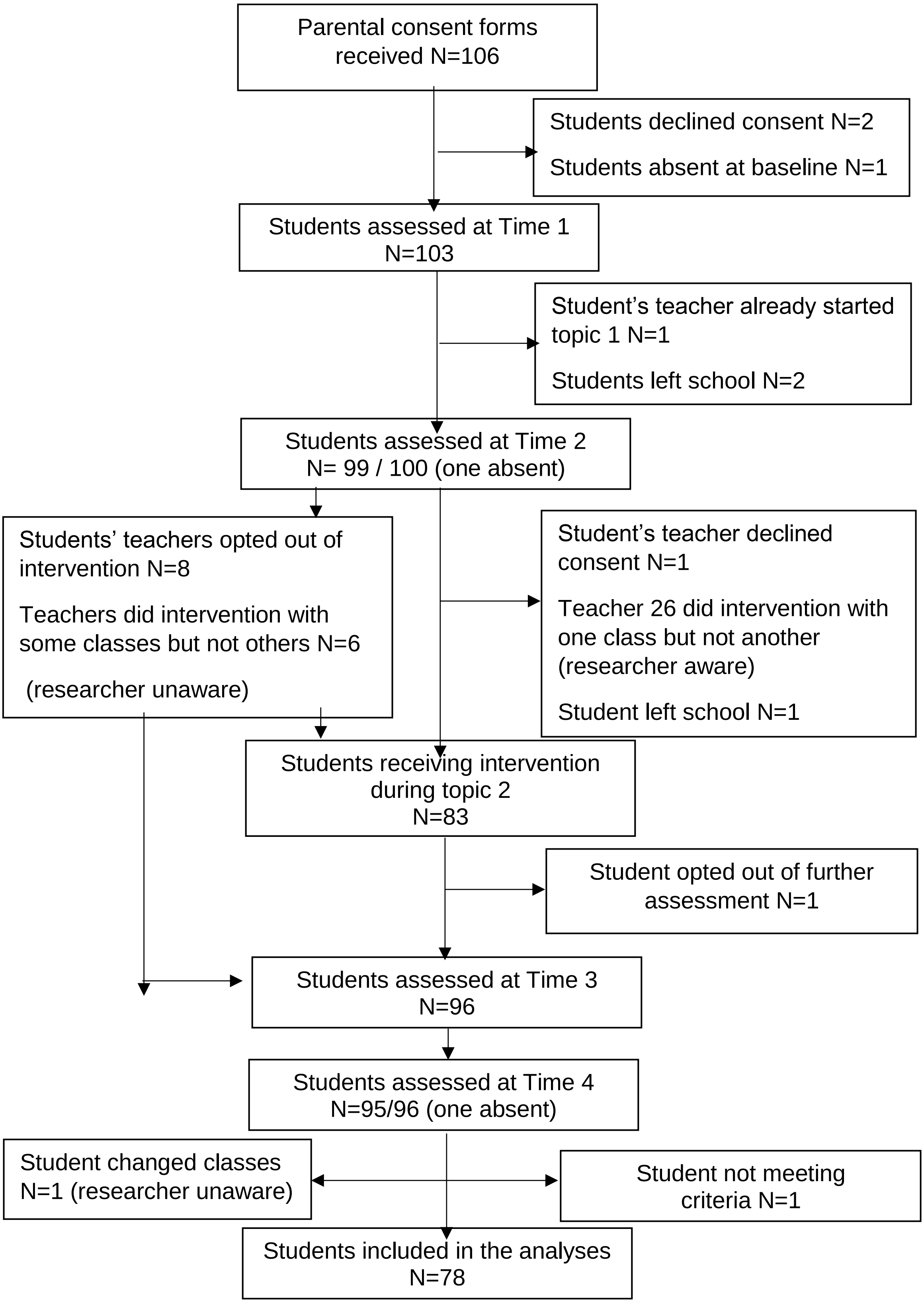

Figure 6.3. Flow of student participants through the study

6.5.3.3 Biographical characteristics of student cohort

Biographical information was obtained from school records and parental consent forms. The information given here, and summarised in Table 6.4, refers to the students who took part in the intervention and who are included in the analyses (N=78). Biographical information for the whole cohort who were assessed at baseline (N=103) can be found in Appendix 6C.

(a) Gender

For the 78 students who took part in the intervention and are included in the analyses, 52 were boys and 26 were girls. This imbalance in gender is partly due to the tendency for language disorder to be more prevalent in boys than girls (Tomblin et al., 1997), and partly because school 1 was an all boys' school.

(b) Chronological age

Schools were invited to include Year 7, 8, and 9 in the study. School 1 was a newly established school and only consisted of Years 7 and 8. Schools 5, 7, and 8 chose not to include Year 9s due to the transition from KS3 to KS4 curricula during that period. School 4 did not receive any parental consent forms for Year 9 students. School 3 had only one student in Year 9 meeting criteria, and School 6 only had one student in Year 8 meeting criteria, so it was agreed in those schools to focus on the other year groups. Thus, 41 participating students were in Year 7, 29 were in Year 8, and 8 were in Year 9. Mean chronological age was 12:3 (*SD* = 9 months: range 11:3 to 14:0).

(c) Socio-economic status

For individual students, Pupil Premium status was used as a proxy for SES. Pupil Premium is financial assistance given to schools based on individual eligibility for the purpose of raising attainment. It is more sensitive as a measure for individuals than eligibility for free school meals, as it can be taken as an indicator not just of economic status but also other social factors. Pupils are eligible for Pupil Premium if (a) they are eligible for free school meals; or (b) they are in the care of the local authority; or (c) their parents are in the regular armed forces (DfE, 2016b). Twenty-eight out of 78 (35.9%) participants were eligible for Pupil Premium.

(d) Medical status

Ten out of 78 participants (12.8%) had a medical condition not usually associated with language disorder. These included: anaphylaxis (1); asthma (2); bladder control (1); diabetes (1); eczema (1); hayfever (1); Hirschsprung's disease (1); liver disease (1); and multiple allergies, asthma, and heart condition (1). Three students (3.9%) had conditions which are often associated with language disorder. These included: Down's Syndrome (1); foetal alcohol syndrome (1); and perforated eardrums (1).

(e) Special educational needs status

This information was available for 77/78 students. Forty-seven participants were on the special needs register of the school. Twelve (15.4% of the total) of these were in possession of a statement of educational need, or education, health and care plan (EHCP). Statements of educational need entitled the school to funding in order to meet individual needs, and were superseded by EHCPs in 2014. Thirty-seven participants were in receipt of school support (for two of these, no special educational need or medical need was listed): conversely, five students not listed as being on the school special needs register had a need identified. Needs were reported in differing ways from school to school, and the data have been amalgamated here where possible according to the broad areas of need within the Special Educational Needs and Disability Code of Practice: 0 - 25 years (DfE & DoH, 2015). Where the area of need was unclear, the need has been quoted here as stated by the school. Some participants had more than one need.

- Communication and interaction (autism spectrum disorder, 3; SLCN, 14)
- Social, emotional, and mental health (6)
- Cognition and learning (intellectual disability, 5; specific learning difficulty, 5; dyslexia, 6; dyspraxia, 1)
- Sensory and physical needs (physical disability, 1)
- "disengaged, struggles in small groups, lack organisational skills" (1)
- "English as an additional language" (1)
- "no specialist assessment" (1)
- "hyperactivity" (1)

(f) Ethnicity

Ethnicity was reported in differing ways from school to school, and in this case it was not meaningful to amalgamate the data: therefore, it has not been included in Table 6.4. Distribution of ethnicity as listed by schools was as follows:

- Albanian (1)
- Any other Asian (1)
- Any other mixed (3)
- Asian (2)
- Bangladeshi (3)
- Black African (3)
- Black Caribbean (1)
- British (10)
- European (1)
- Indian (1)
- Not stated (6)
- Other (3)
- Other Black African (3)
- Pakistani (2)
- White and other (1)
- White and Asian (1)
- White and Black Caribbean (3)
- White British (24)
- White English (9)

(g) English language status

Sixty-three out of 78 parental consent forms (80.8%) stated that English was the main language spoken at home. Forty-nine participants (62.8%) were monolingual English speakers, and 29 participants were bilingual or multilingual.

6.5.3.4 Additional intervention

Schools were asked which students were receiving school-based intervention and speech and language therapy intervention at the time of the study. This information was received from all schools except School 6 who did not supply information regarding school-based intervention (10 students).

(a) Receiving both school-based intervention and speech and language therapy intervention

Three students (3.9% of 78) were known to be receiving both school-based intervention and speech and language therapy intervention, and for one of these, this included vocabulary support.

(b) Receiving school-based intervention only

A further 28 students were known to be receiving school-based intervention only (41.2% of 68), and for nine of these (13.2% of 68), this included vocabulary support.

(c) Receiving speech and language therapy intervention only

Two students (2.6% of 78) were in receipt of speech and language therapy intervention, but not school-based intervention. For both of these, this included vocabulary support.

In total, this meant that 12/78 (15.4%) were in receipt of vocabulary support in addition to Word Discovery intervention.

Table 6.4 Biographical characteristics of participants receiving the intervention

School	1	2	3	4	5	6	7	8	Total	As a percentage of total
Number of participants receiving the intervention	12	11	12	9	5	10	11	8	78	100%
Gender ratio male: female	12:0	6:5	7:5	8:1	2:3	6:4	7:4	4:4	52:26	67%:33%
Mean chronological age	12:1	12:2	11:11	12:6	12:7	12:11	12:4	11:10	(*M*)12:3	
Numbers of participants in receipt of Pupil Premium	9	1	3	5	1	7	2	0	28	35.9%
Number of participants with additional medical condition	3	1	5	0	0	1	1	2	13	16.7%
Number of participants with statement of educational need or EHCP*	0	0	3	3	0	0	5	1	12	15.4%
Number of monolingual English speakers	1	10	12	1	5	4	9	7	49	62.8%

*EHCP: Education Health and Care Plan

6.5.3.5 Attendance

Attendance data were obtained from school records for all but two participants. During topic 1, 55/76 (72.4%) participants had 100% attendance; the remaining 21 (27.6%) were absent for between one and six lessons. During topic 2, 48/78 (63.2%) participants had 100% attendance; the remaining 23 (36.8%) were absent for between one and six lessons. It was felt that to set a minimum standard for the amount of intervention received would entail setting an arbitrary threshold: furthermore, although in some cases students were absent on the day that the words were introduced, they were present on other days when word-learning activities took place. Therefore, all students who had been present for any word-learning activity were counted as having taken part in the intervention. Using this criterion, it was not felt necessary to exclude any students on the basis of non-attendance.

6.6 Word selection and matching

The researcher and the head of science in each school identified two topics (topic 1 and topic 2) from the science schedule which would be taught sequentially during the timeframe of the study. The head of science supplied a list of key words that would be taught during these topics. From these, the researcher created two lists of 10 words, one from each topic: in the first phase of the study, the 10 topic 1 words acted as active control words, being taught in the classroom through the teachers' usual teaching practice. In the second phase, the 10 topic 2 words acted as experimental words being taught through the use of Word Discovery activities.

The two lists of words were matched as closely as possible for phonological complexity, concreteness, and frequency. In order of priority, words were matched as follows:

1. *Syllable length.* Single words rather than phrases were used where possible, but sometimes, due to the concept to be taught and the words provided by the heads of science, the use of phrases was unavoidable.
2. *Phonological complexity*: based on consonant-vowel structure.
3. *Imageability*. Information was taken from the MRC psycholinguistic database (Wilson, 1987) For many words, however, imageability data were not available, therefore a concreteness judgement was also made, as follows.
4. *Concreteness*. This was a binary judgement made by the researcher. The criteria were that if the referent was a physical object which can be seen by the naked eye, it was categorised as concrete; and if it was an abstract concept or something physical which cannot be seen by the naked eye, it was categorised as abstract.
5. *Frequency*. Initially, frequency data were taken from the British National Corpus (BNC: 2007). However, partway through the study, the BNC was no longer searchable online for frequency data, so frequency from the Zipf scale was ascertained instead, and subsequently applied to all the experimental and control words. The Zipf scale is derived from a formula for identifying word frequency developed by van Heuven, Mandera, Keuleers, and Brysbaert (2014) using a database of UK subtitles. The formula results in a standardised frequency measure which is not dependent on size of corpus. Words are given a Zipf value on a scale from 1 (low

frequency) to 7 (high frequency), as illustrated in Figure 6.4. While databases can give some indication of word frequency, the frequency value obtained does not necessarily reflect the frequency of word usage within the classroom during a given topic, nor are the data specific to particular contextual meanings of the word; for example, searching a frequency data base for the word *contract* does not distinguish between [ˈkɒntɹækt] (CONtract: noun) and [kənˈtɹækt] (conTRACT: verb). Therefore, although Zipf values were collected, frequency was not given priority in matching over phonological complexity or concreteness.

Zipf value	**fpmw**
1	**.01**
2	**.1**
3	**1**
4	**10**
5	**100**
6	**1,000**
7	**10,000**

1 – 3 low frequency

4 – 7 high frequency

Examples:

1 porosity, sedimentation

2 newtons, sulphate

3 friction, density

4 weight, mass, expand

5 basically, issues

6 should, years

7 and, for, have

<u>Figure 6.4. Zipf values</u>

Key: fpmw = frequency per million words.

Brown verbal frequency, Kucera-Francis written frequency, and familiarity data were also sought from the MRC psycholinguistic database (Wilson, 1987), but for many words data were not available and so these parameters were not used for word matching.

Once the experimental and active control word lists had been created according to these principles, the researcher generated a third list of words, taken from science curricula which the students were expected not previously to have encountered in science lessons, for example from Year 10 and 11 science syllabi. These words were matched as closely as possible with the experimental words by phonological complexity, concreteness, and frequency, and acted as passive control words, which did not receive any exposure. The inclusion of a set of passive control words was to control for possible effects of maturity over time and repeated exposure during assessment.

In summary, each student was assessed on one set of 30 subject-specific words as follows:

- 10 active control words from topic 1: to be taught through usual teaching practice
- 10 experimental words from topic 2: to be taught using the experimental Word Discovery intervention
- 10 passive control words: words from future science topics which would not be taught during the timescale of the study.

These three teaching conditions are henceforth referred to as *usual teaching practice, experimental,* and *no-intervention* conditions.

Because the study took place in eight schools and covered three year-groups, and because of the ways students were variously allocated to classes, student participants were taught in 46 separate classes. This resulted in 22 different sets of words in total. Appendix 6D contains a full list of all the word sets, and Appendix 6E contains information on phonological complexity, imageability, concreteness, and frequency for two sets of words as examples.

6.7 Measures

This section describes the measures used to assess: language and cognitive ability, (section 6.7.1); knowledge of experimental and control words (section 6.7.2); independent word learning ability (section 6.7.3); usual teaching practice strategies (6.7.4); and student and teacher views of the intervention (section 6.7.5).

6.7.1 Language and cognitive profiling

Information about the language and cognitive profiles of participants was gained through the use of five standardised assessments. All student assessments were administered individually by the researcher in a quiet room in school, during school time. All assessments requiring a verbal response were audio-recorded, using an Olympus LS-11 Linear PCM Recorder, apart from the assessment of one student (ID 38) who declined consent for audio-recording at Time 1. Usually the assessments were administered in a single session taking about one hour, but occasionally this was split over more than one session to fit in with school timetables. For most students, all assessments were administered at Time 1. For 16 students, pre-intervention word knowledge assessment (see section 6.7.2), pre-intervention independent word learning assessment (see section 6.7.3), and most language and cognitive profiling assessments (see section 6.7.1) were administered at Time 1, but, again because of school timetabling, a few outstanding language and cognitive profiling assessments were completed at Time 2. In all cases, the assessments were administered in the same sequence.

Each assessment was administered and scored by the researcher according to the relevant examiner’s manual. Standardised scores were derived for all standardised assessments, with a mean of 100 and a standard deviation of 15.

6.7.1.1 Wechsler Abbreviated Intelligence Scale, second edition (WASI-2: Wechsler, 2011): Vocabulary and Matrix Reasoning subtests

Although verbal and nonverbal ability scores from school records were used for recruitment purposes, the measures used varied from school to school, and may have been carried out up to two years previously. In addition, the verbal measures assessed written language ability rather than spoken language ability. Therefore, the WASI-2 was used to provide more consistent, relevant and up-to-date information. The WASI-2 consists of four subtests, two verbal and two nonverbal: Vocabulary, Similarities, Block Design, and Matrix Reasoning. This assessment was chosen for three reasons: firstly, because the Vocabulary subtest assesses the ability of respondents to produce word definitions verbally, a task mirrored in the word knowledge assessment (see section 6.7.2); secondly, the verbal and nonverbal scales were standardised on the same population, yielding directly comparable information; and thirdly, because a screening version can also be carried out consisting of the Vocabulary and Matrix Reasoning subtests. These two subtests were used in the current study so that sufficient information could be ascertained while minimising the overall duration of each student's assessment. In the Vocabulary subtest (WASI-2 V) the assessor says a word and shows the student the written word, and the student is required to describe what the word means. In the Matrix Reasoning subtest, the student sees a pattern with a piece missing, and chooses the correct missing piece out of five choices. The WASI-2 is standardised from 6:0 to 90 years. The split-half reliability coefficient for children aged six to 16 is reported as .86 to .94 for the Vocabulary subtest, and .85 to .89 for Matrix Reasoning.

6.7.1.2 British Picture Vocabulary Scale, third edition (BPVS-3: Dunn, Dunn, Sewell & Styles, 2011)

The current study was concerned with the comprehension of classroom vocabulary, owing to its centrality to curriculum access. The BPVS-3 was therefore used to find out the existing receptive vocabulary levels of participants. The student sees four pictures, the assessor says a word aloud, and the student points to the picture which best illustrates the word's meaning. The BPVS-3 is standardised from three to 16:11 years. The authors report that reliability is built into the confidence bands for standardised and age-related scores.

6.7.1.3 Clinical Evaluation of Language Fundamentals, fourth edition, UK, (CELF-4 UK: Semel, Wiig, & Secord, 2006): Recalling Sentences subtest

The CELF-4 UK Recalling Sentences subtest was used as a proxy for the presence of language disorder. Sentence recall has been shown to be sensitive to the presence of language disorder due to the heavy demands it places on PSTM as well as drawing on prior language knowledge (Conti-Ramsden et al., 2001). Riches, Loucas, Baird, Charman, and Simonoff's (2010) study with 15-year-olds suggests that sentence recall is sensitive to language impairment even into adolescence. Sentences of increasing length and complexity are read aloud to the student who is required to repeat them verbatim. The CELF-4 UK is standardised from five to 16:11 years. The average corrected stability coefficient for the Recalling Sentences subtest is reported as .90.

6.7.1.4 Working Memory Test Battery for Children (WMTBC: Gathercole & Pickering, 2001): Listening Recall subtest

Deficits in PSTM and executive-loaded verbal working memory are both prevalent in children and adolescents with language disorder (see section 1.5.3). As the merging of phonological and semantic information is important in word learning, the Listening Recall subtest of the WMTBC was used as it assesses the use of both of these skills concurrently. The WMTBC is standardised from 5:7 to 15:9. In this subtest, the respondent listens to sets of short statements, identifies the veracity of the statements, and repeats the last word of each statement in the set. The task requires the information to be held in the PSTM while being processed for semantic content, and thus provides a measure of verbal working memory. The test-retest reliability coefficient for the WMTBC Listening Recall subtest for the age range 9:6 – 11:6 is reported as .38. Reliability for the older age range is not reported.

6.7.1.5 Phonological Awareness Battery (PhAB: Frederickson, Frith, & Reason, 1997): Spoonerisms subtest

Word learning has been shown to draw on phonological resources (see section 1.2.2), therefore the PhAB was used to obtain a measure of phonological skills. The Spoonerisms subtest was used, because, being the most challenging of the subtests, it would be sensitive to the presence of any phonological awareness difficulties within the age group of the participants in the current study. The subtest has two parts: firstly, a phoneme substitution task, in which participants are asked to exchange the first sound of a word with another sound to form a new word; and secondly, a Spoonerisms task, in which participants are given two words and are asked to exchange the first two phonemes of each word to form a nonsense phrase e.g. *King John* becomes *Jing Kon*. The PhAB is standardised from 6:0 – 14:11 years. Cronbach's coefficient alpha for children aged 12:0 to 14:11 is reported as .89 for the Spoonerisms subtest.

6.7.1.6 Language and cognitive profiles of student participants

This section describes the language and cognitive profiles of students as assessed at Time 1. Examination of student assessment scores revealed that there were eight students who, although they presented with a CATV SS below 85, achieved age-appropriate skills on language assessment at Time 1. It is possible, considering the close association between language and literacy, that these students may well have had language difficulties which were not revealed by the assessments used in this study, as the assessments used in this study did not comprise an exhaustive language assessment battery. The intervention cohort, therefore, was a population of adolescents who presented with language disorder according to the definition by Bishop et al. (2017, p.5): "language problems enduring into middle childhood and beyond, with a significant impact on everyday social interactions or educational progress, [which are] unlikely to resolve without specialist help." Table 6.5 gives group means, standard deviations and ranges of language and cognitive assessments, and states how many of the cohort of 78 presented with a SS below 85 for each assessment. Information for the whole cohort of 103 students who were assessed at Time 1 is in Appendix 6F.

Table 6.5. Language and cognitive profiles of student participants

Assessment (N=78 except where stated)	**Mean SS (*SD*)**	**Minimum**	**Maximum**	**Number (%) with SS <85**
CATV *	77.96 (6.98)	59	104	76 (97.4%)
CATNV (N=70) **	88.31 (8.53)	73	111	27 (34.6%)
WASI-2 Vocabulary	88.46 (8.87)	67	104	23 (29.5%)
WASI-2 Matrix Reasoning	92.05 (10.39)	64	121	18 (23.1%)
BPVS-3	79.19 (9.20)	69	105	60 (76.9%)
CELF-4 UK Recalling Sentences	79.53 (14.44)	56	110	45 (57.7%)
WMTBC Listening Recall	88.36 (17.51)	57	122	28 (35.9%)
PhAB Spoonerisms	89.03 (8.42)	69	117	20 (25.6%)

* Data represents Access Reading Test SS instead of CATV SS for participants from school 8.
**No school-administered nonverbal measure was available for participants from school 8.

6.7.2 Word knowledge assessment

For details of the word knowledge assessment, see section 5.4.

6.7.2.1 Administration of the word knowledge assessment

The word knowledge assessment was administered at Time 1, Time 2, Time 3, and Time 4. Based on the experience of the pilot study, a decision was made for the researcher to administer all assessments in the intervention study, in order to ensure consistency of administration, and for independent reliability checks to be carried out. Reliability is explained further in section 6.7.2.4.

The 30 words in each set were randomised using the random function on an Excel spreadsheet (Microsoft, 2016) and typed onto a sheet of paper in Arial size 14 font. For each set of 30 words, the words were listed in the same order at each timepoint. Students were given a visual prompt card containing squares coloured red, amber, green, and a green star, and were encouraged to rate their own knowledge of each word. The purpose of the prompt card was to engage students in the assessment and to draw out their maximum depth of knowledge about each word. The words were read out by the assessor and shown to the student one by one, with the following introduction:

"We're going to decide together whether each word is red, amber or green, to show how well you know it. If you don't know the word, we'll give it a red. If you can tell me something about what it means, we'll give it amber. If you can tell me exactly what it means in science, we'll give it green. If you can say the word in a sentence we'll give it a green star.

I'll say the word, and show you, then we decide whether it's red, amber, green, or a green star. For example, if the word is "sadness", you could say "Sadness is when you're upset." That would be a green star, because you've told me what the word means, and you've used it in a sentence.

Dependent on the responses made by the participants, staged prompts were given by the assessor to draw out maximum knowledge of each participant. These prompts included:

Can you tell me anything about what it means?
Can you think of anything else it means in science?
Can you tell me more exactly what it means in science?
Can you use the word in a sentence?

The flow chart in Appendix 6G gives full details of the procedure. Occasional feedback was given by the assessor to provide encouragement and maintain students' interest in the task. Because the students were involved in the rating, sometimes this entailed commiseration or praise, depending on what the students said.

6.7.2.2 Scoring of the word knowledge assessment

Responses were scored by the assessor either at the time, or afterwards on listening to the audio recording. At Time 1, responses were scored according to definitions provided by the science teacher. Responses were collated along with the rating they had been awarded, generating a scoring guideline sheet for each set of words, so that marking was consistent across participants and across timepoints. See Appendix 6H for sample scoring guidelines.

Depth of word knowledge and expressive word use were scored on separate scales. Students' responses were scored according to the following criteria.

(a) Depth of word knowledge scale

A score of 0 was awarded if the student did not demonstrate any understanding of the word's meaning. Example responses included:

- "Never heard it."
- "I know it but don't know what it means."
- (*diaphragm*) "Where you draw a diagram in science." (incorrect explanation)

A score of 1 was awarded for "a vague contextual placing of the word" (Dale (1965: p.898) where the student's response indicated some understanding of the word's meaning, but it was imprecise. Example responses included:

- (*diaphragm*) "Along here. When you breathe in it goes tight." (vague explanation)
- (*diaphragm*) "Something to do with your body." (correct category but imprecise detail)
- (*diaphragm*) Student points to position of own diaphragm. (gesture only)
- (*compound*) "A fenced round area." (description of an alternative meaning)

A score of 2 was awarded if the student demonstrated a clear understanding of meaning. The student was required to describe what the word meant in the context of science, according to the definition provided by the teacher. The use of technical vocabulary was not essential. Example responses included:

- (*diaphragm*) "A muscle in your chest used for breathing."

- (*kilojoules*) “How much energy people get from eating food.”

(b) Expressive word use scale

An expressive word use score could only be given if the student scored 2 on the depth of word knowledge scale. If that criterion was met, a score of 1 on the expressive word use scale was awarded if the student produced the word with phonological accuracy in a meaningful sentence. Responses had to meet criteria for sentence structure and content as well as speech production, as follows.

Sentence structure and content

Criteria were taken from the Formulated Sentences subtest of the CELF- 4 UK. As long as speech production was correct (see below), either of the following two criteria earned a score of 1:

- ‘a complete sentence that is semantically and syntactically correct, and uses correct structure (a logical, meaningful, complete and grammatical sentence)’
  or
- ‘a complete sentence that demonstrates correct structure and has only one or two deviations in syntax or semantics’ (Semel, Wiig & Secord, 2006, p.33).

If the given word was a verb, any verb tense form was acceptable. For other word classes, the same morphological form needed to be used.

Speech production

Criteria were taken from the Expressive One Word Picture Vocabulary Test (Brownell, 2010, p.27): ‘The following productions, indicating that the phonological representation has been incorrectly stored or retrieved, [were] counted as errors:

- dropping a syllable e.g. “puter” for “computer”
- substituting a syllable e.g. “momometer” for “thermometer”
- adding a syllable e.g. “antliers” for “antlers”
- transposing syllables e.g. “boomranger” for “boomerang”
- dropping a sound e.g. “ethoscope” for “stethoscope”
- substituting a sound e.g. “tunnel” for “funnel”
- adding a sound e.g. “scaddle” for “saddle”
- transposing sounds e.g. “detnist” for “dentist”.’

A student’s first attempt was scored unless they self-corrected. If the student could produce the word within the limits of their phonological inventory, this was counted correct e.g. if a student could not pronounce [ʃ] (sh), [inhəleɪsən] (inhalasun) would be counted as correct for *inhalation*. Judgements were made by the assessor based on other occurrences of the sound within the student’s speech sample.

Example responses scoring 0 on the expressive word use scale included:

- *Translucent*: “When you can see through but it’s not that clear; for example, if the window had a lot of dust in it and you couldn’t see through it. In class my glasses were [ɻansulənt] (transulent) so I had to wipe the dust off it.” (incorrect pronunciation).
- *Diaphragm:* “I’ve got a diaphragm.” (no other indication of understanding was demonstrated).
- *Inhalation*: “When you inhale, you breathe in.” (different morphology)

Example responses scoring 1 on the expressive word use scale included:

- *Inhalation*: “Inhalation is when you breathe in.”
- *Diaphragm*: “A muscle under your lungs. You use your diaphragm to breathe.”
- *Dissolve*: “When the solvent and solute combine together. Sugar dissolves in hot water.”

6.7.2.3 Validity of the word knowledge assessment

The validity of the word knowledge assessment in the intervention study was measured by correlating the baseline word knowledge assessment scores with the students’ scores on the WASI-2 V. Because the sample was larger than that of the pilot study, and hence the data was normally distributed, Pearson’s correlation co-efficient was used. There was a significant positive correlation between the depth of word knowledge scores and WASI-2 V raw scores (Pearson’s r = .492, $p < .01$).

6.7.2.4 Reliability of the word knowledge assessment scoring

Although the researcher had created the word lists, at the time of each assessment the researcher was not usually conscious of the experimental or control status of the words, due to the large number of word sets. In order to establish reliability of the assessment scoring, a speech and language therapist (SLT), not otherwise connected with the study, second-marked 25% of the assessments at all four timepoints directly from the audio-recordings. This percentage is consistent with previous studies assessing reliability (e.g. Lesaux et al., 2014; Starling et al., 2012; Zens et al., 2009). The SLT was blind to the status of the words, and blind to the marking of the researcher. Unweighted Cohen’s kappa, computed online (Lowry, 2001-2017), was used because the data were categorical. There was strong agreement between the two raters, $\kappa = .841$ (95% CI, .820 to .861), suggesting that the scoring was reliable.

6.7.3 Independent word learning ability

As Marulis and Neuman (2010) noted, although standardised assessments could be viewed as a more rigorous option for measuring generalisation effects of therapy, they may not be sensitive enough over the timescale of a study. Therefore, in the current study, both standardised and author-created outcome measures were employed. In addition, given the importance of vocabulary knowledge for academic outcomes (see section 1.6), the current study also aimed to assess the impact of the intervention on academic success. Thus, the current study took a three-fold approach to measuring the impact of Word Discovery on independent word learning ability:

standardised assessment; bespoke author-created assessment; and science attainment assessment.

6.7.3.1 Standardised vocabulary assessment

For a standardised assessment, the current study used the WASI-2 V. This was chosen as it is a definition production task and thus mirrors the word knowledge assessment (section 6.7.2). The WASI-2 V was administered at Time 1 and Time 3 (post- experimental intervention). Details of this assessment are given in section 6.7.1.1. For each item, respondents are awarded a score of 0, 1, or 2; thereby the assessment is sensitive to increased depth of word knowledge as well as increased breadth of word knowledge.

6.7.3.2 Bespoke independent word learning assessment

The development of the bespoke independent word learning measure is described in section 5.6.1. The two passages from Joffe (2011) used in the assessment can be found in Appendix 6I.

(a) Administration of the bespoke independent word learning assessment

The independent word learning assessment was administered individually at Time 1, Time 2, and Time 3. Responses were collated along with the rating they had been awarded, generating a scoring guideline sheet for each section of the independent word learning assessment, so that marking was consistent across participants and across timepoints. (See Appendix 6J).

(b) Scoring of the independent word learning assessment

Three separate scores were derived from the independent word learning assessment: identification of unknown words; number of words whose meaning was correctly derived; and number of independent word-learning strategies listed. Students' responses were scored according to the following criteria.

(i) Identification of unknown words

A count of 1 was given for each word the students said they did not understand.

(ii) Number of unknown words whose meaning was correctly derived

A score of 1 was given for each word meaning that was correctly derived. If a correct answer was given after the assessor had asked "What makes you think that?", it was not accepted. This decision was made to ensure consistency of administration. Examples of responses scoring 0 included:

- *Reverberating*: Through the house / loud / travelling.

Examples of responses scoring 1 included:

- *Reverberating*: Shaking / carrying on / echoing / repeating / vibrating.

(iii) Number of strategies listed

A score of 1 was given for each strategy which the student listed. Responses not deemed to help with discovering the meaning of a word were scored 0. Examples of responses scoring 0 included:

- Practise
- Guess.

Because the question was open-ended, in order to obtain meaningful data, students' responses were assigned to superordinate categories. Examples of responses scoring 1 included:

- Ask a teacher / ask your mum / put hand up (all assigned to the category "ask an adult")
- Ask a friend / ask the person sitting next to you / ask your sister (all assigned to the category "ask a peer").

(c) Reliability of the independent word learning assessment scoring

In order to establish reliability of the assessment scoring, a qualified teacher, not otherwise connected with the study, independently second-marked 25% of the assessments at each timepoint, directly from the audio-recordings. The teacher was blind to the status of the words, and blind to the marking of the researcher. Cohen's kappa with linear weighting, computed online (Lowry, 2001-2017), was used because the data were ordinal. There was strong agreement between the two raters for the number of unknown words whose meaning was correctly derived, κ_w = .803 (95% CI, .690 to .915), and a moderately strong agreement for the number of strategies listed, κ_w = .777 (95% CI, .670 to .884), suggesting that the scoring was reliable.

6.7.3.3 Assessment of science attainment

The researcher sought information on students' curriculum attainment levels from the head of science in each school. Data were received from five schools (schools 2, 4, 5, 6, and 7). Two types of data were received, as follows:

(a) Tracking data

It is usual for schools to track students' progress by awarding a level of ability to each student at key data capture points during the school year. Four schools (schools 2, 4, 5, and 6) used National Curriculum levels, and school 7 used its own system of levels for tracking progress, which it had devised when the use of National Curriculum levels became optional in 2014. However, none of the data capture points for any school occurred at dates which coincided with Time 2 (between topic 1 and topic 2), therefore this data was unhelpful as it did not allow for distinction between usual teaching practice and experimental conditions.

(b) Subject tests

Some schools also conduct subject tests at key intervals. School 6 supplied end-of-module test scores, but the modules covered a time period wider than the timescale of the study, therefore the end-of-module test scores reflected progress in other topics as well as topics 1 and 2. Two schools (schools 2 and 5) supplied end-of-topic test scores for both topic 1 and topic 2. The data from these two schools are reported in section 6.2.3.

6.7.4 Usual teaching practice strategies

During topic 1, data were gathered to find out what the teachers habitually did to teach new words, so that the active control condition could be described, enabling meaningful comparisons to be made between usual teaching practice and Word Discovery intervention. Data to establish this were gathered in two ways: through topic 1 strategy records completed by the teachers, and through observation records of the researcher. A sample completed topic 1 strategy record can be found in Appendix 6K. Teachers were asked to complete their strategy records at the end of each topic 1 lesson. This gave the researcher information on what comprised usual teaching practice for teaching new words, which words had been taught, and what date the words had been taught. To supplement this information, all teachers were asked if the researcher could observe one lesson of each class containing participating students. Due to logistical constraints, this was not possible in every case: as a result, 19 topic 1 lessons, taken by 14 separate teachers, were observed by the researcher, and strategies observed when the teacher was teaching new words were recorded.

6.7.5 Student and teacher views of the intervention

An important aim of the experimental study in this thesis was to evaluate the intervention in terms of whether it was acceptable from a stakeholder perspective, in order to ensure that it was ecologically valid, feasible, and could be implemented in real life contexts. As well as addressing this aspect of the study through the survey reported on in Chapter 4, these issues were addressed in the intervention study itself by seeking the views of the student and teacher participants.

6.7.5.1 Students' views and preferences

A short, structured questionnaire with two questions was administered verbally by the researcher with each participant at Time 3. The questionnaire was delivered immediately after the independent word learning assessment and took approximately 5 – 10 minutes to complete. First, an example of each word-learning activity was shown to the students to facilitate recall, and the students were asked how helpful the activities were, on a five-point Likert scale of: *not at all helpful; not very helpful; don't know; quite helpful;* and *very helpful*. Second, students were asked whether they would prefer word-learning support one-to-one, in small groups, or as a whole class, and their reasons for this. The full text of the questionnaire can be found in Appendix 6L. Students were shown visual prompt cards of the Likert scale and the model of delivery options to reduce verbal processing demands (Appendix 6M). Responses were audio-recorded for later analysis.

6.7.5.2 Teachers' confidence and views

At the beginning of the teacher training session prior to the intervention period (see section 6.8.3), the teachers were asked to rate their agreement with a statement about confidence in teaching vocabulary to students with language disorder aged 11 – 16 years, on a five-point Likert scale of: *strongly disagree; disagree; undecided; agree*; and *strongly agree*.

At Time 3, the teacher questionnaire consisted of a repetition of the statement about confidence, six questions about the intervention, and the questions on biographical information (section 6.5.2).

The questionnaire was 2½ A4 pages long, and took 5 – 10 minutes to complete. The questions about the intervention gained the teacher's views on:

- whether they had ever used any of the activities before
- how easy the activities were to implement
- how effective the activities were
- how likely the teachers were to use the activities again
- how helpful the teacher/therapist collaboration was
- if participating in the study had changed their practice, and if so, how.

Teachers could return their questionnaires to the researcher by hard copy or electronically, and could remain anonymous if they wished. The full text of the questionnaire can be found in Appendix 6N.

6.7.6 Assessment schedule

The assessment schedule is summarised in Table 6.6.

The researcher aimed for an interval of six weeks between Time 1 and Time 2, between Time 2 and Time 3, and between Time 3 and Time 4. However, due to variability from school to school in curriculum scheduling and school term dates, these intervals varied considerably. Even classes covering the same topic moved through the syllabus at different rates. It was quite common for teachers to be unable to give the researcher very much notice of when the topics would finish, as the pace of the syllabus was dictated to some extent by the rate of learning of the students. The researcher timed the assessment points to coincide with the end of topic 1 and the end of topic 2, which inevitably resulted in some deviation from the planned six-week interval for these reasons. The interval between Time 1 and Time 2 ranged from seven to 15 weeks (M = 9.4 weeks); between Time 2 and Time 3 from seven to 15 weeks (M = 8.9 weeks); and between Time 3 and Time 4 from two to nine weeks (M = 5.2 weeks).

Table 6.6. Assessment and intervention schedule for the intervention study

Timepoint	Assessment point / intervention condition	Measures
Time 1	Experimental condition: baseline Usual teaching practice: pre-intervention	BPVS-3 WASI-2 Vocabulary WASI-2 Matrix Reasoning CELF-4 UK Recalling Sentences WMTBC Listening Recall PhAB Spoonerisms Word knowledge assessment Independent word learning assessment
Topic 1	Usual teaching practice condition	Teachers' topic 1 strategy records Lesson observation records
Time 2	Experimental condition: pre-intervention Usual teaching practice: post-intervention	Word knowledge assessment Independent word learning assessment Teacher confidence rating
Topic 2	Experimental condition: Word Discovery intervention	Teachers' topic 2 strategy records Lesson observation records
Time 3	Experimental condition: post-intervention Usual teaching practice: follow-up	Word knowledge assessment Independent word learning assessment WASI-2 Vocabulary Student questionnaire Teacher questionnaire including confidence rating Science attainment data
Time 4	Experimental condition: follow-up Usual teaching practice: second follow-up	Word knowledge assessment

Key: BPVS-3 = British Picture Vocabulary Scale, third edition
CELF-4 UK = Clinical Evaluation of Language Fundamentals, fourth edition, UK
WASI-2 = Wechsler Abbreviated Scale of Intelligence, second edition WMTBC = Working Memory Test Battery for Children
PhAB = Phonological Assessment Battery

6.8 The experimental Word Discovery intervention

The rationale for the intervention was summarised in section 5.7.1, and the content and rationale for each intervention activity was explained in full in section 5.7.2. In this section, the content of the intervention is summarised (section 6.8.1). Following this, the content of the teacher training is described (section 6.8.2). Section 6.8.3 describes fidelity measures, section 6.8.4 reports on dosage, and section 6.8.5 describes the approach taken to measuring word exposure.

6.8.1 Content of intervention

The intervention consisted of seven components which were implemented by teachers in the classroom, embedded within the delivery of the curriculum. Examples of all the intervention activities are in the appendices. Data on the duration of each activity was taken from the researcher's lesson observation records: for further detail on duration, see section 6.8.4.

6.8.1.1 Self-rating checklist (Appendix 6O)

The self-rating checklist took on average 6.5 minutes (range 5 – 8 minutes). A sample completed self-rating checklist can be found in Appendix 6P.

6.8.1.2 Visual image displayed with written word (Appendix 6Q)

This was a strategy rather than a specific activity. Teachers were supplied with visual images of each experimental word on A4 laminated sheets. A sample visual image can be found in Appendix 6Q.

6.8.1.3 Word detective (Appendix 6R)

Teachers were given the word detective prompt card to display in the classroom and to use as they modelled how to discover information about a new word. Teachers were asked to model being a word detective for at least three of the experimental words. The word detective activity took on average 3.5 minutes (range 3 – 4 minutes).

6.8.1.4 Word map (Appendix 6S)

Teachers were asked to do a word map for at least five of the experimental words. To do a word map as a whole class took on average 9 minutes (range 5 - 19 minutes), decreasing in time as students and teacher became accustomed to it. An example of a completed word map can be found in Appendix 6T.

6.8.1.5 Word wise quickie (Appendix 6U)

Teachers were asked to do a word wise quickie for at least the five words which had not been explained with a word map. It could be done as a whole class or in pairs. A prompt card was provided for teachers to use as a mnemonic for themselves or to display. The word wise quickie took approximately one minute.

6.8.1.6 Sound and meaning bingo (Appendix 6V)

Sound and meaning bingo was played as a revision activity for all 10 experimental words. Teachers were asked to play sound and meaning bingo three times in all, towards the end of the topic. Sound and meaning bingo took on average 7.5 minutes (range 6 - 10 minutes). An example of a completed bingo sheet can be found in Appendix 6V.

6.8.1.7 Key word sheet (Appendix 6W)

The teachers were asked to provide opportunity for the students to do a key word sheet entry for all 10 experimental words. The key word sheet was placed in the student's book or folder at the beginning of the topic for easy access. One key word sheet entry took on average 3.7 minutes (range 1 - 8 minutes). An example of a completed key word sheet can be found in Appendix 6X.

6.8.2 Teacher training

The word-learning activities were taught to participating teachers in each school, in a one-hour interactive training session, led by the researcher. The training session took place at Time 2, between topics 1 (usual teaching practice) and topic 2 (Word Discovery). Appendix 6Y contains a sample PowerPoint presentation of a training session. The structure of the training session was as follows:

- Rationale for the research explaining links between vocabulary and academic attainment, and advantages of whole-class intervention
- Phonological and semantic aspects of word learning
- Experience of each of the word-learning activities through learning the meaning of three unknown words
- Practice of the word-learning activities using the experimental subject-specific words
- Explanation of how to incorporate activities into lesson plans embedded into the delivery of syllabus content
- Record-keeping
- Discussion, questions and offer of further support.

All resources necessary for the intervention activities and record-keeping were supplied to teachers both in hard copy and electronically, as Word (Microsoft, 2016) or PowerPoint templates.

Thirty-two of the 34 invited teachers attended the training. The researcher offered to deliver a separate training to two teachers who were not able to attend (T.3 and T.12), but the heads of science preferred to cascade the training to these two teachers. In three schools (schools 4, 6, and 7), the training was open to all members of the science department even if they were not participating in the study (a further 19 teachers). As these teachers did not teach the participating students, it was felt that this would not contaminate the experimental and control conditions.

Teachers were asked to deliver the word-learning activities within each science lesson for the duration of topic 2. A suggested schedule for implementing the word-learning activities over 10 lessons was provided for teachers, with an estimated duration in minutes for each activity (Figure 6.5). Flexibility was necessary in order to fit in with the science curriculum schedule in each school, and so that teachers could insert activities into an appropriate slot in their lessons. The survey of teachers and SLTs (Chapter 4) found that teachers spent an average of 9.4 minutes teaching the new words of the lesson. This provided a justification for the time that teachers were asked to spend on the specific word-learning activities in the suggested lesson schedule.

Lesson	Starter	In body of lesson	Finisher 1	Finisher 2
1	Self-rating 5*	Word map 15†		Key word sheet 4
Before next lesson, display words with visual image				
2	Word detective 4	Word map 10		Key word sheet 2
3	Word detective 2	Word map 10		Key word sheet 2
4	Word detective 2	Word map 10		Key word sheet 2
5		Word map 10	Word wise quickie 2	Key word sheet 2
6			Word wise quickie 1	Key word sheet 2
7	Sound and meaning bingo 8		Word wise quickie 1	Key word sheet 2
8	Sound and meaning bingo 6		Word wise quickie 1	Key word sheet 2
9	Sound and meaning bingo 6		Word wise quickie 1	Key word sheet 2
Before next lesson, remove words and visual images				
10	Key word sheet 2		Self-rating 3	

Figure 6.5. Example lesson schedule

* Numbers after each word-learning activity refer to an estimated duration in minutes for each activity.
† It was anticipated that the word map would take longer the first time teachers and students used it.

6.8.3 Fidelity

Fidelity to the intervention protocol by participating teachers was measured in three ways.

Teachers' records

The topic 2 strategies record gave the researcher information on: how many of the word-learning activities had been done; on what date; and with which words. An example of a completed topic 2 strategies record can be found in Appendix 6Z. Twenty-eight topic 2 strategy records were received, from 20/30 teachers. For four teachers who did not return their strategy records, information was gained verbally or via email from the teacher.

Students' work

At the end of topic 2, the researcher collected photocopies of relevant work produced by participating students. In some cases, students' work was not available to the researcher; for instance, if the students' books were at home for revision. Work was obtained from 63 students overall: word maps for 53 students; self-rating checklists for 46 students; key word sheets for 36 students; bingo sheets for 11 students; and word wise quickies for 3 students. These were anonymised upon receipt.

Lesson observations

As with topic 1 (section 6.7.4), the researcher aimed to observe one lesson of each class containing participating students during topic 2. Again, for logistical reasons, this was not always possible. A total of 20 lessons (17 teachers) were observed during topic 2. The researcher collected data on:

- How new words were taught
- Frequency of exposure of experimental and control words
- Duration of the word-learning activities.

Following topic 2, these three sources of information were cross-referenced and collated to gain an overall picture of the intervention which each participant received. Table 6.7 shows which activities were used at least once in each class. The information in Table 6.7 shows only definite evidence that a strategy was used, and thus represents a minimum level of intervention.

Table 6.7. Evidence of fidelity for the implementation of word-learning activities

School	Class	Evidence that the word-learning activity was used at least once						
		Self-rating checklist	Display visual image	Word detective	Word map	Word wise quickie	Sound and meaning bingo	Key word sheet
1	1	✓		✓	✓			✓
1	2	✓			✓			
1	4				✓			✓
2	5	✓		✓	✓	✓	✓	✓
2	6	✓		✓	✓	✓	✓	✓
2	7			✓	✓	✓	✓	✓
2	8	✓		✓	✓	✓	✓	✓
2	9	✓		✓	✓		✓	✓
3	10	✓				✓		
3	11	✓	✓				✓	✓
3	12	✓	✓	✓	✓	✓	✓	✓
3	13	✓	✓	✓	✓	✓	✓	✓
3	14		✓	✓		✓		✓
4	18			✓	✓	✓		✓
4	19	✓	✓		✓	✓	✓	
4	20	✓	✓				✓	
4	22				✓			
4	23				✓	✓		
4	25				✓	✓	✓	
5	26		✓	✓	✓	✓	✓	✓
5	27		✓		✓			
6	28				✓	✓	✓	✓
6	32	✓			✓			
6	33	✓			✓			
6	34				✓			✓
6	36		✓		✓			✓
6	37			✓	✓			✓
7	38	✓	✓	✓	✓		✓	✓
7	39	✓	✓	✓	✓	✓	✓	✓
7	40	✓	✓	✓	✓	✓	✓	✓
7	41	✓	✓	✓	✓	✓	✓	✓
7	42	✓	✓	✓	✓		✓	✓
8	43	✓	✓		✓	✓	✓	✓
8	44	✓	✓	✓	✓	✓	✓	✓
8	45	✓	✓	✓	✓		✓	
8	46	✓	✓		✓	✓	✓	✓
Total		23	18	19	32	20	22	25

6.8.4 Dosage

Dose

The precise dose (total amount of time spent on the word-learning activities) could not be measured, as it was inappropriate to ask teachers to count and record the duration of activities whilst teaching, and logistically impossible for the researcher to observe every lesson by every teacher. During fidelity observations, the researcher recorded the duration of any word-learning activities observed, and from this derived an average length in minutes for each activity. This was combined with information from teachers' strategy records, which gave details of how often each word-learning activity had been delivered. Thus, an estimate was made of the total amount of time each class spent on word-learning activities in topic 2. This averaged 62.5 minutes (range 6.5 – 135.5 minutes).

Cumulative intervention intensity

Warren, Fey, and Yoder (2007, p.72) proposed the term "cumulative intervention intensity" to describe dosage more precisely in terms of *dose x dose frequency x total intervention duration*. In the current study, lessons were all between 50 and 60 minutes long. Topic 1 was delivered in an average of 11.6 lessons (range 5 – 20) over an average period of 4.25 weeks (range 2 - 9). Topic 2 was delivered in an average of 13.1 lessons (range 6 – 27), over an average period of 4.33 weeks (range 2 - 9). A related *t*-test showed that the difference in the number of lessons between topic 1 and topic 2 was not significant (t (35) = -1.542, p = .132). Estimated cumulative intervention intensity for each class is contained in Table 6.8.

Table 6.8. Cumulative intervention intensity by class

School	Class	Number of lessons topic 1	Number of weeks topic 1	Number of lessons topic 2	Number of weeks topic 2	Estimated total amount of time spent on word-learning activities in topic 2 (in minutes)
1	1	15	3	12	3	41.2
1	2	15	3	9	3	6.5
1	4	15	3	12	3	24.6
2	5	10	5	8	2	118.1
2	6	15	5	8	2	118.4
2	7	7	5	8	4	94.6
2	8	5	5	8	4	117.0
2	9	7	5	10	3	77.6
3	10	8	5	6	3	14.5
3	11	12	3	12	3	83.8
3	12	12	3	11	4	80.6
3	13	12	3	20	5	82.0
3	14	12	3	12	2	13.7
4	18	10	3	19	5	72.3
4	19	17	5	7	2	39.0
4	20	14	4	21	6	19.2
4	22	20	5	25	7	9.0
4	23	14	4	27	7	47.0
4	25	17	5	17	4	36.5
5	26	12	4	12	3	61.1
5	27	12	8	15	9	18.0
6	28	6	2	8	4	55.5
6	32	9	2	9	3	24.5
6	33	6	2	21	7	9.0
6	34	6	3	20	5	51.3
6	36	10	3	16	5	43.4
6	37	7	3	6	2	48.1
7	38	20	9	15	6	78.5
7	39	10	4	17	5	107.8
7	40	10	4	16	5	102.5
7	41	10	3	10	4	65.5
7	42	10	4	10	4	135.5
8	43	11	5	10	5	107.0
8	44	11	5	10	5	66.7
8	45	15	7	12	6	63.5
8	46	16	8	12	6	116.0
Range		5 – 20 lessons	2 – 9 weeks	6 – 27 lessons	2 – 9 weeks	6.5 – 135.5 minutes
Mean		11.6 lessons	4.25 weeks	13.1 lessons	4.33 weeks	62.5 minutes

6.8.5 Word exposure

Topic 1 and topic 2 strategy records contained a space for teachers to record estimates of how often each word was spoken by the teacher. This provided a measure of the amount of exposure each word received. The decision to measure word exposure rather than to control for it was made because it was deemed unethical to ask teachers to control their use of key words within lessons. The topic 1 strategies record contained all the words which the head of science had provided for the topic, so that teachers did not know which were the active control words, and were not influenced to pay more attention to these words. Word exposure is reported in more detail in section 6.6.

6.9 Data analysis

Time x condition interactions in depth of word knowledge data were analysed using related (repeated measures) analysis of variance (ANOVA) followed by planned pairwise comparisons with Bonferroni corrections. Time x condition interactions in expressive word use were analysed using Friedman's one-way ANOVA followed by Wilcoxon's signed ranks tests. Predictors of increase in word knowledge were analysed using hierarchical multiple regression. Word exposure was explored using Wilcoxon's signed ranks.

Changes in standardised vocabulary assessment was analysed using a related *t*-test. Data from the bespoke independent word learning assessment were analysed using one-way related ANOVA followed by pairwise comparisons with Bonferroni corrections.

Qualitative data were analysed through content analysis. These data included usual teaching practice data from teachers' topic 1 strategy records and researcher's lesson observation records, and student and teacher post-intervention questionnaire data. Student and teacher views were also explored using Wilcoxon's signed ranks tests.

More detail on the approach to data analysis is outlined at the beginning of each relevant section in Chapter 7.

Summary of Chapter 6

The current chapter has described the methodology for a study investigating the effectiveness of an experimental intervention (Word Discovery) for adolescents with language disorder in mainstream secondary schools. The aims of the study were to explore the implementation of word-learning activities in the classroom by the teacher, and to measure not only the learning of specifically taught words, but also the development of independent word-learning skills. Additional aims of the study were to explore how students' language and cognitive profiles related to potential increases in word knowledge, and to evaluate the intervention from the student and teacher perspective.

Participants' knowledge of 30 science words was assessed. In the first phase of the study, 10 active control words from topic 1 were taught by science teachers using usual teaching practice. At Time 2, teachers attended a training session. In the second phase, 10 matched experimental words from topic 2 were taught by the same teachers, using Word Discovery intervention, which included phonological-semantic word-learning activities embedded into the delivery of the curriculum. Ten matched passive control words received no intervention. Thirty teachers and 78 students took part in the intervention. Data were collected on language and cognitive profiles, science word knowledge, use and awareness of independent word-learning strategies, science attainment, usual teaching practice strategies, and student and teacher views. Fidelity measures were taken using teachers' strategy records, students' work, and lesson observations. Dosage and word exposure data were collected from teachers' strategy records and lesson observations.

The results are reported in Chapter 7.

Chapter 7

The effectiveness of classroom vocabulary intervention for adolescents with language disorder:

Results

Overview

This chapter presents the results of the intervention study described in Chapter 6, exploring the effectiveness of classroom vocabulary intervention for adolescents with language disorder. The name given to the classroom vocabulary intervention in this thesis is Word Discovery. The study employed a within-subjects repeated measures design. Seventy-eight students aged 11 – 14 years, with low verbal ability according to school attainment records, participated from eight mainstream secondary schools in the UK. Participants' knowledge of 30 science words was assessed. In the first phase of the study, 10 active control words from one topic (topic 1) were taught by science teachers using usual teaching practice. Following this, teachers attended a training session. In the second phase, 10 matched experimental words from a subsequent topic (topic 2) were taught by the same teachers using Word Discovery activities, embedded into the delivery of the curriculum. Ten matched passive control words received no intervention. Student participants' knowledge of the 30 science words was assessed at four timepoints on two scales: (1) depth of word knowledge, and (2) expressive word use. Teacher and student views on Word Discovery intervention were sought.

Section 7.1 reports results of the word knowledge assessment, investigating change over time for the three teaching conditions; usual teaching practice, experimental, and no intervention. Section 7.2 reports the generalisation effect of the intervention on independent word learning skills. Section 7.3 explores predictors of increases in word knowledge. Section 7.4 presents the views of teachers and students on the experimental Word Discovery intervention. Section 7.5 reports strategies which were used in usual teaching practice, enabling comparison between the usual teaching practice and experimental conditions; and section 7.6 compares word exposure in the two teaching conditions. Results are summarised in section 7.7.

7.1 Word knowledge (RQ1)

Word knowledge data were analysed using SPSS 23 (IBM Corp, 2015). Because it was a within-subjects study and the two teaching conditions were sequential, pre-intervention, post-intervention, and follow-up assessments for the experimental and control conditions occurred at different timepoints. These were highlighted in Table 5.1, as repeated here in Table 7.1. Pre-intervention assessment for the usual teaching practice and no-intervention conditions occurred at Time 1, and pre-intervention for the experimental condition occurred at Time 2. Post-intervention for the usual teaching practice and no-intervention conditions occurred at Time 2, and post-intervention for the experimental condition occurred at Time 3. Follow-up for the usual teaching practice and no-intervention conditions occurred at Time 3, and follow-up for the experimental condition occurred at Time 4. The first three timepoints were chosen for the no-intervention words in order to minimise practice effects. This resulted in analysis of pre-intervention, post-intervention, and follow-up data in a 3 x 3 design (time x condition). The data for all four timepoints can be found in Appendix 7A.

Table 7.1. Pre-intervention, post-intervention, and follow-up assessment points for experimental (Word Discovery) and control conditions

	Time 1	**Time 2**	**Time 3**	**Time 4**
Usual teaching practice condition	Pre-intervention	Post-intervention	Follow-up	Second follow-up
Experimental condition (Word Discovery)	Baseline	Pre-intervention	Post-intervention	Follow-up
No-intervention condition	Pre-intervention	Post-intervention	Follow-up	Second follow-up

Word knowledge was assessed through a bespoke word knowledge assessment (see section 6.7.2) which yielded scores for (1) depth of word knowledge and (2) expressive word use.

7.1.1 Depth of word knowledge (hypotheses 1, 2, and 3)

The first three hypotheses of the study related to the increase in depth of word knowledge of targeted words over time. It was hypothesised that: (1) the increase in depth of word knowledge, from pre- to post-intervention, of words taught through Word Discovery activities would be greater than for words taught through usual teaching practice; (2) maintenance in depth of word knowledge, from post-intervention to follow-up, of words taught through Word Discovery activities would be greater than for words taught through usual teaching practice; and (3) there would be no significant change in depth of word knowledge of no-intervention words over time.

Group means (*M*) and standard deviations (*SD*) for depth of word knowledge scores are presented in Table 7.2. The data are also presented graphically in Figure 7.1.

Data for usual teaching practice words and experimental words were normally distributed. Data for no-intervention words were positively skewed at all three assessment points.

Table 7.2. Group mean scores for depth of word knowledge

	Pre-intervention ***M (SD)***	**Post-intervention** ***M (SD)***	**Follow-up** ***M (SD)***
Usual teaching practice words out of 20	4.14 (2.75)	5.72 (3.29)	5.38 (3.36)
Experimental words (Word Discovery) out of 20	3.50 (2.51)	6.96 (3.87)	6.17 (3.80)
No-intervention words out of 20	.92 (1.27)	.99 (1.47)	.90 (1.37)

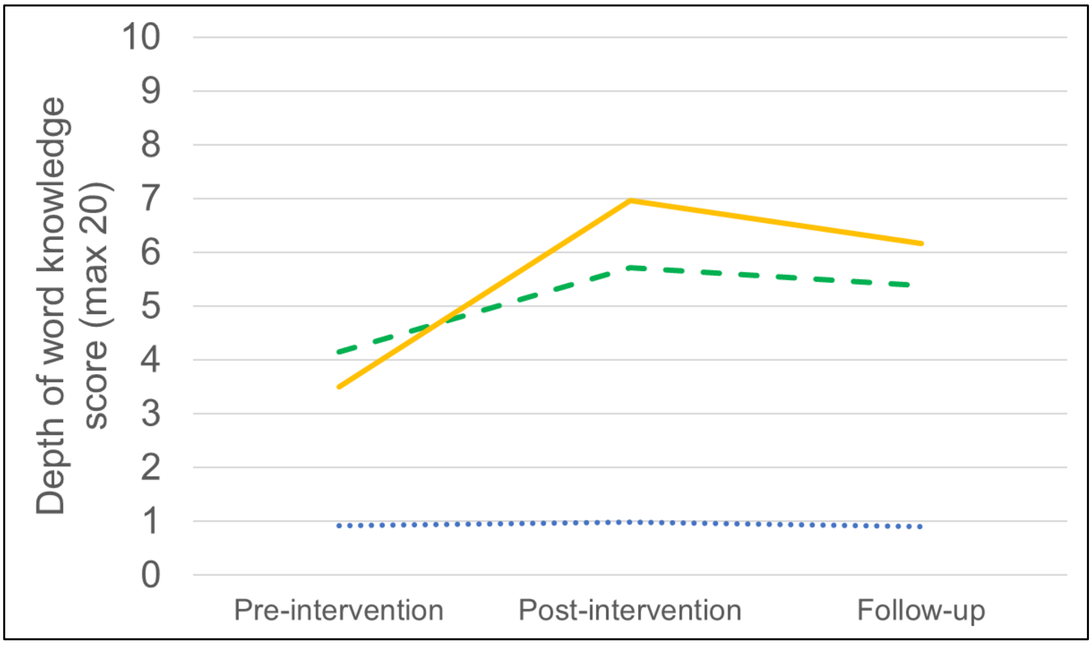

Figure 7.1. Group mean scores for depth of word knowledge

Key: - - - - usual teaching practice
------ experimental
...... no intervention

Because the majority of the data were normally distributed, it was appropriate to conduct a 3 x 3 related (repeated measures) ANOVA, followed by planned pairwise comparisons with Bonferroni corrections. The within-subject variables were teaching condition (with three levels corresponding to usual teaching practice, experimental and no-intervention) and assessment point (with three levels: pre-intervention, post-intervention, and follow-up). The dependent variable was the depth of word knowledge score. Where Mauchly's test indicated that the assumption of sphericity had been violated, a Greenhouse-Geisser correction was employed. There was a significant main effect of time, $F(2, 154) = 74.040$, $p < .001$, $\eta_p^2 = .490$, large effect size; a significant main effect of condition (sphericity not assumed), $F(1.968, 151.545) = 137.872$, $p < .001$, $\eta_p^2 = .642$, large effect size; and also a significant time x condition interaction effect (sphericity not assumed),

$F(2.643, 203.516) = 26.080$, $p < .001$; $\eta_p^2 = .253$, large effect size. Because the data were analysed as a 3 x 3 related ANOVA, rather than the 4 x 3 related ANOVA which was used for the sample size calculation (see section 6.5.3.2), a post-hoc power calculation was included, which showed a resultant observed power of 1.000, giving confidence that the analysis had sufficient power to detect significant effects.

To explore the time x condition interaction, planned comparisons with Bonferroni corrections were used, as follows.

7.1.1.1 Performance in depth of word knowledge over time

Usual teaching practice condition

Planned comparisons showed that depth of word knowledge of usual teaching practice words was significantly greater at the post-intervention point (M = 5.72, SD = 3.29) than at pre-intervention (M = 4.14, SD = 2.75), $p < .001$; but that there was no significant change between post-intervention and follow-up (M = 5.38, SD = 3.36), $p = .272$. This indicated that students' depth of word knowledge of targeted words increased significantly following usual teaching practice, and that this increase was maintained five weeks later. This was confirmed by a significant difference between pre-intervention and follow-up scores ($p < .001$).

Experimental condition (Word Discovery)

Depth of word knowledge of experimental words was significantly greater at the post-intervention point (M = 6.96, SD = 3.85) than at pre-intervention (M = 3.50, SD = 2.51), $p < .001$. Depth of word knowledge at follow-up (M = 6.17, SD = 3.80) was significantly lower than at post-intervention ($p = .002$), but still significantly greater than at pre-intervention ($p < .001$). This indicated that students' depth of word knowledge of targeted words increased significantly following Word Discovery intervention, and that this increase was partially maintained five weeks later.

No-intervention condition

There was no significant change in depth of word knowledge of no-intervention words between pre-intervention (M = 0.92, SD = 1.27) and post-intervention (M = 0.99, SD =1.47), $p = 1.000$; or between post-intervention and follow-up (M = 0.90, SD =1.37), $p = 1.000$.

7.1.1.2 Depth of word knowledge at each timepoint – comparison between conditions

Pre-intervention

At the pre-intervention point, depth of word knowledge of usual teaching practice words (M = 4.14, SD = 2.75) was numerically greater than that of the experimental words (M = 3.50, SD = 2.51), but this difference was not significant ($p = .137$). Depth of word knowledge of no-intervention words (M = 0.92, SD = 1.27) was significantly lower than that of both usual teaching practice words ($p < .001$) and experimental words ($p < .001$).

Post-intervention

At the post-intervention point, depth of word knowledge of experimental words (*M* = 6.96, *SD* = 3.85) was significantly greater than that of usual teaching practice words (*M* = 5.72, *SD* = 3.29), *p* = .015. Depth of word knowledge of no-intervention words (*M* = 0.99, *SD* = 1.47) was significantly lower than that of both usual teaching practice words (*p* < .001) and experimental words (*p* < .001).

Follow-up

At the follow-up point, depth of word knowledge of experimental words (*M* = 6.17, *SD* = 3.80) was still numerically greater than that of the usual teaching practice words (*M* = 5.38, *SD* = 3.36), but this difference was not significant (*p* = .224). Depth of word knowledge of no-intervention words (*M* = 0.90, *SD* = 1.37) was significantly lower than that of both usual teaching practice words (*p* < .001) and experimental words (*p* < .001).

7.1.1.3 Differences between conditions in depth of word knowledge – further analysis

Inspection of the data in Table 7.2 reveals that the depth of word knowledge scores for the no-intervention words were very low. Reasons for this are discussed in section 7.10.1. Because of this, these data were not normally distributed and demonstrated floor effects. To overcome this, and to provide reassurance that the results were robust, a 2 x 3 related ANOVA was conducted with the same time factors (pre-, post-, and follow-up), but only two levels of teaching condition (usual teaching practice and experimental). All these data were normally distributed.

This 2 x 3 related ANOVA showed no significant main effect of condition, $F(1, 77) = 2.186$, $p = .143$, $\eta_p^2 = .028$, small effect size; but there was still a significant main effect of time (sphericity not assumed), $F(1.531, 117.863) = 84.831$, $p < .001$, $\eta_p^2 = .524$, large effect size. Most importantly for the hypotheses, there was still a significant time x condition interaction effect (sphericity not assumed), $F(1.633, 125.732) = 10.699$, $p < .001$; $\eta_p^2 = .122$, medium to large effect size: observed power .974. Planned pairwise comparisons with Bonferroni corrections of depth of word knowledge scores over *time* remained the same as in the 3 x 3 ANOVA. Pairwise comparisons of *condition* at each assessment point showed similar findings with some minor differences. At pre-intervention, depth of word knowledge of usual teaching practice words was marginally greater than that of experimental words (*p* = .046). This had been non-significant in the 3 x 3 ANOVA. At the post-intervention point, depth of word knowledge of experimental words was significantly greater than that of usual teaching practice words (*p* = .005), as before. At the follow-up timepoint, the difference in depth of word knowledge of usual teaching practice words and experimental words was not significant (*p* = .075), as before.

Therefore, with the exception of the marginally significant difference between depth of word knowledge of usual teaching practice words and experimental words at pre-intervention, the results of the 2 x 3 ANOVA were comparable to the 3 x 3 ANOVA. This confirmed, first, that a significant time x condition interaction existed when only the usual teaching practice words and experimental words were considered; second, at post-intervention, depth of word knowledge of words taught through Word Discovery activities was greater than for words taught through usual teaching practice; and, third, at follow-up five weeks later, there was no significant difference between depth of word knowledge of usual teaching practice words and experimental words.

7.1.1.4 Summary of depth of word knowledge results

To summarise this section on depth of word knowledge, these analyses indicate that depth of word knowledge of targeted words significantly increased following usual teaching practice, and that this increase was maintained five weeks later. Depth of word knowledge of experimental words also significantly increased, following Word Discovery intervention. This increase was partially maintained five weeks later, because depth of word knowledge of experimental words remained significantly higher at follow-up than at pre-intervention. At the pre-intervention point, depending on the analysis used, depth of word knowledge of usual teaching practice words either did not differ, or was significantly lower, than that of the experimental words. However, at the post-intervention point, depth of word knowledge of experimental words *was significantly greater* than that of usual teaching practice words. Thus, hypothesis 1, which stated that the increase in depth of word knowledge for experimental words would be greater than for words taught through usual teaching practice, was supported. At follow-up five weeks later, there was again no significant difference in depth of word knowledge between the two conditions; therefore hypothesis 2, which stated that maintenance in depth of word knowledge would be greater than for words taught through usual teaching practice, was not supported.

Depth of word knowledge of no-intervention words did not change over time, and was significantly lower than both usual teaching practice and experimental words at all timepoints. Thus, hypothesis 3 was supported.

7.1.2 Expressive word use (hypotheses 4, 5, and 6)

Hypotheses 4, 5, and 6 related to the increase in expressive word use of targeted words over time. It was hypothesised that: (4) the increase in expressive word use, from pre- to post-intervention, for words taught through Word Discovery activities would be greater than for words taught through usual teaching practice; (5) maintenance in expressive word use, from post-intervention to follow-up, for words taught through Word Discovery activities would be greater than for words taught through usual teaching practice; and (6) there would be no significant difference in expressive word use of no-intervention words over time. Group means and standard deviations for expressive word use are presented in Table 7.3. The data are also presented graphically in Figure 7.2.

Table 7.3. Group mean scores for expressive word use

	Pre-intervention *M (SD)*	Post-intervention *M (SD)*	Follow-up *M (SD)*
Usual teaching practice words out of 10	.58 (.91)	.96 (1.39)	.97 (1.37)
Experimental words (Word Discovery) out of 10	.45 (.73)	1.78 (1.80)	1.49 (1.65)
No-intervention words out of 10	.15 (.40)	.08 (.31)	.14 (.35)

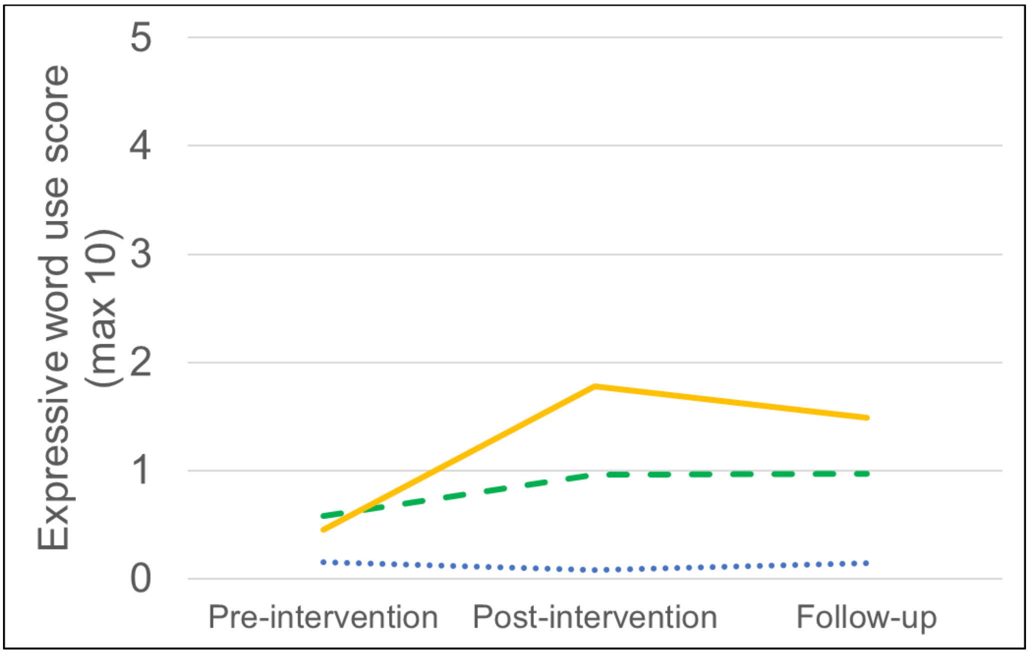

Figure 7.2. Group mean scores for expressive word use

Key: - - - - usual teaching practice
------ experimental
...... no intervention

The level of expressive word use in all conditions was very low and demonstrated floor effects, with all data except post-intervention expressive word use of experimental words being positively skewed. Therefore, non-parametric analysis was used to examine change over time. As this was nonparametric analysis, medians and interquartile ranges are reported in Table 7.4.

Table 7.4. Group median scores for expressive word use

	Pre-intervention Mdn (IQR)	Post-intervention Mdn (IQR)	Follow-up Mdn (IQR)
Usual teaching practice words out of 10	.00 (.00 – 1.00)	.50 (.00 – 1.00)	.00 (.00 – 1.00)
Experimental words (Word Discovery) out of 10	.00 (.00 – 1.00)	1.00 (.00 – 3.00)	1.00 (.00 – 2.00)
No-intervention words out of 10	.00 (.00 - .00)	.00 (.00 - .00)	.00 (.00 - .00)

Key: Mdn = median
IQR = inter-quartile range

7.1.2.1 Performance in expressive word use over time

Three separate Friedman's one-way ANOVAs were conducted to examine expressive word use over time for each teaching condition, followed by post-hoc Wilcoxon's signed ranks tests.

Usual teaching practice condition

There was a significant change in expressive word use of words taught through usual teaching practice over time, χ^2 (2) = 7.369, *p* = .025. Wilcoxon's signed ranks showed that expressive word use of usual teaching practice words was significantly greater at the post-intervention point (*M* = .96, *SD* = 1.39) than at pre-intervention (*M* = .58, *SD* = .91), *Z* = 2.674, *p* = .007; but that there was no significant change between post-intervention and follow-up (*M* = .97, *SD* = 1.37), *Z* = -.186, *p* = .853. This indicated that students' expressive word use increased following usual teaching practice, and that this increase was maintained five weeks later. This was confirmed by a significant difference between pre-intervention and follow-up, *Z* = -3.157, *p* = .002.

Experimental condition (Word Discovery)

There was also a significant change in expressive word use of experimental words over time, χ^2 (2) = 53.153, *p* < .001. Wilcoxon's signed ranks showed that expressive word use of experimental words was significantly greater at the post-intervention point (*M* = 1.78, *SD* = 1.80) than at pre-intervention (*M* = .45, *SD* = .73), *Z* = -5.783, *p* < .001. Expressive word use at follow-up (*M* = 1.49, *SD* = 1.65) was significantly lower than at post-intervention, *Z* = -2.556, *p* = .011; but still significantly greater than at pre-intervention, Z = -5.398, *p* < .001. This indicated that students' expressive word use of targeted words increased following Word Discovery intervention, and that this increase was partially maintained five weeks later.

No-intervention condition

There was no significant change in expressive word use for no-intervention words over time (χ^2 (2) = 4.192, *p* = .123). Thus, hypothesis 6 was supported.

7.1.2.2 Expressive word use at each timepoint - comparison between conditions

Three further Friedman's one-way ANOVAs were conducted to examine differences in expressive word use between teaching conditions at each timepoint, followed by post-hoc Wilcoxon's signed ranks tests.

Pre-intervention

Friedman's ANOVA showed that there was a significant difference between the teaching conditions in expressive word use at pre-intervention (χ^2 (2) = 20.162, p < .001). Wilcoxon's signed ranks showed that there was no difference in expressive word use between the usual teaching practice words (M = .58, SD = .91) and the experimental words (M = .45, SD = .73), Z = -1.059, p = .290, but that expressive word use of no-intervention words (M = 0.15, SD = 0.40) was significantly lower than that of both usual teaching practice words (Z = -3.94, p < .001) and experimental words (Z = -3.41, p = .001).

Post-intervention

There was also a significant difference between the teaching conditions in expressive word use at post-intervention (χ^2 (2) = 67.980, p < .001), with expressive word use of experimental words (M = 1.78, SD = 1.80) being significantly greater than that of usual teaching practice words (M = .96, SD = 1.39), Z = -3.796, p < .001, and expressive word use of no-intervention words (M = 0.08, SD = 0.31) again being significantly lower than that of both usual teaching practice words (Z = -5.35, p < .001) and experimental words (Z = -6.33, p < .001).

Follow-up

There was a significant difference between the teaching conditions at follow-up (χ^2 (2) = 49,922, p < .001). Expressive word use of experimental words (M = 1.49, SD = 1.65) continued to be greater than that of usual teaching practice words (M = 0.97, SD = 1.37), Z = -2.472, p = .013. Expressive word use of no-intervention words (M = 0.14, SD = 0.35) continued to be significantly lower than that of both usual teaching practice words (Z = -5.10, p < .001) and experimental words (Z = -5.96, p < .001).

7.1.2.3 Summary of expressive word use results

To summarise this section on expressive word use, these analyses indicate that expressive word use of targeted words significantly increased following usual teaching practice, and that this increase was maintained five weeks later. Expressive word use of experimental words also significantly increased following Word Discovery intervention. This increase was partially maintained five weeks later, because expressive word use of experimental words remained significantly higher at follow-up than at pre-intervention. At the pre-intervention point, expressive word use of usual teaching practice words did not differ from that of experimental words, but at the post-intervention point, expressive word use of experimental words was *significantly greater* than that of usual teaching practice words, and this significant difference remained at follow-up. Thus hypothesis 4, which stated that the increase in expressive use of experimental words would be greater than for words taught through usual teaching practice, was supported. There was partial support for hypothesis 5, which stated that maintenance in expressive word use would be greater than for words taught through usual teaching practice, because depth of knowledge of experimental words remained significantly higher than that of usual teaching practice words at follow-up.

Expressive word use of no-intervention words did not change over time, and was significantly lower than both usual teaching practice and experimental words at all timepoints. Thus, hypothesis 6 was supported.

7.2 Independent word learning (RQ2)

The generalisation effect of the intervention to transferable independent word learning skills was assessed in three ways: firstly, by the use of the vocabulary subtest of the Wechsler Abbreviated Scale of Intelligence, second edition (WASI-2 V: Wechsler, 2011) (see section 7.2.1); secondly, through a bespoke independent word learning assessment (see section 7.2.2); and thirdly, by the assessment of science attainment (see section 7.2.3).

7.2.1 Standardised vocabulary assessment (hypothesis 7)

Hypothesis 7 stated that there would be significant progress on WASI-2 V standard scores following Word Discovery intervention. Change in standardised vocabulary assessment scores over time was examined by comparing WASI-2 V standard scores at Time 1 and Time 3. The data are presented in Table 7.5. The data were normally distributed at both timepoints; therefore, parametric analysis was used. A related *t*-test showed no significant difference between WASI-2 V standard scores at Time 1 (M = 88.46, SD = 8.87) and Time 3 (M = 88.26, SD = 9.04), $t(77)$ = .289, p = .773. Therefore, hypothesis 7 was not supported.

Table 7.5. Group mean standard scores for WASI-2 V

		N	*M (SD)*	Range
WASI-2 V standard score	Time 1	78	88.46 (8.87)	67 - 104
	Time 3	78	88.26 (9.04)	67 - 113

7.2.2 Bespoke independent word learning assessment

The bespoke independent word learning assessment (Section 6.7.3.2) was administered at Time 1, Time 2, and Time 3. Time 1 represented pre- usual teaching practice; Time 2 represented post-usual teaching practice and pre- Word Discovery intervention; and Time 3 represented post- Word Discovery intervention, as illustrated in Table 7.6.

Table 7.6. Pre-intervention and post-intervention assessment points for independent word learning assessment

	Time 1	Time 2	Time 3
Usual teaching practice condition	Pre- usual teaching practice	Post- usual teaching practice	
Experimental intervention condition		Pre- Word Discovery intervention	Post- Word Discovery intervention

In the bespoke word learning assessment, the students were read two passages from Joffe (2011) and asked to identify any words they did not understand. Then they were asked what they thought these words meant, and to give their reasons. These data were analysed in stages. First, the number of words in the passages which students identified as unknown over time was counted (a). Second, the number of these words whose meaning the students correctly derived from morphology or context was counted (b). Thirdly, (b) was calculated as a percentage of (a). This part of the assessment investigated participants' *use* of independent word learning strategies. The number of words which students could identify as unknown was limited to the number of words in the passages (56 words in total - see Appendix 6I). The maximum achievable number of words whose meaning was correctly derived was dependent on how many words each individual student identified as unknown. Results are given in section 7.2.2.1.

Students were also asked what strategies they could use to find out what a new word means. This part of the assessment investigated participants' *awareness* of independent word-learning strategies. Because this question was open-ended, students' responses were assigned to superordinate categories (see section 6.7.3.2(b)). The maximum number of categories, collated from strategies generated by the students throughout the study, was nine (see Appendix 6J). Results are given in section 7.2.2.2.

The group means, standard deviations, and ranges from the independent word learning assessment are presented in Table 7.7.

Table 7.7. Group mean scores for independent word learning assessment

		N	*M (SD)*	Median	Range
(a) Number of words identified as unknown (max 56)	Time 1	78	3.72 (1.22)	4	1 - 7
	Time 2	78	3.05 (1.41)	3	0 - 7
	Time 3	78	2.37 (1.61)	2	0 - 7
(b)* Number of words' meaning correctly derived	Time 1	78	1.27 (.93)	1	0 - 4
	Time 2	75	.99 (.99)	1	0 - 4
	Time 3	67	.94 (.98)	1	0 - 3
(c) (b) as a percentage of (a)*	Time 1	78	32.43% (24.54)	31	0 - 100
	Time 2	75	29.93% (30.50)	33	0 - 100
	Time 3	67	31.69% (33.99)	25	0 - 100
Number of word-learning strategies listed (max 9) **	Time 1	75	2.69 (1.04)	3	0 - 5
	Time 2	76	2.60 (1.13)	3	0 - 6
	Time 3	77	2.93 (.89)	3	0 - 5

Key: Time 1 = pre- usual teaching practice
Time 2 = post- usual teaching practice and pre- Word Discovery intervention
Time 3 = post- Word Discovery intervention
* Statistics based on N=67.
** Statistics based on N=72 due to omission of this question with some students.

7.2.2.1 Use of independent word learning strategies (hypothesis 8)

Hypothesis 8 stated that there would be no significant increase in students' ability to derive the meaning of unknown words following topic 1 (usual teaching practice), but a significant increase following topic 2 (Word Discovery intervention). This hypothesis was explored through a three-stage process outlined in sections (a), (b), and (c) below.

(a) Number of words identified as unknown

The data were normally distributed; therefore, a one-way related ANOVA was conducted to examine changes in the number of words which the participants identified as unknown over time. The independent variable was time, with three levels (Time 1, Time 2, and Time 3), and the dependent variable was the number of words which the participants identified as unknown. There was a significant change in the number of words identified as unknown over time, $F(2, 154) = 43.655$, $p < .001$; $\eta_p^2 = .362$, large effect size. Planned pairwise comparisons with Bonferroni corrections indicated a significant decrease between Time 1 ($M = 3.72$, $SD = 1.22$) and Time 2 ($M = 3.05$, $SD = 1.42$), $p < .001$; and also between Time 2 and Time 3 ($M = 2.37$, $SD = 1.61$), $p < .001$. This indicated that, as a group, students identified fewer words as unknown with each succeeding timepoint.

(b) Number of words whose meaning was correctly derived

These data were also normally distributed; therefore, a second one-way related ANOVA was conducted to examine changes in participants' ability to derive the meaning of unknown words over time. The independent variable was time, with three levels (Time 1, Time 2, and Time 3), and the dependent variable was the number of words whose meanings were correctly derived. The ANOVA indicated a significant change in the number of words whose meanings were correctly derived over time, with fewer word meanings being correctly derived at each succeeding timepoint, $F(2, 132) = 3.670$, $p = .028$: $\eta_p^2 = .053$, small - medium effect size. Inspection of the data indicated that there was a greater decrease between Time 1 ($M = 1.27$, $SD = .931$) and Time 2 ($M = .99$, SD = .992), than between Time 2 and Time 3 ($M = .94$, $SD = .983$). However, once Bonferroni corrections were applied, the decrease between Time 1 and Time 2 was not significant ($p = .075$), nor was the decrease between Time 2 and Time 3 ($p = 1.000$).

Because students had identified fewer unknown words each time, the number of words whose meaning was correctly derived was also likely to decrease, as borne out by this analysis. Therefore, it was more meaningful to examine the number of words whose meaning was correctly derived as a percentage of words identified as unknown, rather than numerically.

(c) Percentage of words' meaning correctly derived

Because these data were poorly distributed and demonstrated floor effects, non-parametric analysis (Friedman's one-way ANOVA) was conducted. The independent variable was time, with three levels (Time 1, Time 2, and Time 3), and the dependent variable was the percentage of words whose meaning was correctly derived. This percentage did not significantly change over time ($\chi^2(2) = .804$, $p = .669$); therefore, hypothesis 8 was not supported.

7.2.2.2 Awareness of word-learning strategies (hypothesis 9)

Hypothesis 9 stated that there would be no significant increase in awareness of word-learning strategies following topic 1 (usual teaching practice), but a significant increase following topic 2 (Word Discovery intervention). These data were normally distributed, so a further one-way related ANOVA was conducted to examine changes in awareness of word-learning strategies over time. The independent variable was time, with three levels (Time 1, Time 2, and Time 3), and the dependent variable was the number of strategies listed by students. There was a numerical increase in the number of strategies listed over time, but this change fell short of significance, F $(2,142) = 2.467$, $p = .088$: $\eta_p^2 = .034$, small to medium effect size. Pairwise comparisons showed a negligible decrease in the number of strategies listed between Time 1 ($M = 2.69$, $SD = 1.04$) and Time 2 ($M = 2.60$, $SD = 1.13$), $p = 1.000$; and a slight but non-significant increase between Time 2 and Time 3 ($M = 2.93$, $SD = .89$), $p = .071$. Therefore, hypothesis 9 was not supported.

7.2.3 Science attainment (hypothesis 10)

In order to assess the impact of Word Discovery on science attainment, the researcher requested science attainment data at the end of topic 1 and at the end of topic 2. It was hypothesised that increase in students' science attainment would be greater following topic 2 (Word Discovery intervention) than following topic 1 (usual teaching practice).

Five schools (schools 2, 4, 5, 6, and 7) supplied science attainment data, but only schools 2 and 5 supplied data which allowed a distinction to be made between attainment in topic 1 and attainment in topic 2. These data are reported in Table 7.8.

Table 7.8. Science attainment

School and year group	Number of participants	Topic 1 test scores*	Topic 2 test scores**	Mean gain in test scores	Topic 1 National Curriculum level*	Topic 2 National Curriculum level**	Mean gain in National Curriculum levels
2 Y7	7	14.71/35	15.71/35	+1	4.14	5.71	+1.57
2 Y8	2	13.5/29	17.5/29	+4	5.5	5.5	0
5	3	20.7/50	18/50	-2.7	-	-	-

* Post- usual teaching practice
** Post- Word Discovery intervention

With such a small amount of data, and inconsistency in the data supplied, it was not possible to conduct meaningful analysis with regard to the impact of Word Discovery on science attainment.

7.2.4 Summary of independent word learning

These results show that there was a decrease in the number of words which students identified as unknown after each teaching condition, but the percentage of these words whose meaning students correctly derived did not change over time. There was a small but non-significant increase in the number of word-learning strategies listed by students, no change in standardised vocabulary assessment scores over time, and insufficient data on science attainment was received. Findings concerning the impact of Word Discovery intervention on students' independent word learning skills are, therefore, inconclusive.

7.3 Predictors of increases in word knowledge (RQ3)

Hypotheses 11 to 14 related to the exploration of relationships between students' language and cognitive characteristics and their ability to respond to Word Discovery intervention.

Hypothesis 11 stated that there would be a relationship between existing receptive vocabulary and increases in word knowledge, such that students who had higher existing receptive vocabulary levels would demonstrate greater increases in experimental word knowledge than those with lower existing receptive vocabulary levels.

Hypothesis 12 stated that there would be a relationship between sentence recall and increases in word knowledge, such that students who have higher sentence recall ability would demonstrate greater increases in experimental word knowledge than those with lower existing sentence recall ability.

Hypothesis 13 stated that there would be a relationship between verbal working memory and increases in word knowledge, such that students who had higher verbal working memory ability would demonstrate greater increases in experimental word knowledge than those with lower existing verbal working memory ability.

Hypothesis 14 stated that there would be a relationship between phonological awareness and increases in word knowledge, such that students who had higher phonological awareness ability would demonstrate greater increases in experimental word knowledge than those with lower existing phonological awareness ability.

Increases in experimental word knowledge were examined by entering pre-intervention scores in the first step of the regressions, to control for levels of word knowledge at pre-intervention. Post-intervention or follow-up scores acted as the dependent variable. This approach was preferred to using pre-to-post or pre-to-follow-up change scores, due to the potential unreliability of change scores where gains are small (Rogosa & Willett, 1983).

To investigate the hypotheses, four hierarchical multiple regression analyses were conducted, as follows:

1. In the first regression analysis, pre-intervention scores for depth of word knowledge of experimental words were entered into the model in step 1, and the dependent variable was *post-intervention* depth of word knowledge of experimental words.

2. In the second regression analysis, pre-intervention scores for depth of word knowledge of experimental words were entered into the model in step 1, and the dependent variable was *follow-up* depth of word knowledge of experimental words.

3. In the third regression analysis, pre-intervention scores for expressive word use of experimental words were entered into the model in step 1, and the dependent variable was *post-intervention* expressive word use of experimental words.

4. In the fourth regression analysis, pre-intervention scores for expressive word use of experimental words were entered into the model in step 1, and the dependent variable was *follow-up* expressive word use of experimental words.

Based on the literature (e.g. Clark, 1995; Rice & Hoffman, 2015), it was expected that chronological age and nonverbal ability (NVIQ) would influence increases in word knowledge. Therefore, in all the regressions, the effects of age and NVIQ were additionally controlled by entering age and WASI-2 Matrix Reasoning scores in step 1, along with the pre-intervention scores. The aim of the hierarchical multiple regressions was to determine if the addition of receptive vocabulary, sentence recall, verbal working memory, and phonological awareness ability predicted increases in word knowledge over and above age and NVIQ. Therefore, in all the regressions, standard scores from the BPVS-3, CELF-4 UK Recalling Sentences subtest, WMTBC Listening Recall subtest, and PhAB Spoonerisms subtest were entered in step 2.

Thus, seven independent variables were investigated in the model. Tabachnick and Fidell (2014) suggest that for seven independent variables, where a medium effect size is expected, a minimum sample size should be 111. The original target for recruitment in the current study was 120 which could have achieved a sample size approximating 111 if attrition rates had been as expected.

However, as was explained in section 6.5.3.2, attrition rates were higher than expected. As the final sample size was 78, the results of the hierarchical multiple regressions are, therefore, presented here as exploratory. Most other assumptions for the validity of the hierarchical multiple regressions were met, but some were borderline. These borderline assumptions were accepted for the purposes of the current analysis, as the regressions were exploratory only.

In each regression, the independent variables were entered in the following sequence:

Step 1: Chronological age
NVIQ (WASI-2 Matrix Reasoning SS)
Pre-intervention scores
Step 2: Receptive vocabulary (BPVS-3 SS)
Sentence recall (CELF-4 UK Recalling Sentences SS)
Verbal working memory (WMTBC Listening Recall SS)
Phonological awareness (PhAB Spoonerisms SS).

7.3.1 Predictors of increase in depth of word knowledge (hypotheses 11 and 12)

Regression 1: Dependent variable - post-intervention depth of word knowledge of experimental words.

There was independence of observations, as assessed by a Durbin-Watson statistic of 1.577. There was linearity, as assessed by visual inspection of partial regression plots. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1 (lowest value was .770). There were no studentized deleted residuals greater than ±3 standard deviations. There were two leverage values greater than 0.2 (.219 and .212) (0.2 – 0.5 is regarded to be within the “risky” range (Laerd, 2015), and there were no values for Cook's distance above 1 (highest value was .108). The normal P-P Plot was slightly left-skewed.

At step 1, age was not a significant predictor of post-intervention depth of word knowledge scores (β = .082, p = .383); but NVIQ (β = .246, p = .011) and pre-intervention depth of word knowledge scores (β = .519, p < .001) were both significant predictors. Together, these three variables explained 36.6% of the variance in post-intervention depth of word knowledge scores, R^2 = .366, F(3, 77) = 14.236, p < .001, adjusted R^2 = .340. In the full model, NVIQ just retained significance (β = .210, p = .046), and pre-intervention depth of word knowledge scores were still highly significant (β = .475, p < .001); however, no other variables contributed significantly to the model. The full model of age, NVIQ, pre-intervention depth of word knowledge scores, receptive vocabulary, sentence recall ability, verbal working memory, and phonological awareness was significant, R^2 = .396, F(7, 77) = 6.545, p < .001, adjusted R^2 = .335; but receptive vocabulary, sentence recall ability, verbal working memory, and phonological awareness together only added 3% of the variance, a non-significant finding (p = .493). See Table 7.9 for details of the regression model.

Table 7.9. Hierarchical multiple regression predicting post-intervention depth of word knowledge of experimental words from age, NVIQ, pre-intervention scores, receptive vocabulary, sentence recall, verbal working memory, and phonological awareness

Post-intervention depth of word knowledge				
	Step 1		**Step 2**	
Variable	B	β	B	β
Constant	-9.315		-15.725	
Age	.035	.082	.046	.109
NVIQ	.091	.246*	.078	.210*
Pre-intervention depth of word knowledge scores	.794	.519***	.728	.475***
Receptive vocabulary			.017	.040
Sentence recall			.042	.159
Verbal working memory			-.004	-.018
Phonological awareness			.021	.045
R^2	.366		.396	
F	14.236***		6.545***	
ΔR^2	.366		.030	
ΔF	14.236***		.859	

* Significant at the *p* <.05 level
*** Significant at the *p* < .001 level

Regression 2: Dependent variable - follow-up depth of word knowledge of experimental words.

There was independence of observations, as assessed by a Durbin-Watson statistic of 1.731. There was linearity, as assessed by visual inspection of partial regression plots. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1 (lowest value was .770). There were no studentized deleted residuals greater than ±3 standard deviations. There were two leverage values greater than 0.2 (.219 and .212), and there were no values for Cook's distance above 1 (highest value was .101). The assumption of normality was met, as assessed by a normal P-P Plot.

At step 1, age was not a significant predictor of follow-up depth of word knowledge scores (β = .106, p = .237); but NVIQ (β = .260, p = .005) and pre-intervention depth of word knowledge scores (β = .561, p < .001) were both significant predictors. Together, these three variables explained 42.5% of the variance in post-intervention depth of word knowledge scores, R^2 = .425, F(3, 77) = 18.242, p < .001, adjusted R^2 = .402. In the full model, NVIQ remained significant (β = .235, p = .021), and pre-intervention depth of word knowledge scores were still highly significant (β = .533, p < .001); however, no other variables contributed significantly to the model. The full model of age, NVIQ, pre-intervention depth of word knowledge scores, receptive vocabulary, sentence recall ability, verbal working memory, and phonological awareness was significant, R^2 = .448, F(7, 77) = 8.113, p < .001, adjusted R^2 = .393; but receptive vocabulary, sentence recall ability, verbal working memory, and phonological awareness together only added 2.3% of the variance, a non-significant finding (p = .580). See Table 7.10 for details of the regression model.

Table 7.10. Hierarchical multiple regression predicting follow-up depth of word knowledge of experimental words from age, NVIQ, pre-intervention scores, receptive vocabulary, sentence recall, verbal working memory, and phonological awareness

Follow-up depth of word knowledge				
	Step 1		**Step 2**	
Variable	B	β	B	β
Constant	-12.115		-16.821	
Age	.045	.106	.054	.129
NVIQ	.095	.260**	.086	.235*
Pre-intervention depth of word knowledge scores	.849	.561***	.807	.533***
Receptive vocabulary			-.002	-.005
Sentence recall			.038	.146
Verbal working memory			.003	.012
Phonological awareness			.013	.028
R^2	.425		.448	
F	18.242***		8.113***	
ΔR^2	.425		.023	
ΔF	18.242***		.722	

* Significant at the p <.05 level
** Significant at the p < .01 level
*** Significant at the p < .001 level

7.3.2 Predictors of increase in expressive word use (hypotheses 13 and 14)

Regression 3: Dependent variable - post-intervention expressive word use of experimental words.

There was independence of observations, as assessed by a Durbin-Watson statistic of 1.774. There was linearity, as assessed by visual inspection of partial regression plots. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1 (lowest value was .835). There were no studentized deleted residuals greater than ±3 standard deviations. There were no values for Cook's distance above 1 (highest value was .090). There were two leverage values greater than 0.2 (.209 and .206), and the normal P-P Plot was slightly left-skewed.

At step 1, age was not a significant predictor of post-intervention expressive word use scores (β = .062, p = .548); but NVIQ (β = .242, p = .023) and pre-intervention expressive word use scores (β = .357, p = .001) were both significant predictors. Together, these three variables explained 20.9% of the variance in post-intervention expressive word use scores, R^2 = .209, $F(3, 77)$ = 6.506, p = .001, adjusted R^2 = .177. In the full model, NVIQ was no longer significant (β = .188,

p = .112), but pre-intervention expressive word use scores were still highly significant (β = .348, p = .002); however, no other variables contributed significantly to the model. The full model of age, NVIQ, pre-intervention expressive word use scores, receptive vocabulary, sentence recall ability, verbal working memory, and phonological awareness was significant, R^2 = .240, F(7, 77) = 3.158, p =.006, adjusted R^2 = .164; but receptive vocabulary, sentence recall ability, verbal working memory, and phonological awareness together only added 3.1% of the variance, a non-significant finding (p = .581). See Table 7.11 for details of the regression model.

Table 7.11. Hierarchical multiple regression predicting post-intervention expressive word use of experimental words from age, NVIQ, pre-intervention scores, receptive vocabulary, sentence recall, verbal working memory, and phonological awareness

Post-intervention expressive word use				
	Step 1		**Step 2**	
Variable	B	β	B	β
Constant	-4.318		07.427	
Age	.012	.062	.017	.086
NVIQ	.042	.242*	.033	.188
Pre-intervention expressive word use scores	.876	.357**	.855	.348**
Receptive vocabulary			.017	.086
Sentence recall			.017	.134
Verbal working memory			-.002	-.019
Phonological awareness			.009	.042
R^2	.209		.240	
F	6.506**		3.158**	
ΔR^2	.209		.031	
ΔF	6.506**		.720	

* Significant at the p <.05 level
** Significant at the p < .01 level

Regression 4: Dependent variable – follow-up expressive word use of experimental words.

There was independence of observations, as assessed by a Durbin-Watson statistic of 1.797. There was linearity, as assessed by visual inspection of partial regression plots. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1 (lowest value was .835). There was one studentized deleted residual greater than ±3 standard deviations (3.708). There were no values for Cook's distance above 1 (highest value was .087). There were two leverage values greater than 0.2 (.209 and .206), and the normal P-P Plot was slightly left-skewed.

At step 1, age was not a significant predictor of post-intervention expressive word use scores (β = .034, p = .744); but NVIQ was a marginally significant predictor (β = .209, p = .048), and pre-intervention expressive word use scores (β = .387, p < .001) were highly significant. Together, these three variables explained 21.2% of the variance in post-intervention expressive word use scores, R^2 = .212, F(3, 77) = 6.624, p = .001, adjusted R^2 = .180. In the full model, NVIQ was no longer a significant predictor (β = .191, p = .108), but pre-intervention expressive word use scores were still highly significant (β = .371, p = .001); however, no other variables contributed significantly to the model. The full model of age, NVIQ, pre-intervention expressive word use scores, receptive vocabulary, sentence recall ability, verbal working memory, and phonological awareness was significant, R^2 = .232, F(7, 77) = 3.022, p =.008, adjusted R^2 = .155; but receptive vocabulary, sentence recall ability, verbal working memory, and phonological awareness together only added 2% of the variance, a non-significant finding (p = .761). See Table 7.12 for details of the regression model.

Table 7.12. Hierarchical multiple regression predicting follow-up expressive word use of experimental words from age, NVIQ, pre-intervention scores, receptive vocabulary, sentence recall, verbal working memory, and phonological awareness

Follow-up expressive word use				
	Step 1		**Step 2**	
Variable	B	β	B	β
Constant	-2.874		-6.012	
Age	.006	.034	.013	.070
NVIQ	.033	.209*	.030	.191
Pre-intervention expressive word use scores	.872	.387***	.836	.371**
Receptive vocabulary			.006	.034
Sentence recall			.012	.107
Verbal working memory			-.006	-.068
Phonological awareness			.017	.088
R^2	.212		.232	
F	6.624**		3.022**	
ΔR^2	.212		.020	
ΔF	6.624**		.465	

* Significant at the p <.05 level
** Significant at the p < .01 level
*** Significant at the p < .001 level

7.3.3 Summary of predictors of increase in word knowledge

Assumptions for conducting hierarchical multiple regressions with the current data and sample size were borderline, therefore the regressions were exploratory only. None of the models demonstrated any predictive value for receptive vocabulary, sentence recall ability, verbal working memory, or phonological awareness, with regard to increase in depth of word knowledge or expressive word use of experimental words. Therefore, hypotheses 11, 12, 13, and 14 were not supported.

7.4 Teachers' and students' views (RQ4)

7.4.1 Confidence of teachers (hypothesis 15)

It was hypothesised (H15) that teachers' confidence in teaching vocabulary to adolescents with language disorder would increase following participation in the study.

Data to answer this question were obtained through a teacher questionnaire at Time 2 and Time 3. See section 6.7.5.2 and Appendix 6N for further detail of the teacher questionnaire. Twenty-eight completed Time 3 questionnaires were received.

At the beginning of the teacher training session, which took place at Time 2 prior to topic 2 (Word Discovery intervention), teachers were given a questionnaire consisting of one question, asking them to rate their agreement with the following statement: "I am confident at teaching vocabulary to students aged 11 – 16 years who have language difficulties," on a five-point Likert scale of: *strongly disagree; disagree; undecided; agree;* and *strongly agree*. This question was repeated in the Time 3 teacher questionnaire following Word Discovery intervention. Thirty-three Time 2 questionnaires were distributed pre-training, of which 28 were returned. Three of these were returned anonymously. The Time 2 questionnaire was not distributed in school 1, therefore no pre-training measure of confidence for teachers 1, 2, and 3 was obtained. One teacher (T.30) rated 5 (*strongly agree*) on the pre-training questionnaire, and 1 (*strongly disagree*) on the post-intervention questionnaire. It seemed likely that the direction of the scale had been misinterpreted at one or other of the timepoints, therefore this teacher's responses were excluded from analysis.

Wilcoxon's signed ranks was performed on pre-training and post-intervention levels of confidence for all teachers who returned questionnaires at both timepoints (N=14). The group mean for pre-training confidence was 3.29 (SD = .83), and the group mean for post-intervention confidence was 3.79 (SD = .58). This suggests a slight increase in confidence following participation in the study, which was of borderline significance (W = -1.993, p = .053). Thus, there was tentative support for hypothesis 15.

7.4.2 Teachers' views on the Word Discovery activities

In the Time 3 (post-intervention) questionnaire, teachers were asked: if they had previously used any of the word-learning activities; how easy the activities were to implement; how effective the activities were; and how likely they were to use the activities again. Teachers were also asked how helpful they found the teacher / speech and language therapist (SLT) collaboration, and if participating in the project had changed their practice.

In the analyses which follow in this section, Wilcoxon's signed ranks were employed to investigate differences in how the teachers perceived the activities. There was a variation in the number of responses for each activity, and some missing data due to teachers omitting some questions in the questionnaire; therefore, these analyses should be taken as indicative only. Because of this, the data are reported in tabular form as well as graphic form, to enable visual inspection and facilitate interpretation.

7.4.2.1 Previous use of the word-learning activities

Teachers were asked if they had done each word-learning activity before. There were 26 responses to this question. Responses indicated that teachers interpreted the wording of activities quite widely, their answers referring not only to the specific Word Discovery activities of this study. For example, 16/28 teachers said that they had used the key word sheet before, even though this was an author-created resource being used in this study for the first time. Therefore, although results are reported in Table 7.13, this question is of limited validity, and no conclusions can be drawn about how unfamiliar the Word Discovery activities were to the participating teachers.

Table 7.13. Teachers' reported previous use of word-learning activities

	Number of teachers (out of 26) reporting previous use of word-learning activities
Display key words with visual image	20
Key word sheet	16
Self-rating checklist	13
Sound and meaning bingo	11
Word map	4
Word detective	3
Word wise quickie	1

7.4.2.2 Ease of implementation

Teachers were asked to rate their agreement with the statement "The activities were easy to implement." Teachers' ratings, collated and ranked, are presented in Table 7.14.

Wilcoxon's signed ranks indicated that teachers found displaying visual images the easiest to implement, rating it as being significantly easier than the word detective (Z = -4.165, p < .001), the word map (Z = -3.230, p = .001), the word wise quickie (Z = -2.939, p = .003), and sound and meaning bingo (Z = -2.098, p = .036). The self-rating checklist was also rated highly, being perceived as significantly easier to implement than the word detective (Z = -4.098, p < .001), the word map (Z = -2.960, p = .003), and the word wise quickie (Z = -2.923, p = .003). The key word sheet was the next easiest to implement, perceived as being significantly easier than the word detective (Z = -3.440, p = .001) and the word map (Z = -2.467, p = .014). The sound and meaning bingo was significantly easier to implement than the word detective (Z = -2.803, p = .005). All other comparisons were non-significant. Teachers' views on how easy the Word Discovery activities were to implement are represented in Figure 7.3.

Table 7.14. Teachers' ratings for ease of implementation for each word-learning activity

Word-learning activity	**Ease of implementation (1 – strongly disagree, 5 = strongly agree) *M* (*SD*)**
Display key words with visual image	4.35 (.745)
Self-rating checklist	4.25 (.75)
Key word sheet	4.04 (.98)
Sound and meaning bingo	3.89 (.96)
Word wise quickie	3.59 (.98)
Word map	3.36 (1.06)
Word detective	3.07 (.917)

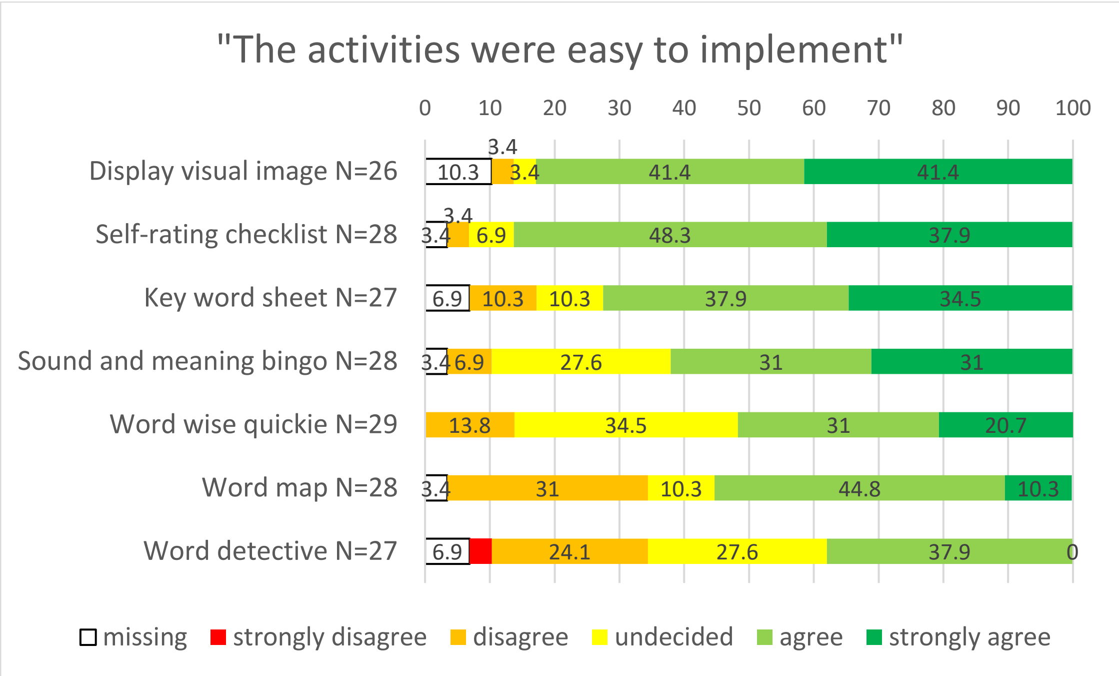

Figure 7.3. Teachers' ratings for ease of implementation

Key: N = the number of responses to this question.
Data labels represent percentages.

7.4.2.3 Effectiveness of the word-learning activities

For each word-learning activity, teachers were asked to rate their agreement with the statement "The activities were effective in enabling the students to learn the curriculum vocabulary." Teachers' ratings, collated and ranked, are presented in Table 7.15.

Wilcoxon's signed ranks indicated that displaying the visual images was perceived as being the most effective in enabling students to learn the curriculum vocabulary, receiving significantly higher ratings than the self-rating checklist (Z = -3.216, p = .001), the word detective (Z = -3.161, p = .002), the word wise quickie (Z = -3.522, p = < .001), and sound and meaning bingo (Z = -2.751, p = .006). The key word sheet was also rated highly, being perceived as significantly more effective than the self-rating checklist (Z = -2.496, p = .013), the word detective (Z = -2.808, p = .005), the word wise quickie (Z = -2.824, p = .005), and sound and meaning bingo (Z = -2.696, p = .007). The word map was perceived as significantly more effective than the word detective (Z = -2.501, p = .012) and the word wise quickie (Z = -2.488, p = .013). All other comparisons were non-significant. Teachers' views on the effectiveness of the word-learning activities are represented in Figure 7.4.

Table 7.15. Teachers' ratings for effectiveness of each word-learning activity

Word-learning activity	**Effectiveness (1 – strongly disagree, 5 = strongly agree) *M* (*SD*)**
Display key words with visual image	4.08 (.72)
Key word sheet	4.00 (.80)
Word map	3.85 (.88)
Sound and meaning bingo	3.44 (.70)
Self-rating checklist	3.41 (.84)
Word wise quickie	3.32 (.72)
Word detective	3.24 (.88)

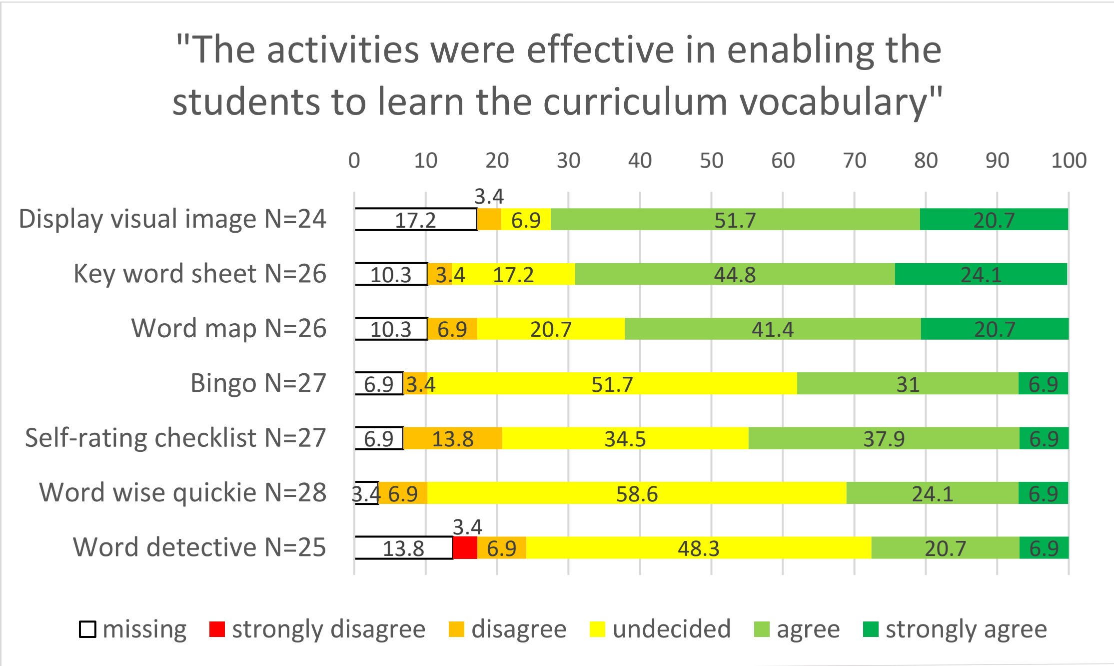

Figure 7.4. Teachers' ratings for effectiveness of each word-learning activity

Key: N = the number of responses to this question.
Data labels represent percentages.

7.4.2.4 Intention to use the word-learning activities again

Teachers were asked to rate their agreement with the statement "I will use these activities again," for each activity. Teachers' ratings, collated and ranked, are presented in Table 7.16.

Wilcoxon's signed ranks indicated that displaying the visual images was the activity which teachers reported they were most likely to use again, being rated significantly more highly than the self-rating checklist (Z = -2.183, p = .029), the word detective (Z = -4.008, p < .001), the word map (Z = -2.581, p = .010), the word wise quickie (Z = -2.982, p = .003), and sound and meaning bingo (Z = -2.385, p = .017). The activity which teachers reported they were least likely to use again was the word detective, which received significantly lower ratings than the key word sheet (Z = -3.482, p < .001), the word map (Z = -2.906, p = .004), and sound and meaning bingo (Z = -2.982, p = .003). All other comparisons were non-significant. Teachers' intention to use the word-learning activities again is represented in Figure 7.5.

Table 7.16. Teachers' intention to use the word-learning activities again

Word-learning activity	**Intention to use activity again (1 – strongly disagree, 5 = strongly agree) *M* (*SD*)**
Display key words with visual image	4.32 (.80)
Key word sheet	4.08 (.91)
Self-rating checklist	4.00 (.89)
Word map	3.85 (.97)
Sound and meaning bingo	3.80 (.87)
Word wise quickie	3.59 (1.05)
Word detective	2.96 (.81)

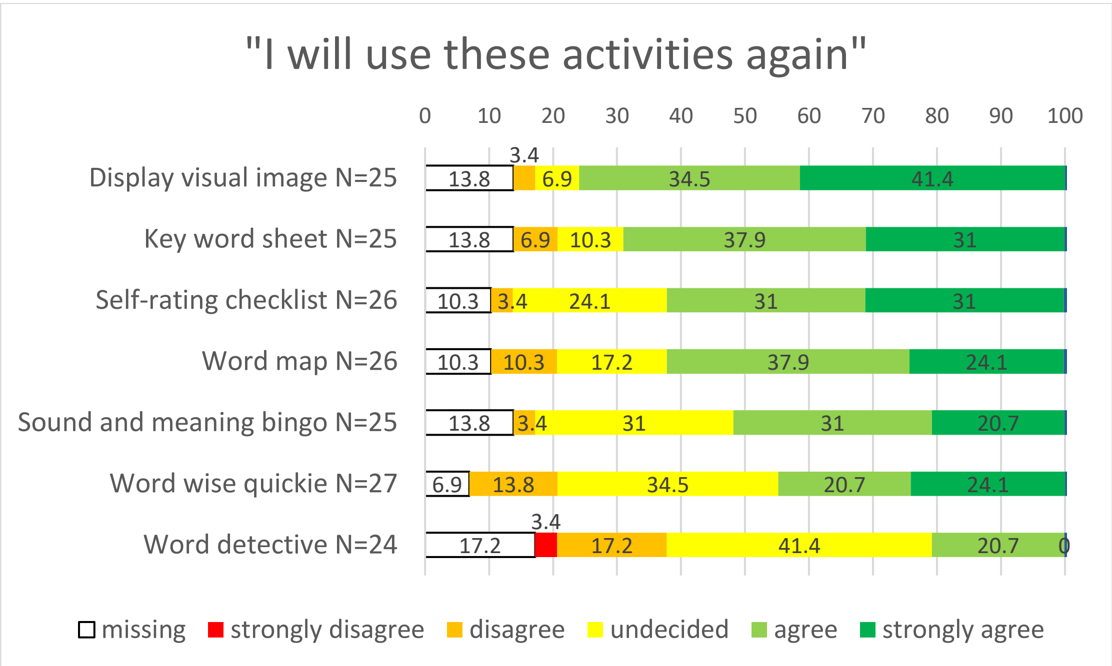

Figure 7.5. Teachers' intention to use the word-learning activities again

Key: N = the number of responses to this question.
Data labels represent percentages.

7.4.3 Teacher/SLT collaboration

Teachers were asked to rate their agreement with the statement "I found the teacher / speech and language therapist[12] collaboration helpful." There were 27 responses to this question. Twenty-five teachers agreed or strongly agreed that the teacher/SLT collaboration was helpful, and two teachers were undecided.

7.4.4 Change in practice

Teachers were asked if participating in the project had changed their practice, and if so, how. There were 25 responses to this question. Twenty-three teachers reported that taking part in the project had changed their practice, and two reported that it had not. These two teachers did not elaborate. Teachers' explanations as to how their practice had changed were inputted into NVivo 11 and coded, to identify recurring themes. Themes centred around increased awareness of the amount and complexity of curriculum vocabulary (7 comments), and an intention to use the activities in the future (14 comments), for example:

> *"I have become more aware of the need to dedicate specific time to key words."* (T.19)

> **"***I will use the word map and the A-Z key words sheet as students quickly got into the routine of using it. Bingo was quick and fun for the students. I found that by doing all these small activities - the students remembered the words much faster and their meanings and even my lower ability students had more confidence with the words."* (T.33)

7.4.5 Further comments

Teachers were given a free-text field to add further comments at the end of the questionnaire. Thirteen teachers took this opportunity. Comments were inputted into NVivo 11 and coded, in order to identify recurring themes. The most frequent theme (6 comments) related to the pressures of time, for example:

> *"Although I can see the merits of several of the activities, I found that time restraints made it difficult to implement them as frequently as requested. It was very difficult to fit activities into lessons and still cover the large amount of required content, which resulted in me falling behind schedule with the class."* (T.28)

The second most commonly cited theme was that lower ability students found the activities difficult to access (5 comments), for example:

> *"I think [the word-learning activities] worked well for year 7 students but [not] necessarily those who had been identified. Stronger pupils may have taken over in some aspects. Perhaps some preliminary training with the selected children initially would have meant they used it more automatically/efficiently in lessons."* (T.17)

[12] The SLT was the current researcher.

7.4.6 Students' preference for model of delivery (hypothesis 16)

Hypothesis 16 stated that students would prefer a whole-class model of vocabulary intervention delivery over a small-group or individual model. Student views were obtained during a verbally-administered questionnaire at Time 3 (post- experimental intervention). Details of the questionnaire can be found in section 6.7.5.1 and Appendix 6L.

At Time 3, students were asked whether they would prefer to do word-learning activities one-to-one, in small groups, as a whole class, or in a different way, and their reasons for this. Results are illustrated in Figure 7.6.

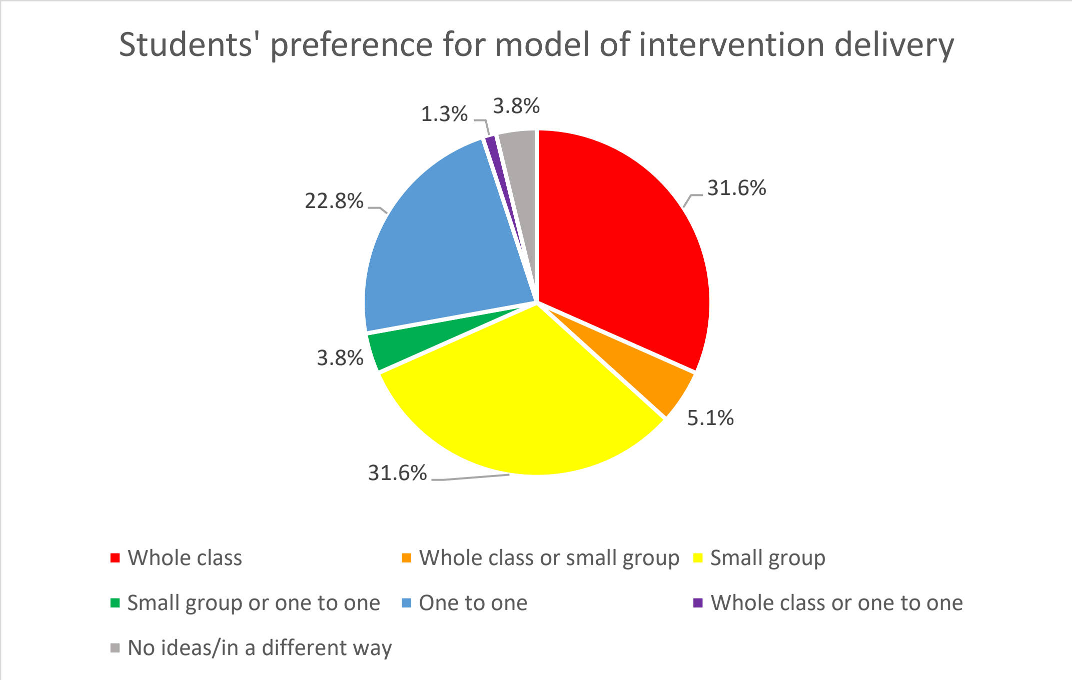

Figure 7.6. Students' preference for model of intervention delivery

Reasons given were inputted into NVivo 11 and coded, in order to identify recurring themes. Approximately one third of students (31.6%) said that they would prefer to stay in the whole class. The most common reason cited (9 comments) was the benefit of learning from peers, for example:

> *"We can discuss together if somebody's wrong; the teacher or another pupil can make us correct and we can write the correct thing in our paper."* (ID 9)

> *"Because people have different opinions and they might have the right answer and they might help you."* (ID 89)

Others (7 comments) realised it was beneficial for everyone in the class:

> *"Because some people might not know the same word what I don't know, so it's good to make other people know."* (ID 72)

> *"More people that don't understand can all learn it together."* (ID 92)

Conversely, nearly a quarter (22.8%) said that they would prefer to receive vocabulary intervention individually out of class. For many students, this preference was related to their ability to concentrate (9 comments), and feeling less confident in class (5 comments), for example:

> *"Sometimes I can get - forgot what it mean – distract, distracted. I'm not a big fan of a lot of people round me."* (ID 83)

> *"Because it's only you and the teacher and I don't like being in small groups or whole class cos I don't really put my hand up as much cos I get scared if I get the answer wrong." (ID 69)*

> *"In the whole class, I'm not really comfortable with the meaning and if I say it wrong and that. And in small group I sometimes get distracted and I don't concentrate as much. One to one I feel more comfortable and there's no one to make me get distracted and then I can actually think about the word."* (ID 53)

A further third (31.6%) said that they would prefer to receive vocabulary intervention in small groups out of class. Students' comments illustrated the advantages of learning from other people (10 comments), but without the problem of distraction (13 comments), for example:

> *"So not everybody's shouting across the room and more time to think about it and if you're stuck you can ask the people around you."* (ID 41)

> *"One to one is not really helpful – because there's not other people to like express their ideas. Like because when other people express their ideas it kinds of help me. And big groups – there's not much focus. And small groups is good because for example like three to four people, we can all share our ideas and focus."* (ID 4)

Two students reported that they had no ideas, and one student who chose only the "in a different way" option had misunderstood the question:

> *"See it on board, some information about it. See what it is, how the word is spelt and think of what it could be used for." (ID 3)*

To summarise, no clear preference for a particular model of vocabulary intervention delivery emerged; therefore, hypothesis 16 was not supported.

7.4.7 Students' views on the Word Discovery activities

The student questionnaire administered at Time 3 also gathered qualitative data regarding students' views on the helpfulness of the word-learning activities. Students were asked how helpful the word-learning activities were, on a five-point Likert scale of*: not at all helpful; not very helpful; don't know; quite helpful;* and *very helpful*. If a student could not remember an activity, no rating was awarded. Results are illustrated in Figure 7.7. Because the number of responses to each activity varied widely, owing to the numbers of students saying they could not remember doing the activity, ratings have been expressed as percentages.

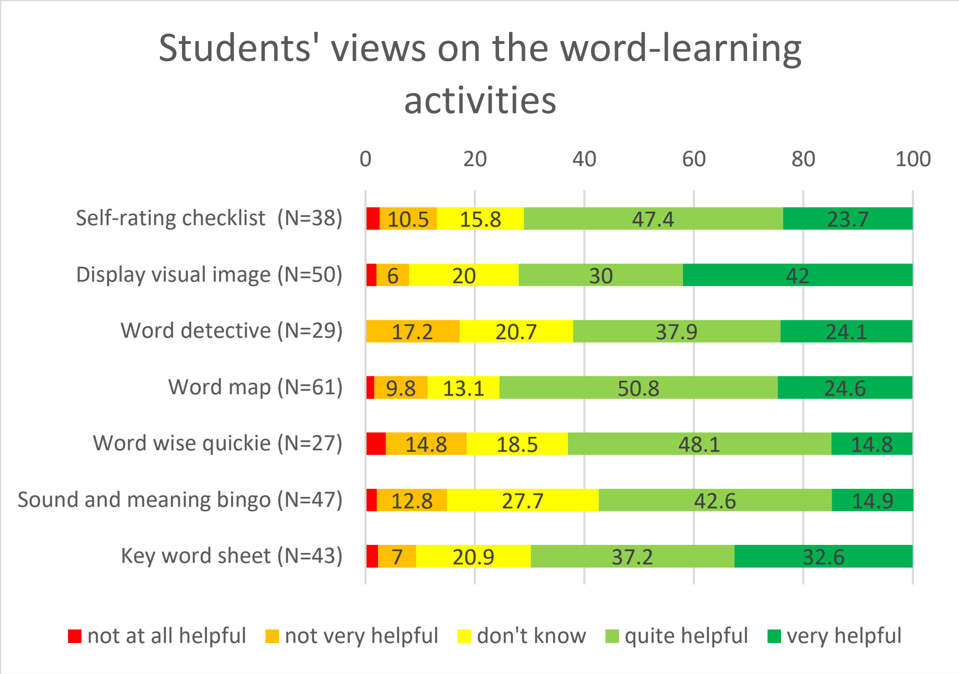

Figure 7.7. Students' ratings for each word-learning activity

Key: N = the number of responses to this question.
Data labels represent percentages.

Student ratings were collated and ranked according to how helpful they found the word-learning activities. The data are presented in Table 7.17.

Table 7.17. Students' mean ratings of helpfulness of the word-learning activities

Word-learning activity	**Helpfulness (1 – not at all, 5 – very) *M* (*SD*)**
Display key words with visual image	3.98 (1.09)
Key word sheet	3.98 (.95)
Word map	3.88 (.96)
Word detective	3.84 (.94)
Self-rating checklist	3.80 (.98)
Sound and meaning bingo	3.54 (1.03)
Word wise quickie	3.50 (1.07)

Wilcoxon's signed ranks were employed to investigate differences in how the students perceived the activities, although it must be noted that due to the wide variation in the number of responses for each activity, these results should be taken as indicative only. As a group, students found the visual image and the key word sheet equally the most helpful. The display of visual images received a significantly higher rating than the word wise quickie (Z = -2.627, p = .009) and sound and meaning bingo (Z = -2.553, p = .011). The key word sheet received a significantly higher rating than the word wise quickie (Z = -2.913, p = .004), and was perceived to be marginally more helpful than sound and meaning bingo (Z = -1.933, p = .053). The next most helpful activity was the word map, which received a higher rating than the self-rating checklist, of borderline significance (Z = -1.975, p = .048). All other differences in how helpful students found the word-learning activities were non-significant.

Students were given the opportunity to give reasons for their rating. A sample of comments for each word-learning activity is included in Table 7.18. The comments included here were chosen as being representative of the range of comments made. Speech marks denote verbatim quotes from the student. Unintelligible segments are denoted by xxx.

Table 7.18. Students' views on the word-learning activities: sample comments

Word-learning activity	**Reasons why quite helpful or very helpful**	**Reasons why not very helpful or not at all helpful**
Self-rating checklist	"Because the first day when we started learning about reproduction, we got to tick it if we don't know it, or very well, and I have mainly all the *not at all* yet, but then at the end of the term when we needed to re-do this table, I had mainly all of them in the *very well* so it did help a lot" (ID 17)	"Because I knew them." (ID 16)
Key words displayed with visual image	"Cos then I can see what to do in the box." (ID 95)	"Not quite because I don't know what the word means, only a picture." (ID 12)
Word detective	"Because in the word - I think it was um – it was a word, but there were two words in it, and if you put them together you get that word" (ID 17)	No comments made.*
Word map	"I had to have the teacher explain what it was cos I didn't really get it at the start, then I got it cos .... he got the plastic sheet out and told us the right decibel. ... it got easier cos I knew what it rhymed with: decibel – bell " (ID 101)	"Cos I knew what it means already – solution." (ID 6)
Word wise quickie	"In the next session she'll mark it then we'll do it again till we understand it." (ID 14)	"Not very helpful cos I sometimes I don't understand what miss is saying." (ID 95)
Sound and meaning bingo	"Because it was fun" (ID 29)	"Because it was just kind of guessing, people shouted out the answers as well so you kind of xxx" (ID 19)
Key word sheet	"Because you got to circle the letter that you knew, that it started with - I think it was testes - you'd circle it, then write the word on the line next to the box, and then write a sentence, and then you could look back, and it was like right there" (ID 17)	"We didn't do it that much and it was sort of like the words diagram really xxx you can look back at but it's not really that helpful." (ID 26)

Key: xxx = unintelligible
* Most (N=58) students could not remember doing the word detective activity.

7.5 Usual teaching practice strategies

The construction of the study also allowed the researcher to gather data which would enable comparison between usual teaching practice and the experimental intervention. This was to enable meaningful comparisons to be made between usual teaching practice and Word Discovery intervention. Usual teaching practice data were gathered during topic 1 in two ways: through strategy records completed by the teachers; and through lesson observation records completed by the researcher.

Usual teaching practice data were analysed through a simple content analysis approach (Flick, 2014). Data from topic 1 strategy records and lesson observation records were inputted into NVivo 11 and categorised according to the vocabulary teaching strategies that were contained in the survey (section 4.4.10 and Appendix 4B). Additional categories were added as they emerged from the data. Some strategies were listed generally more than once by the same teacher, in which case they were only counted once. If they had recorded strategies more than once, but in relation to specific words, each entry was counted. Some entries were coded under more than one category. Results are set out in detail in sections 7.5.1 and 7.5.2, and summarised in section 7.5.3.

7.5.1 Topic 1 (usual teaching practice) strategy records

Thirty-nine topic 1 strategy records (each for a different class), from a total of 27 teachers, were received by the researcher. If the teacher stated exactly the same strategies for each class, duplicates were counted as one entry only. If the teacher stated separate strategies for each word, these were counted as separate entries. The strategy listed most frequently in teachers' strategy records was to play definition games, followed by activities involving spelling practice, and practical demonstration / experiment. Giving definitions and displaying visual images of the key words also featured frequently. Table 7.19 lists the strategies in order of frequency, and a sample entry for each strategy. The sample entries in Table 7.19 have been recorded verbatim, i.e. exactly how they were written by the teacher. Thirty entries were not legible or explicit enough for the researcher to be able to identify a specific strategy. These were coded as *unclear*.

Table 7.19. Usual teaching practice recorded by teachers in topic 1 strategy records

Number of teachers out of 27	Number of entries	Strategy	Sample verbatim entry (teacher number)
12	22	Definition games	Splat is used as a plenary. Definition of words are given and the students have to race each other to splat the correct word. (T.5)
10	11	Spelling	Anagrams and hangman to practise spelling key words. (T.28)
9	44	Practical demonstration / experiment	Hydrogen: Described how it was formed. They did the squeaky pop test. (T.4)
8	20	Give definitions	Fuels: Definition – written in books plus did practical. (T.4)
8	11	Display key words with a visual image	Spot the difference between two pictures, which eventually leads to a definition. (T.1)
7	19	Give examples	Thermal energy: Gave definition of heat being energy. Gave example cup tea versus swimming pool of ice. (T.4)
6	10	Discussion	Kinetic – when discussing changes of state and particles. Definition. (T.25)
6	8	List key words on the board	Keywords displayed on every page of flipchart and referred to. (T.3)
6	8	Teach how to derive meaning from morphology	Looking at the root of words / searching for words with similar roots or meaning. (T.3)
6	7	Encourage students to draw on personal experience related to the word through scaffolded questioning	Ask students what they think / know. (T.27)
6	7	Students write the word	Adding new words to key words boxes and making sure we know the meaning. (T.19)
6	6	Use of a visual image - video	Watch video to collect information, use secondary activity/task to reinforce it. (T.1)
5	7	Students say the word aloud	Class say the word out loud together. (T.2)
5	6	Students to generate their own definition	Present word and example and ask kids to work out definition, then share ideas. (T.19)
5	5	Reading	Bold in text. (T.18)
5	5	Students say the word in a sentence	Used in questioning and asked to include keywords in answers. (T.2)
4	6	Use of a visual image - diagram	Show students a graph or diagram with missing information. Can they work out what is hidden behind different shapes? They have to use their prior knowledge and the shape of the graph or limited information in front of them to understand some concepts, then the word is formally introduced to them. (T.1)
4	6	Repetition	Constantly revisit words (repetition). (T.7)

3	3	Teach phonological awareness of the word	Phonetic spelling. (T.17)
3	3	Students write the word in a sentence	Free writing with key words to include. (T.31)
2	8	Semantic feature analysis	Made them list facts to help them differentiate (between antibody and antibiotic). (T.16)
2	2	Students write the word - cloze	Word fills. (T.31)
2	4	Students write the definition	Construct definition as a class and write down into books – make obvious by highlighting /underlining etc. (T.27)
2	3	Encourage students to think of a personal experience related to the word	Describe new word in non-scientific context first, before applying it to science lesson. (T.1)
2	3	Praise	Recognise / praise correct use of keywords. (T.30)
2	2	Give synonyms	Gradient – similar to slope. (T.31)
2	2	Word generation	Word game A to Z. Name as many diseases as possible (disease). (T.16)
1	1	Find associated words	At the end of the lesson the key words are returned to and the students write a definition or words that go with the key word depending on their ability (T.5)
1	1	Develop student awareness by encouraging students to identify unknown words	All new key words are on all power point slides and the students at the start of the lesson indicate if they know the meaning of the word. Students repeat the key words three times out loud. (T.5)
1	1	Make word vocally salient	Exaggeration. (T.18)
1	1	Students self-rate their own knowledge	All new key words are on all power point slides and the students at the start of the lesson indicate if they know the meaning of the word. Students repeat the key words three times out loud. (T.5)
	30	Unclear	Interactive white board games. (T.7)

The following strategies that were contained in the survey were not recorded in any topic 1 strategy records:

- Students look words up in the dictionary/glossary
- Teach students how to derive meaning from context
- Give examples of use in multiple contexts
- List key words in lesson plans
- Use a must-should-could approach
- Students record new words and meanings in their own vocabulary book.

7.5.2 Topic 1 (usual teaching practice) lesson observation records

Nineteen topic 1 lessons, taken by 14 separate teachers, were observed by the researcher. The researcher collected data on what strategies were used by the teacher when teaching new words. The vocabulary teaching strategy most frequently observed was to list key words on the board, closely followed by the giving of definitions, and paraphrasing to define word meaning. No instances of semantic feature analysis were observed, and only one instance was noted of drawing attention to phonological features of the word. Table 7.20 shows the total number of times each strategy was noted across all 19 lessons, and an example of each strategy. In Table 7.20, italics represent the researcher's notes made during observations, and speech marks represent direct quotes from the teacher.

Table 7.20. Usual teaching practice recorded during topic 1 lesson observations by the researcher

Number of teachers out of 14	Number of occurrences	Strategy	Example (teacher number)
8	10	List key words on the board	*Wrote key words on board during lesson.* (T.21)
7	8	Give definitions	"Volume is the space taken up." (T.31)
6	6	Give definition - paraphrase	"any old how - instead we call it random." (T.22)
4	5	Repetition	*Repeated key words often.* (T.4)
4	4	Reading	"Can you spot a new word on the board?" (T.31)
4	4	Students write the word in a cloze activity	*Written on board: The tap water gets ..... We can measure this with a ....* (T.4)
3	3	Encourage students to draw on personal experience related to the word through scaffolded questioning	*Ten minutes asking for ideas of density and valuing each contribution.* (T.23)
3	3	Students say the word aloud	"What did we say the balls are?" (T.1)
3	3	Give synonyms	"What form is it in? What state is it in?" (T.31)
3	3	Signpost	"We're going to learn some new key words" "We're going to look at a new word today called density" (T.23)
2	2	Students write the definition	"Write the definition of a group - you can find it in your fact sheet." (T.20)
2	2	Definition games	Written word - definition match. (T.27)
2	2	Teach how to derive meaning from morphology	"How can we remember that word [stamen] - has the men in it." (T.7)
2	2	Teacher elicits specific word	*Spoken cloze i.e. teacher scaffolded by pointing to written word:* "It's more ... " *to elicit streamlined rather than smoother.* (T.32)
2	2	Students say the word in a sentence	"Can you use the three key words in your answer?" (T.32)

2	2	Students write the word	"Write down the red key words and write its definition." (T.32)
2	2	Use of a visual image	*Key words displayed with picture*. (T.21)
2	2	Word generation	"How many different substances on the periodic table can you think of?" (T.19)
2	2	Map word to object	*Spoke word* ("tongs") *and asked student to hold up tongs.* (T.33)
1	1	Give examples of use in multiple contexts	"We're using the word solid there to mean something else - it doesn't move." (T.31)
1	1	Give examples	"Hydrogen is what we call the product". (T.4)
1	1	Make word vocally salient	*Highlighted "compressibility" with voice.* (T.31)
1	1	Teach phonological awareness of the word	"Sounds like something you might put on your floor at home - carpet – carpel." (T.7)
1	1	Students self-rate their own knowledge of the word	*Asked how many have used the word particle before.* (T.21)
1	1	Use of a visual image - diagram	*Asked students to label diagram*. (T.27)
1	1	Song	*Played Periodic Table song on YouTube.* (T.19)

Key: Researchers' notes in *italics*
Direct quotes from the teacher in "speech marks"

The only strategy that was listed in topic 1 strategy records, but was not observed during lesson observations, was as follows:

- Find associated words.

The following strategies that were contained in the survey were not observed during lesson observations:

- Develop student awareness by encouraging students to identify unknown words
- Students generate their own definition
- Teach students how to derive meaning from context
- Students look words up in the dictionary/glossary
- List key words in lesson plans
- Use a must-should-could approach
- Students record new words and meanings in their own vocabulary book
- Encourage students to think of a personal experience related to the word
- Semantic feature analysis
- Students write the word in a sentence.

The following strategies were listed in topic 1 strategy records, and were frequently observed during lessons, but had not been recorded as specific vocabulary teaching strategies, because they did not comprise direct strategies to facilitate word learning, such as highlighting semantic or phonological features, or requiring students to say the word.

- Discussion
- Practical demonstration / experiment
- Praise
- Spelling
- Watching a video.

7.5.3 Summary of usual teaching practice results

This directory of strategies in habitual use by teachers portrays the environment in which the word-learning activities subsequently took place, and depicts differences between the usual teaching practice and experimental conditions. The findings can be summarised as follows. Firstly, vocabulary teaching strategies used by teachers predominantly took a semantic (though not specifically semantic feature analysis) and literacy perspective. Only two teachers (eight entries) reported the use of specific aspects of semantic feature analysis, and only three teachers (three entries) reported using activities which involved phonological awareness. Secondly, although there was overlap, some strategies were reported in teachers' strategy records which did not feature in the researchers' lesson observation records, suggesting differing perspectives on what constitutes vocabulary teaching. These points are discussed further in section 7.7.

7.6 Word exposure

In a further comparison between usual teaching practice and the experimental intervention, data was collected from teacher strategy records to establish whether the implementation of Word Discovery resulted in increased exposure to the words.

From the raw data, an average was calculated of the number of times which target words were spoken by the teacher, in the lesson in which the word was introduced, in topic 1 (usual teaching practice) and in topic 2 (Word Discovery). Due to limited teacher compliance with returning completed strategy records, there were gaps in the data; therefore, average exposure was calculated only from those classes where data were available for both topic 1 and topic 2. Table 7.21 gives the average exposure of words on the day that they were introduced (in *italics* for ease of inspection). Where the teacher recorded a range, e.g. 5 – 10, the higher figure is stated and was used for calculations. Table 7.21 also gives the number of words taught in each condition, out of the 10 targeted words.

Wilcoxon's signed ranks test indicated that there was no significant difference between the conditions in the number of words taught (Z = -1.593, p = .111), but that there was a marginally significant difference between the conditions in the amount of exposure the words received (Z = -1.965, p = .049), with the experimental words receiving more exposure (M = 9.7; range per class 5.1 – 19.9) than the usual teaching practice words (M = 8.3; range per class 1.6 – 23.4). Teachers did not have access to the no-intervention words; exposure of these, therefore, was measured only by researcher lesson observations. None of the no-intervention words were observed to have been used, in either phase of the study.

Table 7.21. Word exposure in usual teaching practice and experimental conditions

		Usual teaching practice condition		**Experimental condition**	
School	Class	Number of words taught in topic 1 out of 10	*Average exposure of topic 1 words on the day introduced*	Number of words taught in topic 2 out of 10	*Average exposure of topic 2 words on the day introduced*
1	1	10	*18.1*	9	*14.4*
1	2	10	*18.2*	10	*19.9*
1	4	9		4+	
2	5	8	*8.1*	8	*7.8*
2	6	10	*4.8*	9	*6.2*
2	7	8		9	*7.2*
2	8	10	*3.8*	10	*6.6*
2	9	10		4	
3	10			8	
3	11	7	*5.6*	10	
3	12	8	*3.6*	10	*10.9*
3	13	6	*10.4*	10	
3	14	7	*2.5*		
4	18	5	*2.4*	8	*8.0*
4	19			6	*5.9*
4	20	6+		9	
4	22	4	*2.3*	1+	
4	23			5	
4	25	6	*10.3*	8	*11.1*
5	26	10	*8.0*	9	*17.0*
5	27	9	*4.7*		
6	28	9	*9.5*	9	*10.8*
6	32	7	*4.8*	9	
6	33		*7.6*		
6	34				
6	36				
6	37	10		8	*14.2*
7	38	10	*3.2*	10	*5.9*
7	39	9	*3.3*	10	*5.1*
7	40	9	*3.8*	10	*5.2*
7	41	9	*4.7*	10	
7	42	6	*1.6*	9	*5.4*
8	43	10	*6.6*	10	
8	44	9	*9.0*	10	*7.9*
8	45	10	*23.4*	9	*8.3*
8	46	10	*11.1*	10	*15.6*
Mean		8.5	*8.3*	8.8	*9.7*

7.7 Summary of results

Participants' knowledge of 30 science words was assessed at pre-intervention, post-intervention, and follow-up assessment points: 10 active control words were taught by science teachers through usual teaching practice; 10 matched experimental words were taught by the same teachers using Word Discovery activities; and 10 matched passive control words received no intervention.

Effects of the intervention - w*ord knowledge*

Depth of word knowledge of targeted words significantly increased following usual teaching practice, and this increase was maintained five weeks later. Depth of word knowledge of experimental words also significantly increased following Word Discovery intervention, and this increase was partially maintained five weeks later. At the pre-intervention point, depending on the analysis used, depth of word knowledge of usual teaching practice words either did not differ, or was significantly lower, than that of the experimental words, but at the post-intervention point, depth of word knowledge of experimental words was significantly greater than that of usual teaching practice words. Although this significant difference was not maintained at follow-up, depth of word knowledge of experimental words remained significantly higher at follow-up than at pre-intervention.

Expressive word use of targeted words significantly increased following usual teaching practice, and this increase was maintained five weeks later. Expressive word use of experimental words also significantly increased following Word Discovery intervention, and this increase was partially maintained five weeks later. At the pre-intervention point, expressive word use of usual teaching practice words did not differ from that of experimental words, but at the post-intervention point, expressive word use of experimental words was significantly greater than that of usual teaching practice words, and this significant difference was maintained at follow-up.

These findings demonstrate that Word Discovery intervention was more effective than usual teaching practice in increasing the word knowledge of participating students. There was no change in students' depth of word knowledge or expressive word use of no-intervention words over time, confirming that change in usual teaching practice and experimental word knowledge was not due to maturity or practice effects.

Generalisation effects of the intervention

There was a decrease in the number of words which students identified as unknown after each teaching condition, but the percentage of these words whose meaning students correctly derived did not change over time. There was a small but non-significant increase in the number of word-learning strategies listed by students, and no change in standardised vocabulary assessment scores over time. The impact of Word Discovery intervention on students' independent word learning skills is, therefore, not evident from this study.

Predictors of increase in word knowledge

In hierarchical multiple regression models, NVIQ and pre-intervention scores were significant predictors of post-intervention and follow-up depth of word knowledge of experimental words. With regard to post-intervention and follow-up expressive word use of experimental words, only pre-intervention scores were significant predictors. No other variables (age, receptive vocabulary, verbal working memory, sentence recall, or phonological awareness) demonstrated any predictive value towards post-intervention or follow-up depth of word knowledge or expressive word use.

Teachers' views

There was a non-significant increase in teacher confidence following participation in the intervention study. As a group, teachers felt that the display of visual images and the self-rating checklist were the easiest of the activities to implement. They reported that displaying the visual images was the most effective, followed by the key word sheet, and these were also the two activities which teachers said they would be most likely to use again. Of the three phonological-semantic activities, teachers found the sound and meaning bingo the easiest to implement, but felt that the word map was the most effective. The word map was also the phonological-semantic activity they thought they were most likely to use again. Although a few teachers mentioned barriers to implementing the word-learning activities in the classroom, nearly all the teachers reported that the teacher/SLT collaboration was helpful, and also that participating in the study had positively changed their practice.

Students' views

Preferences for model of intervention delivery were distributed evenly between the options: approximately one third preferring a whole-class model; approximately one third preferring a small-group model; and approximately one quarter preferring individual intervention; with the remaining students stating mixed preferences or no preference. As a group, students were generally positive about all the word-learning activities, finding the display of visual images and the key word sheet the most helpful.

Comparison of usual teaching practice and experimental conditions

In contrast to the experimental intervention, which took a holistic but essentially phonological-semantic approach, the vocabulary teaching strategies used by teachers predominantly took a semantic and literacy approach, with only three teachers reporting activities which involved phonological awareness. The words taught through Word Discovery received marginally more exposure than words taught through usual teaching practice.

Summary of Chapter 7

The current chapter has reported the results of the main experimental study of this thesis, which investigated the effectiveness of Word Discovery intervention for adolescents with language disorder in mainstream secondary school classrooms. The findings will be explored in further depth in the discussion, which follows in Chapter 8.

Chapter 8

The effectiveness of classroom vocabulary intervention for adolescents with language disorder:

Discussion

Overview

This chapter discusses the findings of the main experimental study of this thesis. Thirty teachers implemented Word Discovery, a classroom vocabulary intervention, for 78 mainstream secondary school students with language disorder aged 11 – 14 years. Student participants' knowledge of 30 science words was assessed at four timepoints on two scales: (1) depth of word knowledge, and (2) expressive word use. In the first phase of the study, 10 words from topic 1 were taught by science teachers through usual teaching practice. At the end of topic 1, teachers attended a one-hour training session, in which they learnt and practised phonological-semantic word-activities. In the second phase, 10 matched experimental words from topic 2 were taught by the same teachers using these activities, embedded into the delivery of the syllabus. Ten matched control words received no intervention. Change in word knowledge over time was explored, and teacher and student views on the intervention were sought.

In the current chapter, section 8.1 explores how features of the study design compare with other studies. Section 8.2 discusses the impact of Word Discovery on knowledge of targeted words. Section 8.3 discusses the results of the independent word learning assessment, and issues surrounding the assessment of generalisation effects. Section 8.4 discusses predictors of increases in word knowledge. Section 8.5 considers student views of the model of vocabulary intervention delivery. Following this, each word-learning activity is appraised in section 8.6. The next two sections explore comparisons between usual teaching practice and Word Discovery intervention: section 8.7 with regard to the word-learning activities and strategies used; and section 8.8 with regard to the amount of spoken exposure that the words received. The feasibility of the intervention, incorporating teacher views, is discussed in section 8.9; and lastly, section 8.10 evaluates the limitations of the study. The chapter concludes with a summary, and introduces the reader to Chapter 9, in which clinical and educational implications are discussed, and suggestions made for further research.

8.1 Study design strengths

The study employed a within-subjects repeated measures design. The advantage of this design was that it enabled different teaching conditions to be compared in the same cohort of participants, in a design with sufficient statistical power. Although the projected sample size had been calculated based on a 4 x 3 design, the 3 x 3 analysis resulted in an observed power of 1.000, suggesting that there was a sufficient sample despite the level of attrition. Thus, the study design overcame the sample size limitations of many previous vocabulary intervention studies for adolescents with language disorder. Seventy-eight students and 30 teachers participated in the current study. Of previous studies known to the researcher, four had samples sizes of 10 or below; seven were between 15 and 54; and only two (Joffe, et al., in preparation; Murphy et al., 2017) had sample sizes larger than the current study (358 and 203 respectively). The current study, extending the research of Lowe and Joffe (2017), also overcame a limitation of this earlier study, which was that it had only one participating teacher. Further, the word selection process was more robust than that of Lowe and Joffe, whose results were subject to ceiling effects due to the inclusion of high frequency words already known to the participants. In the current study, teachers supplied the researcher with more than 10 words for each topic so that a pool of words was available, enabling high frequency and difficult-to-match words to be omitted.

A further strength of the study was the demographic heterogeneity of the student cohort. Schools from a number of geographical regions in England participated, resulting in diversity of socio-economic status, English language status, and ethnicity. As such, the findings of the study have wide applicability to populations of adolescents with language disorder.

The experimental study was an effectiveness study, rather than an efficacy study. When choosing an appropriate study design, it is necessary to strike a balance between the empirical soundness of an efficacy study where intervention is tested in ideal conditions, and the practical applicability of an effectiveness study carried out in naturalistic conditions (Craig et al., 2014). In line with Clegg (2014), the current researcher argues that the findings of an effectiveness study, carried out with maximum empirical rigour, make a powerful contribution to the evidence base, because, having met and overcome challenges which parallel real-life circumstances, the findings have direct relevance to practice.

8.2 Word knowledge (RQ1)

The main hypotheses of the intervention study related to the increase in depth of word knowledge and expressive word use of targeted science curriculum words. It was hypothesised that: (H1) the increase in depth of word knowledge, from pre- to post-intervention, of words taught through Word Discovery activities would be greater than for words taught through usual teaching practice; and (H2) maintenance in depth of word knowledge, from post-intervention to follow-up, of words taught through Word Discovery activities would be greater than for words taught through usual teaching practice. There were corresponding hypotheses for expressive word use.

Depth of word knowledge will be considered first.

8.2.1 Depth of word knowledge change pre- to post-intervention (hypothesis 1)

At the pre-intervention point, the 3 x 3 ANOVA showed that depth of word knowledge of usual teaching practice words did not differ from that of experimental words, but the post-intervention point, depth of word knowledge of experimental words was significantly greater than that of usual teaching practice words. This indicated that Word Discovery had a greater effect on depth of word knowledge than usual teaching practice, hence providing support for the first hypothesis. In fact, the 2 x 3 ANOVA, with the same time factors (pre-, post-, and follow-up), but only two levels of teaching condition (usual teaching practice and experimental), showed a marginally significant difference at pre-intervention between depth of word knowledge of the usual teaching practice words and depth of word knowledge of the experimental words, with depth of word knowledge of the usual teaching practice words being slightly greater than that of experimental words. In contrast, at post-intervention, the opposite was found, with depth of word knowledge of the experimental words being significantly greater than that of usual teaching practice words. This lends further support to hypothesis 1.

Aspects of word learning

It is proposed that Word Discovery was effective because it addressed multiple aspects of word learning. Phonological and semantic aspects of word learning were combined, thus facilitating the mapping of phonological form onto semantic content. The activities made phonological and semantic information explicit, and involved deliberate repetition of the words by both teachers and students. Thus, the phonological loop component of working memory was constantly activated, enabling phonological and semantic information to be processed, and supporting the executive-loaded verbal working memory skills involved in word learning. This approach had the potential to benefit those who had phonological weaknesses but relative semantic strengths, as well as those for whom the converse was true. In addition, visual support, orthographic input, and personalisation were intrinsic to the intervention, thus exploiting a wide range of modalities and skills.

Choice of experimental and control words

Because the two sets of words were chosen from different topics, one potential confound was that some topics may have been more interesting to students than others, and some topics may have had a propensity towards more abstract or technical words than others. For example, consider the differences between a chemistry topic (e.g. “Chemical reactions”) and a biology topic (e.g. “Reproduction”). However, student participants were taught in 46 classes across different year groups and schools, which resulted in 22 different sets of words in total. This mitigates the possible confounding variable of differing levels of interest or complexity which could have arisen if a single set of experimental and control words had been used, and adds to the strength of the study.

Degree of gain

The mean numerical gain from pre- to post-intervention for usual teaching practice words was 1.58 (SD = 2.71), and for experimental words 3.46 (SD = 3.24), out of a possible 20. Although 3.46 seems a modest gain, it represented a medium to large effect size (η_p^2 = .122, when only these two teaching conditions were considered), suggesting clinical significance. These results are comparable to those found in other vocabulary intervention studies with adolescents. For example, the mean word knowledge gain in Snow et al. (2009) (section 2.3.2.3) was 4.43 out of 40 assessed words (d = .21, small effect size); and in Spencer et al. (2017) (section 3.4.3) the mean gain was 1.17 out of 10 targeted words (η^2 = .42, large effect size). The clinical significance of the gains in the current study is further demonstrated by considering the gain in relation to the smaller amount of cumulative intervention intensity compared to other studies. In the current study, intervention duration ranged from 6.5 minutes to two and a quarter hours over an average of four to five weeks. This is compared to cross-curricular intervention throughout the course of one academic year (Snow et al.) and six to seven hours over 10 weeks (Spencer et al.).

Furthermore, as this was a cascading intervention, whereby the SLT trained another agent of change (the teachers), it is relevant to consider the amount of training provided. In the current study, this was one hour, considerably less than in other studies. For example, in the study by Starling et al. (2012) (section 2.3.2.1), training on language modification techniques took place in 50-minute sessions once a week for 10 weeks, concurrently with the intervention; and, in addition, support was available in the form of three lesson observations, whereas in the current study a maximum of one lesson observation took place.

These gains, in fact, represented a considerable achievement for the participants. In the word knowledge assessment, words were presented in verbal and written form to the student, with no context. Students therefore had to bring to mind the meaning of each word, with no access to the contextual clues which typically support understanding (Anderson & Nagy, 1996). The scoring system of the word knowledge assessment used in the current study also needs to be taken into consideration. A score of 1 was awarded for a response indicating partial knowledge, and a score of 2 was awarded for a response indicating precise knowledge in the context of the syllabus. Examples of responses and their scores for the word *gravity* appear in Table 8.1.

Table 8.1. Word knowledge assessment scoring examples: *gravity*

Responses for the word *gravity*	**Depth of word knowledge scale**
I don't know	0
If you went into space, there's no gravity there, but if you're on earth, there is gravity. Gravity makes you walk and everything, because if there wasn't you'd be floating everywhere (ID 33, Time 4)	1
The force exerted on objects by masses such as the planets, moons, and the sun (definition supplied by teacher)	2

The responses earning a score of 2 on the depth of word knowledge scale were based on definitions supplied to the researcher by the teachers; however, during Time 2 and Time 3 assessments, it became apparent that for most words, a score of 1 was the highest realistic goal for many participants, making a total score of 20 unattainable. Researcher lesson observations raised the possibility that teachers did not present some concepts at the same level of scientific precision as the definitions they had supplied.

Furthermore, not all of the 10 experimental words were taught. Table 7.21 shows that this happened in 19 of the 31 classes for which data were available. The mean number of experimental words taught was 8.8 out of 10. As this was an effectiveness study, carried out in real-life situations, this variation from the intended standard was to be expected and could not be avoided.

Taking these things into consideration, a gain of 3.46 represented a worthwhile achievement. This gain in depth of word knowledge was made as a consequence of very modest input, in two respects: first, in the amount of training which the teachers received (one hour); and, second, in the amount of intervention which the students received (an average of one hour's intervention, delivered by the teacher within the topic syllabus). As this amount of teacher/SLT collaboration and classroom input was achievable in the research context, it is reasonable to conclude that it has the potential to translate into practice, demonstrating ecological validity.

8.2.2 Maintenance of depth of word knowledge (hypothesis 2)

The second hypothesis of the study was that maintenance in depth of word knowledge, from post-intervention to follow-up, of words taught through Word Discovery activities would be greater than for words taught through usual teaching practice. This hypothesis was not supported: at post-intervention, depth of word knowledge of experimental words (M = 6.96, SD = 3.85) was significantly greater than that of usual teaching practice words (M = 5.72, SD = 3.29), but at follow-up, although depth of word knowledge of experimental words (M = 6.17, SD = 3.80) was still numerically greater than that of the usual teaching practice words (M = 5.38, SD = 3.36), this difference was not significant. The more modest increases in depth of word knowledge of the usual teaching practice words were maintained, whereas the larger increases of the experimental words were less well maintained.

Interestingly, this is a similar pattern of results to the findings of Lowe and Joffe (2017), which used a similar study design. A slight loss of maintenance is to be expected during a period when words are not being repeatedly revised, particularly for children with language disorder. In the study by Rice et al. (1994) (section 1.5), the children with language disorder did not show the same degree of word knowledge retention as age-matched or language-matched controls, and this was only one to three days after exposure to the words. In contrast, other vocabulary studies which included a follow-up period have nonetheless demonstrated retention (Clegg, 2014; Spencer et al., 2017; Wilson, et al., 2015). Possibly, this is because in these studies, direct vocabulary teaching occurred, whereas in the study by Rice et al., words occurred in context without specific attention being drawn to them.

As the words were directly taught in the current study, it was, therefore, expected that the degree of maintenance would follow a similar pattern to that of other vocabulary intervention studies rather than that of Rice et al. (1994), where no direct teaching took place. However, this was not the case, raising the question of why the experimental words were not so well retained as the usual teaching practice words. Potentially, there could have been some differences between the usual teaching practice and experimental topics which made some words more memorable than others; however, as described in section 7.2.1, the large number of different word sets makes this explanation unlikely.

A more plausible explanation relates to the interaction between verbal working memory and semantic representation. Most participants had very low SS on the Recalling Sentences subtest of the CELF-4 UK (M = 79.53: 58% scoring 80 or below), implying possible inefficiencies within working memory (Baddeley, Hitch & Allen, 2009), and many had low SS on the Listening Recall subtest of the WMTBC (M = 88.36: 30% scoring 80 or below). A potential hypothesis is that during the word-learning activities, components of working memory were repeatedly activated, for the experimental words more so than for the usual teaching practice words, keeping the experimental words constantly primed, but that due to the verbal working memory and semantic limitations of the participants, only insecure or limited semantic representations were laid down. If this was the case, during the follow-up period with no revision, the insecure traces of understanding which had been acquired during the intervention period could have become lost or difficult to retrieve. This interpretation is consistent with the proposition of Kail and Leonard (1986) (section 1.5.1) that semantic limitations contribute to inefficient word storage. However, to test this hypothesis, more precise information on the working memory and semantic skills of the participants would be required than was obtained from the assessments administered in the current study.

Nevertheless, it is promising to note that the loss of maintenance was only partial, with depth of word knowledge for experimental words remaining significantly greater at follow-up than it was at pre-intervention.

8.2.3 Expressive word use: pre- to post-intervention change and maintenance (hypotheses 4 and 5)

Hypothesis 4 stated that the increase in expressive word use, from pre- to post-intervention, for words taught through Word Discovery activities would be greater than for words taught through usual teaching practice. Hypothesis 5 stated that maintenance in expressive word use, from post-intervention to follow-up, for words taught through Word Discovery activities would be greater than for words taught through usual teaching practice. Results indicated that at the pre-intervention point, expressive word use of usual teaching practice words did not differ from that of experimental words, but at the post-intervention point, expressive word use of experimental words was significantly greater than that of usual teaching practice words; thus, hypotheses 4 was supported. There was partial support for hypothesis 5, because although there was a significant decrease in expressive word use of experimental words from post-intervention to follow-up, but no decrease in that of usual teaching practice words, expressive word use of experimental words remained significantly greater than that of usual teaching practice words at follow-up.

These results suggest stronger evidence for the maintenance of expressive word use of experimental words than was the case for depth of word knowledge. The expressive task in the word knowledge assessment did not require the students to retrieve words from their lexicon; rather, it required them to produce words with phonological accuracy in a meaningful sentence, after the word had been spoken by the assessor. A potential hypothesis, to explain why expressive word use showed a tendency towards better maintenance than depth of word knowledge, could be that the phonological component of Word Discovery activities facilitated performance on this task by strengthening phonological deficits, and enabling stronger phonological representations to be established. This hypothesis would concur with Stackhouse and Wells (1997) and Lahey and Edwards (1999), who posited that weak phonological skills particularly affect naming, a task which requires production of the word.

However, phonological awareness skills appeared to be a relative strength for this cohort, according to SS on the PhAB Spoonerisms subtest (M = 89.03: only 9% scoring 80 or below); therefore, this explanation remains speculative. An alternative proposition is that improvement in expressive word use was an example of an intervention building on strengths. The hierarchical multiple regressions (section 7.3) were conducted in order to elucidate which, if any, of the assessed language and cognitive skills predicted increases in expressive word use; however, as no variables other than pre-intervention scores showed any predictive value towards increase in expressive word use, no firm conclusions can be drawn with regard to the roles that phonological strengths or phonological input played in students' increase in expressive word use. Predictors of response to intervention are discussed further in section 8.4.

Whichever mechanism may be at work, inspection of the data reveals low expressive word use scores following both experimental and usual teaching practice conditions. This indicates that the adolescents with language disorder in this cohort had, and continued to have, considerable difficulty using science curriculum words expressively. This lends strong support to the findings of previous research showing the persistence of language disorder in adolescence (Johnson et al., 1999) and the complexity of science vocabulary (Woodward & Noell, 1991), particularly for adolescents with language disorder (Forwood, 2014). This difficulty is illustrated by the efforts of ID 8 to use the word *filtration* (an experimental word) in a sentence:

Assessor: *What does filtration mean?*

Student: *Is it the filter paper that is - it the filter paper that changes sand into salt and you can add water to it?*

Assessor: *Can you tell me more exactly what it means?*

Student: *Does it, it means that um the- it can change - it can change um um no, salt - no, sand - it can change things into another. So like if you add sand and you, you, if you have a bottle and you have the filter shaped like a cone, like a funnel, and you put the top of the - where the lid goes on to, and you pour sand, it changes - it changes - it changes the lit- it changes the colour and the sand and if you add water it can make liquid - some of it liquid and fresh, um and fresh, um salt, so I ...*

Assessor: *Can you use filtration in a sentence?*

Student: *Um I fil- I changed, I um, I changed - I used fil- I used filtration to - I used filtration to um, to - I used um filtration to, to change - oh I don't know how to; it's hard.* (ID 8, Time 4).

Because of these ongoing difficulties, it is essential to find optimum ways of helping these students. Word Discovery intervention was successful in increasing both students' depth of word knowledge and their expressive word use, with modest gains being made. The implications of this for practice are discussed further in Chapter 9.

8.2.4 No-intervention words: depth of word knowledge and expressive word use (hypotheses 3 and 6)

It was hypothesised that there would be no significant difference in either depth of word knowledge (H3) or expressive word use (H6) of no-intervention words over time. Results showed no significant change in depth of word knowledge or expressive word use of no-intervention words at any point in time; therefore, as anticipated, both of these hypotheses were supported.

These results add strength to the findings of the study by demonstrating that increases in depth of word knowledge and expressive word use of usual teaching practice and experimental words were unlikely to be due to maturity or practice effects.

8.3 Independent word learning (RQ2)

In this section, firstly the outcomes of the independent word learning assessment are reviewed, and subsequently the issues surrounding the measurement of generalisation effects of intervention are discussed. The current study followed the recommendation of Marulis and Neuman (2010) by utilising a standardised measure as well as a bespoke author-created measure to examine the impact of the intervention on transferable word-learning skills. In addition, it aimed to measure the impact of the intervention on curriculum attainment, a design feature absent from other vocabulary intervention studies of children and adolescents with language disorder.

8.3.1 Standardised assessment (hypothesis 7)

Hypothesis 7 stated that there would be significant progress in standard scores on the WASI-2 V following Word Discovery intervention. Results showed no significant difference between pre-intervention WASI-2 V standard scores and post-intervention WASI-2 V standard scores; therefore, this hypothesis was not supported.

One possible reason for this was that Word Discovery did not specifically target definition production skills. However, because the pre-intervention assessment was administered at Time 1 (prior to the usual teaching practice condition) and the post-intervention assessment was administered at Time 3 (following the experimental condition), even if a change in scores had been achieved, this assessment schedule would not have demonstrated whether progress was attributable to usual teaching practice or to Word Discovery intervention. Although a weakness of the study design, this was necessary in order to avoid repeating the standardised assessment within too short a timescale: the intervals between Time 1 and Time 2, and between Time 2 and Time 3, were both approximately nine weeks. Marulis and Neuman (2010) noted that many studies have used only bespoke measures for this reason.

8.3.2 Bespoke independent word learning assessment (hypotheses 8 and 9)

The bespoke independent word learning assessment (section 6.7.3.2) had three parts; (i) the students' ability to identify words they did not understand; (ii) their ability to derive the meaning of these words; and (iii) their knowledge of strategies to use when confronted with an unknown word. The first two parts together investigated hypothesis 8, regarding participants' *use* of independent word learning strategies, and the third part investigated hypothesis 9, regarding participants' *awareness* of such strategies.

Hypothesis 8 stated that there would be no significant increase in students' ability to derive the meaning of unknown words following topic 1 (usual teaching practice), but that there would be a significant increase following topic 2 (Word Discovery intervention). The outcome was a significant decrease in the number of words which students identified as unknown after each teaching condition (mean decrease after topic 1 was 0.67 out of a maximum of 7; mean decrease after topic 2 was 0.68), but the percentage of these words whose meaning students correctly derived did not change over time; therefore, hypothesis 8 was not supported.

Hypothesis 9 stated that there would be no significant increase in awareness of word-learning strategies following topic 1, but a significant increase following topic 2. The outcome was a negligible decrease in the number of word-learning strategies listed by students following topic 1 (mean change -0.09 out of a maximum of 6), and a small but non-significant increase following topic 2 (mean gain 0.24). Therefore, hypothesis 9 was not supported.

Unlike the standardised assessment, the bespoke independent word learning assessment was repeated at Time 1, Time 2, and Time 3, which allowed for a distinction between the effects of usual teaching practice and Word Discovery intervention. Out of the three components of the assessment, only one demonstrated significant change; namely, that the number of words which students identified as unknown significantly decreased over time. It is probable that, when a word was encountered for the first time, students employed strategies to derive its meaning from morphology and context. Evidence for this comes from students' responses. This is illustrated by the following excerpts of the independent word learning assessment with ID 58 at Time 1 and Time 2.

<u>Time 1:</u>

Assessor: *Are there any words in here that you don't know? You can point to them for me.*

Student: (points to arsonphobia and perseverant)

Assessor: *Great. This one is arsonphobia. What do you think arsonphobia might mean?*

Student: *Does that mean like she's scared of fire or something?*

Assessor: *And what makes you think that?*

Student: *Because she was so severe she- and persever- I don't know that word. She couldn't even like light her candle on her birthday - it was like she was really* *scared, so she doesn't like fire. Like any fire she sees she gets really freaked out and stuff.* (ID 58, Time 1)

Time 2:

Assessor: *Can you show me any words in there you don't understand?*

Student: *No.*

Assessor: *Do you know them all?*

Student: (nods)

Assessor: *Well done.* (ID 58, Time 2)

These excerpts exemplify that, having worked out the meaning on first encounter, at subsequent timepoints a previously unknown word could become a known word. This had the further effect that fewer students identified any unknown words at each succeeding timepoint. However, as these decreases occurred following usual teaching practice as well as following Word Discovery, changes cannot be attributed to the experimental intervention, and are more likely to be due to practice effects.

Interpretations of the bespoke word learning assessment results are discussed further in section 8.3.4, in relation to issues surrounding the measurement of generalisation effects.

8.3.3 Science curriculum attainment (hypothesis 10)

It was hypothesised (H10) that increase in students' science attainment would be greater following topic 2 (Word Discovery intervention) than following topic 1 (usual teaching practice); however, as previously explained (section 7.2.3), insufficient data on science attainment was received to be able to comment on the generalisation effect of Word Discovery on curriculum access.

The ultimate goal of vocabulary intervention is to improve the child's or adolescent's ability to access the curriculum, and consequently enhance their life chances. Despite the evidence that language disorder impacts on academic outcomes (e.g. Conti-Ramsden et al., 2009; Croll, 1995), none of the vocabulary intervention studies of children or adolescents with language disorder reviewed in this thesis have included assessment of academic attainment. The current study attempted to address this situation by obtaining science attainment data, but insufficient appropriate data were obtained to achieve this. The question of how vocabulary intervention impacts on academic attainment thus remains unanswered, and is an important goal for future research. This is discussed further in Chapter 9.

8.3.4 The measurement of generalisation effects

Overall, the bespoke independent word learning assessment did not demonstrate any specific impact of the intervention on transferable word learning skills. There are two ways of interpreting these results. Firstly, the main activity which was intended to develop independent word learning was the word detective, and this was also the activity which the teachers were the least comfortable with (this is discussed further in section 8.6.3). This could in part account for the lack of progress in the development of independent word learning skills following intervention. Consequently, the way the word detective activity was presented to teachers, and delivered in the classroom, needs to be reviewed and improved.

The second way of interpreting these results is that the independent word learning assessment itself needs refinement in order to make it more sensitive to change, and to be more compatible with appropriate methods of analysis. The assessment was trialled during the pilot study, and in the main study strong inter-rater agreement was achieved ($\kappa_w = .803$) for the number of unknown words whose meaning was correctly derived, and a moderately strong agreement was achieved ($\kappa_w = .777$) for the number of strategies listed. Nonetheless, the assessment could be developed further.

As it was a novel, author-created tool, no comparable assessments could be found against which to measure its validity. One weakness of the assessment became apparent once it had been administered with several participants, as follows. Many students were observed to use strategies such as contextual derivation when confronted with the unknown words in the passages, but did not name these strategies when asked, "If you don't understand a word, what can you do to find out what the word means?" Participants typically mentioned strategies such as: "ask a teacher;" "ask a friend;" and "look it up". However, few participants listed strategies such as "look at the syllables," or "look at the rest of the sentence," even if they had used morphological or contextual strategies while describing what they thought the words in the passages might mean. This is illustrated by the following excerpt from a Time 3 independent word learning assessment.

Assessor:	*Are there any other words in there you don't know?*
Student:	*[ɹɪvɜtəbɹeɪt]* (revertebrate)
Assessor:	*Reverberated. What do you think that might mean?*
Student:	*It means like the noise - I don't know think of the word - [ɹɪbraɪbɹeɪtɪd]* (rebribrated) *through the house.*
Assessor:	*And what makes you think that's what it means?*
Student:	*Because of the ending with [bɹeɪtɪd]* (brated).
Assessor:	*Any other words in there you don't know?*
Student:	*No.*
Assessor:	*OK, great, well done. So, if you don't understand a word, what can you do to find out what that word means?*
Student:	*Looking it up the dictionary.*
Assessor:	*M-hm. What else can you do?*
Student:	*Ask a teacher.*
Assessor:	*Anything else you can do?*
Student:	*Search it on google.*
Assessor:	*M-hm. Anything else?*
Student:	*Er no.* (ID 89, Time 3).

This excerpt exemplifies the fact that students often appeared to use morphological or contextual strategies without being consciously aware of what steps they were taking when confronted with an unknown word. If the wording had been “What can you do to *work* out what the word means?” this would perhaps have encouraged students to reflect on what they do when trying to decipher meaning, and elicited a wider range of responses, making the assessment tool more successful in measuring change pre- to post-intervention.

Although no impact of intervention on independent word learning was evident in this study, a benefit of conducting the independent word learning assessment was that it has contributed insight into the complexity of measuring generalisation effects of intervention. The literature reveals no consensus on the most effective way of measuring increase in independent word learning, with a variety of methods being used in previous research: Wilson et al. (2015) used sets of semantically related and unrelated control words; and Joffe et al. (in preparation) used a bespoke vocabulary idiom awareness measure. The current study took yet another approach, creating an assessment which measured students’ use and awareness of word learning strategies. Because of the importance of independent word learning for improving access to the curriculum, and consequent long-term academic, social, and health outcomes, future research needs to draw on the varied methods of previous studies, refining them to create a valid and effective assessment tool.

8.4 Predictors of increase in word knowledge (RQ3)

Four exploratory hierarchical multiple regressions were conducted to investigate relationships between students’ language and cognitive characteristics and their ability to respond to Word Discovery intervention. Using pre-intervention scores as a predictor variable, and post-intervention or follow-up scores as the dependent variable, the first two models explored depth of word knowledge, and the latter two models explored expressive word use. It was hypothesised that students who demonstrated higher abilities in: receptive vocabulary (H11); sentence recall (H12); verbal working memory (H13); and phonological awareness ability (H14), would show greater increases in experimental word knowledge than those with lower existing abilities in these areas.

NVIQ significantly predicted post-intervention and follow-up depth of word knowledge of experimental words, in line with expectations (Rice & Hoffman, 2015), though in the full models it was not significant in terms of expressive word use. Chronological age, on the other hand, did not significantly add to the predictive power of any of the models. This could have been because all participants’ ages fell within a close range (11:3 to 14:0); but, more likely, it was because the target words for each year group were chosen from curricula appropriate for each specific age group. No other variables (receptive vocabulary, verbal working memory, sentence recall, nor phonological awareness) demonstrated any predictive value towards post-intervention or follow-up scores in either depth of word knowledge or expressive word use.

These findings were contrary to expectations based on the literature concerning the relationship between vocabulary acquisition and existing vocabulary knowledge, verbal working memory, language disorder (using sentence recall as a marker), and phonological awareness (Dockrell et al., 2007; Leonard et al., 2007; McGregor et al., 2013; Stackhouse & Wells, 1997). However, as the sample size and some of the assumptions for the regressions were non-optimal, no firm conclusions could be drawn, and this remains an area for future research.

8.5 Teacher and student views (RQ4)

An important aim of this thesis was to evaluate the acceptability, feasibility, and ecological validity of the intervention (Craig et al., 2014; NIHCE, 2013). In addition to addressing this through the survey in Chapter 4, a novel component of the intervention study was to evaluate the intervention from the student and teacher perspective (RQ4). In this section, student views on the model of intervention delivery will be discussed. Because teachers' views (H15) are critical to the feasibility of Word Discovery as a classroom intervention, their views are not discussed separately here, but incorporated into the section on feasibility (section 8.9). Student and teacher views on the word-learning activities are integrated with the researcher's evaluations in the section appraising each word-learning activity (section 8.6).

8.5.1 Students' preferred model of intervention (hypothesis 16)

An innovative aspect of the Word Discovery intervention was its delivery by teachers within the classroom. This aspect of the intervention was central to the current study, because of the increasing importance of a whole-class context in the secondary school years (section 2.3.1). Acceptability of the whole-class model of intervention on the part of the students (H16) will now be discussed.

In the Time 3 questionnaire, students were asked about their preferred model of intervention delivery (section 7.4.6). Preferences were distributed more or less evenly between the options: approximately one third preferring a whole-class model; approximately one third preferring a small-group model; and approximately one quarter preferring individual intervention; with the remaining students stating mixed preferences or no preference.

The 32% of students preferring an inclusion (whole-class) model of support compares closely with the 37.5% found by Klingner et al. (1998). This was contrary to expectations, as the Klingner et al. cohort was younger (aged nine to 11 years) than the current cohort (aged 11 – 14 years), and it was anticipated that the increased self-consciousness of adolescence may make it more likely that the students would prefer to stay in class (Ehren, 2002). In fact, 58% said that they would prefer an individual or small-group setting. The students themselves explained this finding, by their insightful comments about how easily distracted they can be in the classroom, thereby feeling that individual or small-group intervention would be more beneficial for them. Difficulty with attention control in children with language disorder is well-established in the literature, and this difficulty can continue into the older age range. Victorino and Schwartz (2015) conducted an interesting experiment which illustrates this, with 20 children with language disorder and 20 TD children, aged nine to 12 years. Children were simultaneously presented auditorily with two words, one in each ear, at the same time as being visually presented with a picture. They were instructed to attend to either the right or the left ear only, and to identify if the word they heard in that ear was the same as or different to the picture. When the picture was unrelated to either word, TD children responded more quickly than if the word they were meant to ignore was the same as the picture, suggesting that TD children could inhibit unrelated stimuli more easily than related stimuli. Conversely, in the children with language disorder, response times were similar for both related and unrelated words. This indicated that the children with language disorder had as much difficulty inhibiting unrelated stimuli as they did related stimuli. Applying this finding to the classroom provides an explanation for why students with language disorder have difficulty ignoring irrelevant noise made by other students when they should be focussing on the teacher.

In contrast, the comments of the students who expressed a preference for staying in class indicated that they appreciated the benefits of learning from peers. Possibly, these students were better able to control their attention, and consequently more able to capitalise on social mediation, an important aspect of classroom pedagogy. Adey and Shayer (1994) described how the zone of proximal development (Vygotsky, 1981) can be established collaboratively, for the benefit of the class as a whole. In this way, Adey and Shayer propose, learning opportunities are multiplied, as students learn from their peers as well as from the teacher.

The small-group model of delivery was an attractive option for some students (32%), combining as it does the advantages of reduced distractions with the advantages of peer learning. However, the small-group option still has the disadvantage of necessitating withdrawal from the classroom. It was argued in section 2.3.1 that remaining in lessons was preferable from a theoretical stance because of the word-learning opportunities afforded by the context of the lesson. The views of the students with attentional difficulties challenge this argument, as their difficulties concentrating may limit their potential to glean contextual information from the classroom situation.

It was also noted in section 2.3.1 that students who are withdrawn from class miss the content of lessons, and fall further behind. This seemed to be the case for one participant in the current study, who, when asked about sound and meaning bingo, said:

> *"I wasn't there. I went to reading but I saw, like when I came the last 20 minutes of the lesson, I saw people do it but I didn't know what to do so I just sat. So the last 20 minutes I did nothing."* (ID 44, Time 3)

This student was in receipt of individual school-based intervention for literacy, so she had some experience of both whole-class and individual situations, and her stated preference was for a whole-class model of intervention. However, with regard to vocabulary intervention, the only model that students received in this study was the whole-class model, therefore their views on individual or small-group intervention were largely hypothetical. It would be useful to examine the relationship between student preferences and response to intervention, but it was beyond the scope of the current study to pursue this line of enquiry. One thing the current findings do clarify is that a single model of intervention delivery is unlikely to meet all students' needs.

8.6 Appraisal of the word-learning activities

The Word Discovery activities are appraised in this section integrating the views of students and teachers with the researcher's evaluations. Figure 8.1 contains a visual summary of the word-learning activities.

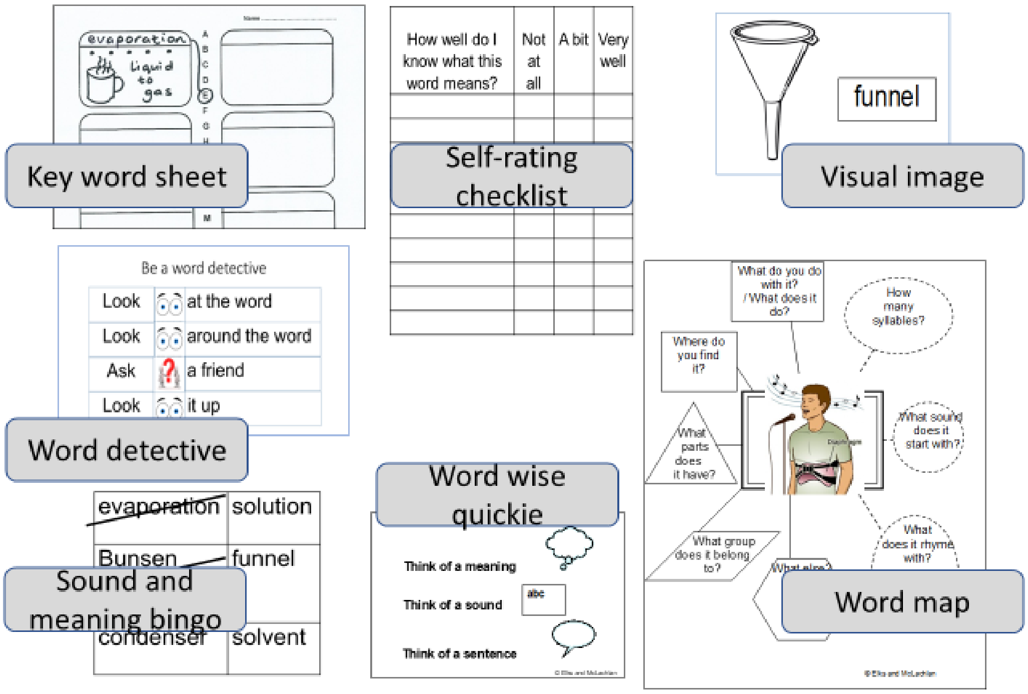

Figure 8.1. The word-learning activities

As a group, students were generally positive about the all the word-learning activities, rating the display of visual images and the key word sheet as the most helpful. These results could be subject to bias, because the student questionnaire was delivered verbally by the researcher, and therefore students may have been influenced to supply positive responses in an effort to please. However, from the students' point of view, it was not the researcher who carried out the intervention, but the teacher, so the students probably felt comfortable giving honest views, thus reducing the possibility of bias.

As for the teachers, as a group they felt that the self-rating checklist and the display of the visual images were the easiest to implement. They rated the display of visual images as the most effective, followed by the key word sheet; and these were also the two activities which teachers said they would be most likely to use again. Of the three phonological-semantic activities, teachers rated the sound and meaning bingo as the easiest to implement, but found that the word map was the most effective. The word map was also the phonological-semantic activity they felt they were most likely to use again. As with the students' comments, the teachers' responses could also be subject to bias, because, although anonymity was offered, in practice this was not achieved because the teachers returned the questionnaires to the researcher by hand or via email. There was a large proportion of *undecided* in teachers' responses, which teachers might have chosen either if they had not done that particular activity, or to avoid being negative. Nonetheless, there was a range of both positive and negative views, suggesting limited bias.

Each word-learning activity will now be appraised in turn.

8.6.1 Self-rating checklist

Almost three-quarters (71%) of students found the self-rating checklist helpful. Most teachers (86%) found it easy to implement, but less than half of them (45%) thought that it was effective in helping students learn the words. This is an understandable evaluation of the activity, as it did not directly teach any phonological or semantic features of the words, and perhaps its value lay in enabling the students to evaluate their own learning. Teachers typically use other formative and summative assessments, but the students may have been motivated by being able to see their progress for themselves by comparing pre-topic with post-topic levels of knowledge. Indeed, motivation was central to the purpose of the activity, facilitating a self-learning approach by cueing students in to which words were going to be encountered, and contributing to the natural incentive of needing to know what the words meant (Miller & Gildea, 1987). The self-rating checklist provided a forum for raising students' awareness of which words they needed to learn, priming them to notice subsequent encounters of the words. This was the case for ID 38, who said the self-rating checklist was quite helpful, because:

> *"It gets the words into my head."* (ID 38)

8.6.2 Display of visual images

Most students liked the fact that visual images were displayed. This was unsurprising, in light of the popular view, illustrated by survey responses, that children and adolescents with language disorder benefit from visual support. The argument is that auditory information is transitory, and auditory traces quickly disappear, especially for those with phonological short-term memory limitations: in contrast, visual information which stays in place has some permanence, and is available for ongoing reference. This view is supported by research showing that children with language disorder have age-appropriate visual short-term memory skills (e.g. Archibald & Gathercole, 2006); however, there is a contrasting view in the literature (e.g. Vugs, Cuperus, Hendriks, & Verhoeven, 2013) which has shown that age-appropriate visuo-spatial working memory skills are not universally present in children and adolescents with language disorder. This could explain the fact that not all students in the present study (8%) found the display of visual images helpful; although, as visual skills were not assessed in the present study, this proposition remains speculative.

8.6.3 Word detective

The word detective received the least favourable reviews of all the activities. It was the chief activity aimed at developing independent word learning skills, and yet due to its lack of popularity with teachers, it was not always delivered as intended, or as frequently as intended. The researcher supplied prompt cards with the intention that teachers would teach students how to use these as a mnemonic to help them remember strategies for finding out word meanings.

However, only 17/30 teachers recorded having done the word detective activity, and it received low ratings in the teacher questionnaire on effectiveness, ease of implementation, and intention to use again. This could have been improved by the provision of more specific instructions by the researcher, and more practice during teacher training. Informal feedback during teacher training sessions suggested that many of the teachers were unfamiliar with morphology, and did not themselves consciously use word roots, prefixes and suffixes to derive meaning. To model being a word detective to their students was, therefore, a challenge for these teachers. There is a possibility that teachers of other subjects, particularly English, who are already familiar with teaching derivation of word meaning from morphology and context, would feel more able to model being a word detective, and more able to encourage the use of the prompt card as a self-help strategy.

8.6.4 Word map

The fact that most students (75%) and teachers found the word map helpful vindicates the word map as a choice for classroom vocabulary intervention. Fifty-five percent of teachers found the word map easy to implement and 62% found it effective. Comments made verbally to the researcher corroborate this, for example:

> *"I will definitely do the word maps again – I'm sure it helps the students learn the words."* (T.5, at Time 3)

It must be noted, however, that the word map was not popular with all teachers, with 31% finding it hard to implement. The word map was perhaps the most complex of the word-learning activities, and the most time-consuming, but this was a necessary consequence of its embracing both phonological and semantic information in detail. The researcher proposes that the word map tapped into metalinguistic awareness at a critical window of opportunity during its development (van Kleeck, 1984). It is likely that students were becoming increasingly aware of their difficulties, and hence they could have realised that the word map directly addressed their word-learning deficiencies. As students became more familiar with word maps, they were able to complete them more easily: several comments mirror those of ID 101 (Table 7.18), who said that although he did not understand it at first, it became easier. The word map allowed phonological and semantic features to be presented in a structured way, at relevant points in the teaching of new concepts. It was hoped that the word map framework would become integral to the students' mindset as they approached new words, resulting in conscious reflection on phonological and semantic properties, thus facilitating independent word learning. Examining whether this occurred would form an interesting subject for future research.

8.6.5 Word wise quickie

In contrast to the word map, the word wise quickie – enabling phonological-semantic links to be revised - did not receive such favourable reviews. One potential reason for this could be variations in the way it was delivered in the classroom. For example, T.27 was observed asking students to use the words in a sentence. In conversation after the lesson, she referred to this as the word wise quickie, though she had not presented the three elements of the word wise quickie (sound, meaning, and sentence) together. In another example, T.28 was found to have used the word wise quickie as a written exercise. Even though teachers had been given opportunities to practise during the training, they were perhaps unsure how to deliver the word wise quickie, and students consequently unsure how to respond. This is another learning point for the researcher, in terms of reviewing and improving the way it is presented to teachers in training.

8.6.6 Sound and meaning bingo

Sound and meaning bingo – another way of revising phonological-semantic links - received mixed reviews from both students and teachers. Fifty-eight percent of students said that they thought sound and meaning bingo was helpful. As with the self-rating checklist, most teachers (62%) found sound and meaning bingo easy to implement, but fewer (38%) found it effective. ID 19 gave some insight into potential reasons for its limited effectiveness, when, justifying his *not very helpful* rating, he said:

> *"It was just kind of guessing; people shouted out the answer as well, so you kind of found out."* (ID 19)

It seems as though the exuberance of other students denied this participant the chance to think clues through for himself. Of course, the same criticisms would be equally applicable to definition-only bingo. So, although a key element of sound and meaning bingo was to increase motivation through competition and fun, in some cases perhaps this was counter-productive, and resulted in the loss of opportunities to benefit from the phonological input. Like the word wise quickie, sound and meaning bingo was also delivered variably. For example, T.8 displayed the visual images during sound and meaning bingo, and gave the definition clue first, waited for a short interval while students tried to remember the meaning, and then gave the phonological clue for further assistance. However, unlike the variations in the way the word wise quickie was implemented, in this adaptation the teacher still adhered to the core content of the activity.

8.6.7 Key word sheet

The key word sheet was a popular choice amongst students and teachers alike. The essence of the key word sheet was that it incorporated all the components of word learning mentioned in Table 5.2, affording opportunities to revise phonological-semantic links, as well as opportunities for students to create their own definitions, thus personalising their knowledge in relation to their own experiences. Although examination of students' work revealed that dots for each syllable were rarely added, in other respects the key word sheets were completed as suggested. Seventy-two percent of teachers reported that the key word sheet was easy to implement, and 69% reported that it was effective. The key word sheet was often placed in the students' exercise books or folders at the beginning of the topic, so that it could easily be found. The comments by ID 17 (Table 7.18) show that she appreciated its ease of access and visual permanence.

8.6.8 Summary of word-learning activities

The activities and strategies contained in Word Discovery covered a range of components of word learning. The linking of phonological and semantic information when words were taught conformed to the dual deficit hypothesis proposed by Nash and Donaldson (2005). Not only were areas of weakness developed, but, moreover, students with differing levels of relative phonological and semantic skill were accommodated, as the two-pronged approach allowed students to draw on existing strengths.

Overall, despite a small amount of negative feedback from teachers and students, both quantitative and qualitative data support the argument that the word-learning activities in the current study were effective in increasing the depth of word knowledge and expressive word use of adolescents with language disorder, over and above usual teaching practice. Indeed, the fact that some negative feedback was received adds credence to the positive feedback. The inherent flexibility of the word-learning activities enabled teachers to be creative in their implementation, adapting the activities to suit their own teaching styles, whilst adhering to the aims of the activity and to the principles of Word Discovery intervention as a whole.

Perhaps the most revealing statistic concerning the effectiveness and acceptability of Word Discovery relates to the likelihood of teachers using the activities again. Teacher ratings for whether they would use the activities again appeared in the following order, from highest to lowest:

1. Display of visual image
2. Key word sheet
3. Self-rating checklist
4. Word map
5. Sound and meaning bingo
6. Word wise quickie
7. Word detective.

Due to the aforementioned possibility of bias, the positivity of responses to this question may be inflated. To find out whether intentions materialise in practice could be the subject of future research.

8.7 Comparing usual teaching practice with Word Discovery intervention

Teachers' topic 1 strategy records enabled meaningful comparisons to be made between the usual teaching practice condition and the Word Discovery condition. It was found that vocabulary teaching strategies used by teachers predominantly took a semantic (not specifically semantic feature analysis) and literacy perspective, in contrast to Word Discovery, which took a holistic but essentially phonological-semantic (including semantic feature analysis) approach. In addition, there was some discrepancy between the strategies recorded by teachers and the strategies recorded by the researcher.

There is some doubt as to whether the teaching practices recorded during the present study were in fact unbiased representations of usual teaching practice, because the teachers knew that they were taking part in a vocabulary study, and this could have influenced their practice during topic

1 as well as during topic 2. There was, in fact, some evidence that this could be the case from teachers' comments:

> *"I realise that was far too many new words all at once."* (T.7, after topic 1 lesson observation)
>
> *"One thing it's made me realise is just how many words we introduce them to in each topic."* (T.1, before training session)

A degree of raised awareness was inevitable due to the requirement of gaining teachers' consent to participate in the study. However, influence was kept to a minimum by telling the teachers nothing about the specifics of the intervention until the training session after topic 1.

It is interesting to note the discrepancies between strategies reported in teachers' records and strategies recorded during the researcher's lesson observations. Although there was overlap, some strategies were reported in teachers' records which did not feature in the researchers' observation records, suggesting differing perspectives on what constitutes a vocabulary teaching strategy. Two strategies listed frequently by teachers in their strategy records were practising spelling and practical demonstration / experiment. These strategies were also observed during lesson observations but were not recorded by the researcher as vocabulary teaching strategies. The reason for this was that they were not regarded by the researcher to comprise specific word learning strategies, as they did not in themselves comprise specific techniques such highlighting semantic or phonological features, or requiring students to say the word.

When considering specific vocabulary teaching strategies, both teacher strategy records and researcher observation records showed that strategies used by teachers were predominantly semantic and literacy-based. Only three teachers mentioned activities which involved phonological awareness, confirming the findings of the survey (Chapter 4). Because of the role that phonological input plays in word-learning (section 1.2.2), this minimal attention to the phonological form of words, corroborated by researcher observations, is a justification of the rationale for adding a phonological component to classroom vocabulary teaching.

Starling et al. (2012) also noted that there is an emphasis on literacy over oracy at secondary school. In contrast, Word Discovery, whilst supporting literacy by accompanying speech with the written word, took an oral perspective. Questions which teachers asked the researcher during teacher training indicated that not all teachers were aware that oral language is the foundation for written language, and the consequent importance of developing oral language. This underlines the value of Word Discovery as a classroom vocabulary intervention which not only addresses multiple aspects of word learning, but is also of central relevance to the curriculum.

Nonetheless, teachers' records and researcher's observations both demonstrated that teachers were aware of the need for vocabulary teaching, and frequently engaged in direct instruction of targeted words. The following strategies were often reported and observed: listing key words on the board; giving definitions; paraphrasing; and revising definitions through games. This type of direct instruction mirrors the findings of Ford-Connors and Paratore (2015), who reported that the use of direct instruction was more common than in-depth vocabulary teaching involving the teaching of strategies for word-learning.

In the current study, one aspect of vocabulary teaching that Word Discovery shared with usual teaching practice was the display of visual images. Because specific visual images for each experimental word were supplied to teachers, it is possible that the images may have been more constantly displayed during Word Discovery intervention than happens during usual teaching practice, but there is insufficient evidence to support this. Thus, it is proposed that the activities of Word Discovery which were a novel addition to usual teaching practice were: the self-rating checklist; the word map; the word wise quickie; sound and meaning bingo; the word detective; and the key word sheet.

8.8 Word exposure

Collection of data through teacher strategy records enabled consideration of whether the implementation of Word Discovery resulted in increased exposure to the words.

Two other studies (St. John & Vance, 2014; Wilson et al., 2015), like the current study, used a set of active control words which received exposure but were not included in the intervention. However, in the study by Wilson et al., the words were not spoken aloud, so they cannot truly be taken to have received any exposure. In the study by St. John and Vance, the active control words were spoken, and taught through usual teaching practice, but exposure was not measured, either for usual teaching practice or experimental words, and so neither the impact of the intervention on exposure, nor the impact of increased exposure on word learning, could be examined. The current study attempted to overcome these limitations by measuring the number of exposures each word received. This was done by asking teachers to count the number of word exposures on the day that they were introduced. There was a marginally significant difference between the topics in the amount of exposure the words received, with teachers speaking the experimental words on average 9.7 times on the day that the word was introduced, compared with 8.3 times for the usual teaching practice words.

This method was not perfect, because there were exposures on other days within the topic. However, it would have been unrealistic to expect teachers to count exposures of all 10 words in every lesson; therefore, this method provided a comparable measure of exposure in both the usual teaching practice and experimental conditions.

As the experimental words received marginally more exposure than the usual teaching practice words, there could be an argument for the greater increases in experimental word knowledge to be due to greater exposure, rather than the content of the Word Discovery activities. Amount of exposure has been shown to be associated with increased word learning, both for TD children (Dockrell et al., 2007) and children with language disorder (Rice et al., 1994). The work of Dockrell and colleagues showed that TD children required repeated exposures in context to deepen knowledge of a word's meaning and to be able to produce a word expressively. The study by Rice et al. showed that children with language disorder who had received 10 word-exposures made greater word knowledge gains than those who had received three exposures.

However, the small degree of increased exposure within the current study is unlikely to be the critical factor in increased word learning. The position taken in this thesis is that Word Discovery provided a framework in which words were deliberately spoken, thus bringing about the increased exposure. Word Discovery provided a vehicle with which to overcome the minimal input constraint proposed by Rice et al. (1994), necessary for children with language disorder to learn new words. Crucially, in Word Discovery, word exposure occurred in focused and meaningful contexts, and the activities directly targeted the phonological and semantic aspects of word learning which are so often challenging for children and adolescents with language disorder. Thus, although increased exposure is important, the researcher argues that it was the specific content of the word-learning activities which effected enhanced word learning.

8.9 Feasibility

This section draws together various aspects of the study relevant to the potential of Word Discovery for implementation in speech and language therapy and teaching practice. Teachers' views on the whole-class model of intervention delivery were gathered from the teacher questionnaire, email correspondence and conversations. Section 8.9.1 discusses the practicality of conducting the research. Section 8.9.2 explores the rate of teacher attrition, and in section 8.9.3, fidelity to the intervention is discussed. Finally, in section 8.9.4, the reported benefits to teachers of participation in the study are described.

8.9.1 Practicality of conducting the research

Because the inclusion criteria for the study yielded a cohort of students with language disorder, the researcher expected that students would be clustered in classes of similar ability, due to the common practice of setting students of similar ability together in classes. Although many participants (66/78) were indeed taught in classes set for ability, even so, there were often only one or two participating students in each class. This resulted in a large number of different curriculum schedules, with ensuing logistical complications for the researcher. This was alleviated by conducting the study in two waves, 2015 - 2016, and 2016 – 2017, which retained a margin of flexibility in the researcher's diary to conduct assessments at critical times.

This flexibility also allowed the researcher to accommodate unavoidable issues which occurred during the study. For example, school 6 was without a gas supply for a few weeks, which meant that the science schedule had to be rearranged. This delayed the start of the study with Year 9 in this school, and affected the interval between timepoints. In school 4, the science department was due to be re-housed to a new building, and many changes of staff were imminent, which affected the degree of engagement with the study in the department. Inspection of Table 7.7 shows that these were the two schools where the return of data from teachers was the most inconsistent.

The outcomes of the research relied heavily on information provided by schools. Despite the researcher's best efforts in building relationships with teachers and keeping channels of communication open, there were varying levels of compliance with supplying this information, even apart from the two schools facing particular challenges. This was, perhaps, a function of the fact that the study took place in several schools, and the researcher's presence in each school was intermittent. Wider inclusion criteria would have enabled more students in each school to take part, resulting in fewer schools which would have enabled the researcher being present in school more regularly, keeping the study foremost in the teachers' minds. However, had this been the case, the cohort would not have been such a homogenous group in their language profile. A strength of this study is that, in comparison with many other vocabulary intervention studies, a large sample of adolescents with language disorder was recruited.

8.9.2 Teacher attrition

Four of the 34 teachers invited to take part did not implement any of the Word Discovery activities. A further five delivered the intervention with some of their classes containing participating students, but not with others (section 6.5.2). Comments made in the questionnaire, verbally, and via email, suggest that the pressure of other priorities impacted on these teachers' ability to engage with the study as fully as they would have liked. It is of note that the teacher attrition rate was higher in the two schools facing particular challenges. For example:

> *"Thank you for this opportunity to take part in the project however I don't foresee me being able to carry out all of the tasks you wish and considering that there is only one student in my class I would like to politely opt-out. Thanks again and good luck with all the studies."* (T.34: via email after the training session)

For this teacher, having a small number of students in his class was a factor in his decision not to take part in the project. As mentioned in section 8.9.1, wider inclusion criteria would have enabled more students in each class to take part, potentially increasing the perceived value of taking part and reducing the teacher attrition rate, but this would have altered the group characteristics of the student participants.

Another factor in the decision of some teachers not to take part was related to uncertainty about the appropriacy of the intervention for their classes. In contrast to T.17, who felt that higher-ability students received greater benefit from the word-learning activities than lower-ability students (section 7.4.5), T.26 was concerned about the suitability of the intervention for her higher-ability class, and so delivered it with her lower-ability class only. It was incumbent upon the researcher to respect the teacher's wishes in this case; likewise, it is incumbent upon clinicians to acknowledge that there will be a range of views amongst teachers, who know their students and hold the responsibility for teaching them.

If the target population had included TD students as well as those with language disorder, this may have made full participation more appealing to both T.34 and T.26. Research into the effectiveness of Word Discovery intervention with TD adolescents is considered further in Chapter 9.

8.9.3 Fidelity to the intervention

Completed strategy records illustrated variability from teacher to teacher in how many of the activities they implemented (section 5.8.3). The researcher aimed to provide as much assistance as possible to teachers to facilitate their involvement: the training session included multiple opportunities to experience and practise the word-learning activities, and electronic and hard copies of the PowerPoint presentation and resources were supplied. However, because the study aimed to embed word-learning activities into the delivery of the existing curriculum, a certain amount of flexibility was permitted in where the teachers inserted the activities into the topic syllabus. Teacher records showed that the amount of time spent on the word-learning activities ranged from 6.5 minutes to 2 hours 15 minutes, suggesting that some teachers were more willing than others, or found it easier, to implement the word-learning activities.

External pressures were a factor in the extent to which some teachers were able to engage fully with the project. In the example which follows, the researcher had asked the head of science (also a participating teacher) via email if completed teacher questionnaires, strategy records, and students' work could be picked up at the science team's weekly meeting, following topic 2. This was the teacher's reply:

> *"Apologies for the radio silence. We have had a lot going on here over the past few weeks and it has been rather stressful. Hopefully that will change after the Easter break. I'm not sure about the meeting on Tuesday. We have a huge number of things to do and not very much time to do it."* (T.1, via email during topic 2)

The next example is a comment made verbally to the researcher when she asked the teacher if she could photocopy students' work from their books.

> *"We have to follow a standardised scheme of work and we're not allowed to deviate from that. [The head of science] said it was OK to do it, but not to stick the work in their books."* (T.19, at Time 3)

These comments illustrate competing demands both on the teachers' time and on their methods of teaching.

Conversations and observations also revealed some variation in how the activities were interpreted. The way one teacher interpreted the word wise quickie has already been mentioned (section 8.6.5). Another example relates to the use of the word map. One of the questions on the word map is "What parts does it have?" This question was on the semantic side of the word map, and was intended to expand on attributes of the concept. For example, for *surface area,* the question "What parts does it have?" could be answered "length, breadth, and depth". Some teachers misinterpreted this question, or found it difficult. In this example, T.23, teaching *surface area*, drew attention to the two parts of the written word: "sur" and "face".

The researcher had planned two teacher training sessions: one to explain and practise the word-learning activities; and one to plan how they would be embedded into the topic. In the event, no schools could afford the researcher the second session, owing to other priorities. This meant that the researcher had to rely on the teachers' own lesson planning. Email, telephone, and face-to-face support was offered, but only two teachers (T.28 and T.33) took up this offer, asking questions via email after the training. The lesson observations, therefore, served as useful opportunities to maintain contact with and provide support to the teachers, important ingredients of success when assimilating new methods into practice (Darling-Hammond & McLaughlin, 2001).

One teacher referred to the lack of time to make resources, agreeing that the display of visual images was easy to implement, but commenting:

> *"If you have someone to help you make them."* (T.1, in Time 3 questionnaire)

Two teachers (T.5 and T.28) addressed the challenge of preparation time by collating a pack for each student of the Word Discovery resources. T.5 called this the "literacy pack", and students kept it in their trays in the classroom. After the initial investment of time at the beginning of the topic, this reduced ongoing preparation time throughout the rest of the topic, and made the resources easy to access during lessons.

To summarise, closer fidelity to the intervention could have been achieved by: (a) providing more detailed written instructions for each activity in addition to the PowerPoint presentation; (b) the realisation of the planned second training session; and (c) providing collated packs of the Word Discovery resources. Notwithstanding, sufficient data were available to confirm a satisfactory degree of fidelity to the intervention.

8.9.4 Benefits to teachers of participation

Challenges aside, taking part in the study seems to have been a positive experience for most teachers. Teachers' increased confidence (H15), following participation in the study, was close to significance. As the confidence rating was a subjective measure, answered without anonymity, it was subject to bias, but nonetheless this was an encouraging finding.

In addition to this, 25 teachers agreed or strongly agreed that the teacher/SLT collaboration was helpful, and only two teachers were undecided. This question was also subject to bias, for the same reasons. Even so, it is another source of encouragement, supported by other indicators that teachers valued the teacher/SLT collaboration. Twenty-three teachers out of 25 reported that taking part in the project had changed their practice, and most gave positive examples of how their practice had changed. As previously mentioned, only future research would be able to confirm whether participating teachers continued to use the word-learning activities in their routine teaching practice. But, at the very least, participation in the study raised teachers' awareness of vocabulary, as seen by the comments of T.7 and T.1 in section 8.7. For both these teachers, involvement in the first phase of the study served to raise their awareness of the need to focus directly on vocabulary for students with language disorder, and the training session at Time 2 gave them the tools to do so. This is evidenced by their comments in the Time 3 questionnaire (post- Word Discovery intervention) about how participation in the study had changed their practice:

> *"Giving me more strategies to use."* (T.7, Time 3)

> *"I consider the number of words I introduce in one lesson, the number of times I repeat it, and use of pictures."* (T.1, Time 3)

8.9.5 Summary of feasibility

This section has discussed the feasibility of implementing Word Discovery, and its acceptability from the teachers' point of view. There is little consensus on how to assess acceptability in health research (Sekhon, Cartwright, & Francis, 2017), and the judgment of acceptability here, based on the available information, is subjective. It is concluded that teachers required training, resources, and ongoing support to deliver Word Discovery intervention. Although classroom vocabulary intervention specifically for students with language disorder may not be appropriate for all teachers in all circumstances, the overall picture was that Word Discovery was feasible, and acceptable to teachers.

The issues discussed in this chapter have exemplified the potential challenges encountered when constructing and conducting an effectiveness study. However, valuable information has been revealed concerning the ecological validity of Word Discovery intervention and its applicability to real-life circumstances. This is discussed further in Chapter 9.

8.10 Limitations

Some limitations to the current study have already been discussed; for example, concerning the independent word learning measures (section 8.3). There were a number of other limitations to the study, which will be explored here.

8.10.1 Differences in depth of word knowledge and expressive word use of usual teaching practice, experimental, and no-intervention words

In the current study, depth of word knowledge and expressive word use scores for the no-intervention words were very low. This was because the no-intervention words were not of a comparable level of difficulty to the experimental and usual teaching practice words. Science words had been chosen so that they would be a similar genre of word, but in order to avoid potential contamination by direct teaching, the words had been chosen from future science syllabi. This was important, because in a previous study (Lowe & Joffe, 2012) the control words had been chosen from another topic that was to be taught immediately after the follow-up timepoint. In the event, this topic was taught sooner than expected, meaning that the control words received exposure before the follow-up timepoint and had to be omitted from analysis. In the current study, these differences in word knowledge at baseline were overcome by conducting a 2 x 3 related ANOVA with two levels of teaching condition only (usual teaching practice and experimental) in addition to the full 3 x 3 ANOVA.

8.10.2 Word knowledge assessment

Word knowledge was assessed through a definition production task. Definition production tasks have been used to assess depth of word knowledge in previous research (Justice et al., 2005; Nash & Snowling, 2006), but they present challenges for children and adolescents who have difficulty expressing themselves. Another example of responses and their scores, this time for the word *normal,* appears in Table 8.2.

Table 8.2. Word knowledge assessment scoring examples: *normal*

Responses for the word *normal*	Depth of word knowledge scale
I don't know	0
Same as everyone else (ID 96, Time 3)	1
The line drawn at right angles to the mirror (definition supplied by teacher, in the context of the topic "Light")	2

However, some students had difficulty expressing what *normal* meant, even though they apparently had some understanding of the non-scientific meaning, for example:

> *"Normal is that the thing's normal."* (ID 100, Time 4)

In such cases, where the response was semantically empty, a score of 0 was awarded. The study would have been strengthened by the addition of a receptive vocabulary assessment which did not involve expressive language skills, such as a picture pointing task. Unfortunately, it was not feasible in the given timescale to devise a set of images and a valid set of distractors for the large number of experimental and control words in the study (22 sets of 30 words).

It was, therefore, felt that a definition production task was the best option for this study design, because it would measure a key outcome of the intervention, i.e. the development of semantic representations. In future research, a study design in which all participants were assessed on the same set of words would make it possible to devise an appropriate receptive vocabulary assessment, which could be used as an adjunct to a definition production task.

8.10.3 Blind assessment

All assessments were carried out by the researcher. Blind assessment had originally been planned, but the pilot study revealed that, because the word knowledge and independent word learning assessments were author-created tools, administration could be subject to variation. Given the geographical spread of participating schools, and the necessity of conducting assessments at critical timepoints, it would have been logistically challenging to source appropriately qualified and available personnel who could act as blind assessors, and to provide them with enough training to overcome potential variations in administration. A decision was, therefore, made for the researcher to administer all assessments, and for independent reliability checks to be carried out. The kappa coefficients obtained for the word knowledge assessment and independent word learning assessment indicate strong and strong / moderately strong reliability respectively, overcoming the lack of blind assessment.

8.10.4 Standardised vocabulary assessment

As was explained in section 7.3.1, the WASI-2 V was administered at Time 1 and Time 3, which, even if a change in scores had been achieved, would not have demonstrated whether progress was attributable to the usual teaching practice condition or to the experimental intervention condition. For the within-subjects design, three assessment points would have been necessary, with a midway assessment point between control and experimental conditions. The only way to achieve this, without the assessment intervals being too short, would have been a longer study duration, though the disadvantage of this would have been the possibility of contamination by other confounding variables such as incidental learning or changes of teaching staff. A between-groups study, in which different conditions were concurrent, would overcome these disadvantages, with three assessment points (baseline, pre-intervention, and post-intervention) to enable a distinction between experimental and control conditions.

8.10.5 Differential effect of the word-learning activities

The study design did not allow investigation of which activities had the most impact on the word learning of the participants. Word Discovery comprised a range of techniques, not all of which were phonological-semantic. In addition, the incidental presence of orthography, which has been shown to enhance the word learning of children with language disorder (Ricketts, Dockrell, Patel, Charman, & Lindsay, 2015), was integral to all activities except the word wise quickie. It was not, therefore, possible to establish whether improvement was due to phonological-semantic intervention or due to a combination of factors. An intervention consisting solely of phonological-semantic techniques could have been devised to overcome this. However, such an approach would have been contrary to professional consensus, which holds that students with language disorder need a combination of approaches in order to maximally benefit from vocabulary intervention. This position, supported by the findings of the survey (section 4.4.10.3), and consistent with the multi-faceted view of word learning described in sections 1.2 and 1.3, was the rationale for devising an intervention package which encompassed a range of techniques. Just as in clinical practice, it was essential that intervention gave participants the best possible chance of success; therefore, an eclectic approach including word-learning activities which tapped a range of modalities and skills was justified. A delayed-intervention between-groups design, in which groups of students participated in different intervention conditions at different phases of the study, could allow examination of the differential effect of the word-learning activities.

8.10.6 Dosage and word exposure

Dosage is a critical aspect of intervention which may be “key to optimizing intervention effects” (Warren et al., 2007, p.70), and it has been the subject of intense debate in the field of speech and language therapy (e.g. Law & Conti-Ramsden, 2000). Average cumulative intervention intensity in the current study was estimated to average one hour, within 13 lessons, over a period of four weeks. The number of experimental word exposures averaged 9.7 on the day the word was introduced, in comparison to 8.3 exposures for the usual teaching practice words. A limitation of the current study is that neither dosage nor exposure could be controlled, and the ranges for each of these parameters was wide. Furthermore, overall figures for both dosage and exposure contained a proportion of informed estimates. It was impractical to observe every lesson in order to count every word exposure and the duration of every word-learning activity, so dosage and exposure data were obtained from teachers’ strategy records and lesson observations. Where data were missing due to incomplete strategy records, this was overcome by obtaining the information from other sources, such as students’ work and verbal or email communication.

Where there was insufficient information to make an informed estimate, the data were omitted from calculations; thus, the figures reported have a reasonable accuracy.

Summary of Chapter 8

The current chapter has evaluated the success of Word Discovery as a classroom vocabulary intervention. The present study improves on previous research in three key ways: (1) by including a large sample of adolescents with language disorder, who had varied demographic characteristics; (2) by selecting experimental and control words which were directly relevant to the existing curriculum; and (3) by seeking the views of student and teacher participants about the acceptability of the intervention approach. These features maximise the applicability of the findings to a wide population of adolescents with language disorder, and increase their relevance to practising SLTs and MSSTs.

The experimental Word Discovery intervention was more effective than usual teaching practice in increasing the word knowledge of participating students, in terms of both depth of word knowledge and expressive word use. It was found that usual teaching practice typically took semantic and literacy perspectives, whereas Word Discovery focused on oral vocabulary, and addressed multiple aspects of word learning; notably, adding a phonological component to vocabulary teaching in the secondary school classroom. The findings of the study contribute to the currently limited evidence base for a phonological-semantic approach to vocabulary intervention for adolescents with language disorder, and extend the research to a whole-class model of intervention delivery.

The study was unable to demonstrate enhancement of participants' vocabulary skills in the wider sense of increasing transferable word-learning skills, and reasons for this were discussed. There were challenges in conducting the research, and participation in the study was a challenge for some teachers, but overall it was found that Word Discovery was feasible, and acceptable to participating students and teachers. Limitations to the study were evaluated.

The same challenges encountered whilst conducting this research would be equally relevant when implementing Word Discovery in speech and language therapy and teaching practice. Clinical and teaching implications, and suggestions for future research, are followed up in more detail in Chapter 9.

Chapter 9

General discussion and conclusions

Overview

This chapter continues the themes discussed in Chapter 8, exploring in more detail the implications of the findings for clinical and educational practice, and future research. The conclusions drawn in this chapter are situated in the context of the researcher's position as a speech and language therapist (SLT) in the UK. Following an overview of the thesis (section 9.1), the implications of the findings are discussed with respect to: the effectiveness of Word Discovery (section 9.2); the measurement of generalisation effects (section 9.3); predictors of responses to intervention (section 9.4); the development of Word Discovery as an effective intervention (section 9.5); and the role of Word Discovery in collaborative practice (section 9.6). Final conclusions are summarised at the end of the chapter.

9.1 Overview of the thesis

This thesis posed four main research questions:

RQ1: Does classroom vocabulary intervention, delivered by the teacher in a mainstream setting, increase the word knowledge of adolescents with language disorder?

RQ2: Does classroom vocabulary intervention, delivered by the teacher in a mainstream setting, improve the independent word learning ability of adolescents with language disorder?

RQ3: Which language or cognitive characteristics predict the potential to respond to classroom vocabulary intervention?

RQ4: What are the teachers' and students' views about the classroom vocabulary intervention?

These questions were addressed via the implementation of a novel intervention approach designed to enhance the vocabulary skills of adolescents with language disorder. A distinction was drawn between two aspects of enhancing vocabulary skills: first, the increase in knowledge of the words targeted in the intervention; and second, the development of independent word learning skills. The intervention approach, named Word Discovery, aimed to encompass both of these aspects. Evidence was presented that enhancing vocabulary skills of children and adolescents with language disorder is important for improving their access to the school curriculum and consequently enhancing their long-term life outcomes (Chapter 1). The theoretical basis for the intervention techniques was evidenced through reviews of the literature on vocabulary intervention for children and adolescents with language disorder (Chapters 2 and 3), and the potential practical utility of the intervention was demonstrated by surveying the current practice of teachers and SLTs (Chapter 4). Assessments and interventions for enhancing the vocabulary skills of adolescents with language disorder were piloted in Chapter 5, and the effectiveness of Word Discovery as an intervention approach for enhancing the vocabulary skills of adolescents with language disorder was established through an experimental study, reported on in Chapters 6, 7, and 8.

The experimental study drew together two fields of evidence from the literature: universal vocabulary teaching approaches (e.g. Beck et al, 2013; Snow et al., 2009); and phonological-semantic intervention techniques used in specialist or targeted provision (e.g. Ebbels et al., 2012; Joffe et al., in preparation). The novel contribution of the current thesis to the evidence base is that it combined these two sources of evidence, applying evidence-based word-learning activities to a universal model of delivery, implemented by teachers within the mainstream curriculum. The prevalence of language disorder (Norbury et al., 2016) and the prevailing UK educational policy of inclusion (DfE & DoH, 2015) suggest that many mainstream secondary school classes will contain students with language disorder. The effectiveness of Word Discovery, therefore, has potentially wide-reaching implications for universal vocabulary teaching in mainstream secondary schools.

9.2 The effect of Word Discovery on word knowledge

The major finding of the intervention study in this thesis was that a modest amount of intervention was more effective than usual teaching practice in increasing adolescents' knowledge of targeted science curriculum vocabulary. A bespoke word knowledge assessment showed an increase in both depth of word knowledge and expressive word use, suggesting strengthened semantic and phonological representations.

The survey (Chapter 4), and the data gathered during the usual teaching practice phase of the intervention study, showed that teachers typically make phonological information explicit less often than SLTs, when teaching vocabulary. The integration of phonological and semantic information, along with the utilisation of multiple aspects of word learning, have been proposed as a reason for the effectiveness of Word Discovery (section 8.2.1).

A further reason for its effectiveness may have been the timeliness of the intervention, occurring, as it did, at a point in time where developmental and environmental opportunities coincide. Developmentally, this relates to continuing development of metalinguistic awareness during adolescence (van Kleeck, 1984; Spencer et al., 2013). Comments by students in the current study hinted at this metalinguistic awareness:

> [The word wise quickie was] *"quite helpful because, um, because some words are tricky, so like it helps us, like when we actually think of like what it means, like what it does and all that."* (ID 44, Time 3)
>
> [The display of visual images] *"was really, really, helpful for me ... because like learning new words is like hard but they were like pictures."* (ID 27, Time 3)

Both these students demonstrated their awareness that words can be difficult to learn.

At the same time, because of the heightened neurological changes taking place during adolescence, students have the potential to respond to educational and rehabilitation programmes during this period (Blakemore & Choudhury, 2006; Blakemore & Mills, 2014).

These developments coincide with a critical period in the adolescent's school career. At secondary school, vocabulary becomes increasingly technical and specialised (Nippold, 2007), yet there is no respite from the pace at which new vocabulary is presented to students, nor from the increasing focus on examination success (DfE, 2017a). The researcher argues, therefore, that research and practice in the field of language disorder need to move beyond the view that intervention *can* be effective even in this older age-group (e.g. Ebbels et al., 2012), to a standpoint where adolescence is viewed as a *critical window of opportunity* in which it is crucial to intervene.

9.3 The measurement of generalisation effects

This section considers the impact of Word Discovery on the second aspect of enhancing vocabulary skills; namely, independent word learning. The experimental study did not demonstrate significant progress in independent word learning skills, and so this remains an area for future research. As discussed in section 8.3.4, a first priority is to develop a more valid, reliable, and sensitive method for assessing the effects of vocabulary intervention on independent word-learning skills.

Related to this is the need to develop a robust way of measuring the impact of vocabulary intervention on curriculum attainment. The only studies to have assessed academic attainment following vocabulary intervention are the Word Generation studies (e.g. Snow et al., 2009) and studies by Lesaux and colleagues (e.g. Lesaux et al., 2014), and neither of these addressed this issue specifically within the field of language disorder. None of the studies included in the systematic review (Chapter 3) investigated the impact of vocabulary intervention on academic progress. A shortcoming of the current study was that schools collected attainment data in different ways, and at timepoints which were asynchronous with the assessment timepoints of the study. This could be overcome in future by ensuring that all participating schools use the same methods of curriculum attainment assessment. Furthermore, it would be important to choose schools' data capture points as a basis for the starting point of the study, and to schedule the rest of the study accordingly, rather than choosing a starting point at the convenience of the research team. The impact of intervention on curriculum attainment remains an area of paramount importance for future research, given that the long-term aim of vocabulary intervention for adolescents with language disorder is not just to increase their word knowledge, but to enhance their independent word-learning skills in order to facilitate better access to the curriculum, and hence to enhance their life chances.

9.4 Predictors of response to intervention

The hierarchical multiple regressions in the experimental study did not identify any specific language or cognitive factors, other than NVIQ, that were predictive of increases in depth of word knowledge or expressive word use. The recruitment of a larger cohort of students with a wider range of language and cognitive abilities, including TD adolescents as well as those with language disorder, would enable this question to be examined with more rigour.

A further key finding of the study was that, although there was widespread support amongst students for the actual Word Discovery activities, not all students wished to receive vocabulary intervention in the whole class situation. This is worthy of consideration as another potential predictor of response to intervention. For these students, the idea of withdrawal from class for small-group or individual support was preferable. As discussed in section 8.5.1, this is unsurprising for students who have attentional difficulties, but there could be other factors, such as the severity of language disorder, the particular language and cognitive profile of the student, and the student’s social and emotional well-being. Attentional, language, learning, or social and emotional factors could influence the degree to which a student engages with lessons, and hence influence the extent to which they benefit from the teaching input. During lesson observations, the researcher noted differing levels of engagement amongst participating students, but it was beyond the scope of this thesis to investigate the degree of engagement in relation to students’ ability to respond to the intervention, so this remains an area for future research.

To examine predictors of response to intervention fully, it would be necessary to explore the interaction between factors such as student preference, language and cognitive profile, and social and emotional well-being, in conjunction with exploring how these factors influenced response to different models of intervention. When investigating the effect of different models of delivery, the influence of the agent of change would also have to be considered. In a mainstream whole-class model, the intervention is likely to be delivered by a teacher; whereas in small-group or individual models, the intervention is likely to be delivered by a teaching assistant or SLT. These three professional groups possess differing sets of knowledge and skills. Knowing how all these variables interact would be valuable in informing choices of intervention in clinical and teaching practice. Some students with language disorder may need specialist or targeted provision, receiving vocabulary intervention in small groups or individually at certain points in their development, followed up by classroom support. As T.17 said (section 7.4.5), initial preliminary training with less able students could make it easier for them to access the word-learning activities during lessons. This would enable the inclusion of Word Discovery activities in the classroom to reach its potential in contributing to “Quality First Teaching” (section 2.3), by making the classroom vocabulary support accessible to all students.

In the absence of evidence from research, an interim clinical implication is that a single approach is unlikely to meet all students’ needs. Archibald (2017) discusses the notion of “reason-based practice” (Archibald, 2017, p.1), whereby SLTs use their theoretical and research knowledge to inform clinical judgement. The preliminary indications from the current research suggest that reason-based practice would necessitate flexibility when making intervention choices, according to the needs of the student and the circumstances.

9.5 The development of Word Discovery as an effective intervention

The findings of the research in this thesis form the basis for extending the research along various lines of enquiry, in order to explore further the development of Word Discovery as an effective intervention. These lines of enquiry include: the applicability of Word Discovery to Tier 2 words; the investigation of optimum cumulative intervention intensity; and the long-term maintenance of newly-acquired word knowledge. These will be discussed in turn.

9.5.1 The applicability of Word Discovery to Tier 2 words

Responses to the survey in Chapter 4 indicated a desire amongst practitioners to know how to provide intervention for Tier 2 (cross-curricular) words. The intervention by Spencer et al. (2017), which was a small-group intervention for Tier 2 words consisting of phonological-semantic word-learning activities, met with moderate success. As Word Discovery also consisted of phonological-semantic word-learning activities, it is reasonable to conclude that the techniques used in Word Discovery need not be exclusively confined to the teaching of Tier 3 (subject-specific) words, but that they could be equally applicable to Tier 2 words. A whole-school approach, implementing intervention for Tier 2 words across a range of subjects, would increase the amount of input students received for each word, and enable them to encounter the words in a variety of meaningful contexts. This could form the subject of future research, but, in the meantime, the application of Word Discovery to Tier 2 words in the whole-class setting could be eligible for inclusion in reason-based practice.

9.5.2 Optimum cumulative intervention intensity

Another line of enquiry would be to investigate further the impact of dosage on the effectiveness of intervention. An encouraging outcome of the current study was that improvement occurred even in the context of a limited amount of input, consisting of one hour's teacher training and an average of one hour's teaching in the classroom. Other studies investigating the effect of teacher training on the language skills of children or adolescents with language disorder have invested greater amounts of time in training, and also provided more ongoing support. For example, in the study by Starling et al. (2012) (section 2.3.2.1), the duration of training was 50-minutes once a week for 10 weeks, followed by three lesson observations for ongoing support. It is questionable whether this level of input is compatible with current speech and language therapy resources in the UK (Bercow, 2008; Pring, 2016), whereas the small amount of input in the current study has translational potential.

It is currently unclear what the optimum cumulative intervention intensity is for classroom vocabulary intervention. Marulis and Neuman (2010) (section 2.2.4.4) conducted a systematic review of vocabulary intervention studies on children aged four to six years, including those who were typically developing, those of social disadvantage, and those with low academic attainment. Overall, they found that intensive intervention with a smaller number of sessions resulted in better outcomes than more extended intervention regimes. The systematic review (Chapter 3) did not elucidate whether these findings hold true for adolescents with language disorder. In the present study, participants made modest gains in knowledge of 10 experimental words. It is open to question whether greater gains would have been made with more intensive input or with a different intervention regime. The training in the current study was limited to one hour within the science department, and intervention was confined to the science classroom. If whole-school training took place, this one hour's input in science could potentially be reproduced across all subjects, demanding no more time of individual teachers but multiplying the amount of intervention received by students. This remains a promising area for future research.

9.5.3 Maintenance of word knowledge

There was some loss of retention in experimental word knowledge over the five-week follow-up period in the current study. The purpose of the follow-up assessment was to evaluate retention after a period of no input, and it showed that recently acquired phonological and semantic knowledge had, to some extent, deteriorated.

The implication of these findings for practice is the need for constant revision to maintain recently-acquired word knowledge. Science curricula tend to be constructed in a cyclical fashion, such that topics, once introduced, are revisited throughout Key Stages 3 and 4, in more detail each time. This provides opportunities for students to recall earlier learning and build on current knowledge. If revision opportunities occur at intervals that are too far apart, the deterioration of phonological and semantic information could result in its becoming too poorly specified to retrieve, leaving students with language disorder at risk of falling further behind. Revision opportunities need to occur with regularity and frequency.

9.6 The role of Word Discovery in collaborative practice

The choice of Word Discovery as an intervention option is reliant on collaborative practice between the teacher and the SLT. The virtues of teacher/SLT collaboration have been widely extolled (Archibald, 2017; Ehren, 2002). Considering collaboration in the context of the current thesis, the teachers and SLTs in the survey (Chapter 4) expressed a desire to collaborate with each other, but reported practical obstacles; and in the intervention study, the researcher encountered varying attitudes towards participation amongst teachers. This has implications for the applicability of whole-class vocabulary intervention to different situations. It behoves practising SLTs to be respectful of the fact that new ways of working will not be unconditionally accepted by all teachers, owing to factors such as their style of working, the needs of the students in their class, and competing priorities.

A potential solution is to find the keys which unlock barriers to collaborative work. McKean et al. (2017) (section 4.5.2) reported factors critical to the success of collaborative practice such as shared understanding of roles, and open and honest communication. In the current study, information-sharing enabled the researcher to discover the key priorities of each school which motivated them to take part in the study. These incentives included: an Ofsted report requiring improvement in science attainment; a school focus on mastery learning (Slavin, 1987); and the inclusion of vocabulary teaching in one teacher’s performance management targets. Information-sharing in practice may reveal similar priorities which could form the basis of inter-professional dialogue and contribute to successful collaborative practice, to the benefit of students.

To maximise the effectiveness of inter-professional dialogue, it is important to have a shared terminology. McKean et al. (2017) found no issues regarding the use of a common language between the professions, but the findings of the current study suggested that there are still cases where a common terminology needs to be established; for example, there were different perspectives by the teachers and researcher on what constituted a vocabulary teaching strategy (section 7.7). The very words *vocabulary* or *language* can refer equally to the written word or the spoken word, unless this is explicitly stated. As the current thesis has shown, teachers tend to take a literacy perspective, whereas SLTs tend to take an oral language perspective. To maximise acceptance of a classroom intervention such as Word Discovery, it may be more effectual to promote it to schools as a literacy intervention rather than an oral language intervention. Conversations between SLTs and teaching colleagues can facilitate development of a shared inter-professional understanding of vocabulary knowledge as a critical component of reading comprehension, with reading comprehension being seen in turn as crucial for examination success.

Collaborative practice contributes to the continuing professional development of each practitioner. The SLT has much to learn from the expertise of teaching colleagues, and the teacher has much to learn from the expertise of the SLT. Indeed, there are moves to commence collaborative working from the outset of professional training. Joint practice placements during training are already taking place in New Zealand (Wilson, McNeill, & Gillon, 2017); and in the UK, the “Carter Review of Initial Teacher Training” (DfE, 2015) recommended that training in special educational needs (including SLCN) should be part of core content on all initial teacher training courses. This recommendation was accepted by the government in office at that time (DfE, 2016a). Such a move could instil vocabulary awareness into the mindset of the newly-qualified teacher. The classroom vocabulary intervention which has been shown to be effective in the current thesis represents a candidate for inclusion in SLCN training for secondary school teachers.

Summary of Chapter 9: final conclusion

Shaped by a systematic review of the literature, and by a survey of current teaching and speech and language therapy practice, an intervention study was conducted, in which 78 adolescents with language disorder aged 11 – 13 years were taught science curriculum words by teachers in class, under two conditions: 1) 10 words taught through usual teaching practice; and 2) 10 words taught using an experimental intervention incorporating phonological-semantic activities. Word Discovery intervention was more effective than usual teaching practice in increasing the word knowledge of participating students. Positive feedback regarding the word-learning activities was received from students and teachers, but a range of preferences for model of intervention delivery was found amongst students.

The practice implications of these findings can be summarised as follows:

- Combined phonological-semantic intervention, integrated with multiple aspects of word learning and embedded into the mainstream secondary school science curriculum, increases the targeted word knowledge of adolescents with language disorder.
- Frequent and regular revision is necessary to maintain recently-acquired word knowledge.
- Vocabulary intervention during the secondary school years is critical due to the developmental and environmental opportunities present during adolescence.

- The Word Discovery approach complements the range of intervention options open to the speech and language therapist working in partnership with secondary school teaching colleagues. When appraising options for intervention, flexibility needs to be adopted according to the needs of the student and the circumstances.
- Word Discovery activities, delivered universally in the classroom, have the potential to supplement the resources of the secondary school teacher and contribute to Quality First Teaching.

To extend the findings of the current study, further research is required in the following areas:

- To develop a valid, reliable, and sensitive method for assessing the effects of vocabulary intervention on independent word-learning skills
- To measure the impact of classroom vocabulary intervention on academic attainment
- To explore the interaction between factors such as student preference, language and cognitive profile, and social and emotional well-being, in conjunction with exploring how these factors influence response to intervention in different models of delivery
- To examine the applicability of the Word Discovery approach to subjects other than science, and to Tier 2 words
- To establish the optimum cumulative intervention intensity for classroom vocabulary intervention
- To explore further the roles that phonological processing, semantic processing, and verbal working memory play in the increase and maintenance of depth of word knowledge and expressive word use.

The present thesis has shown that evidence-based word-learning techniques, applied to the whole-class context, can effectively increase the vocabulary knowledge of adolescents with language disorder. Bearing in mind the association between vocabulary knowledge and academic outcomes, these findings are important in a society where academic success is not only the goal but also the means to positive employment, social, and health outcomes.

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Appendices

Appendix 4A

Ethical approval indemnity letter: survey

School of Health Sciences Research Office
Northampton Square
London EC1V 0HB

Tel: +44 (0) 20 7040 5704

www.city.ac.uk

CITY UNIVERSITY LONDON

Ref: PhD/14-15/10

13 February 2015

Dear Hilary / Vicky / Natalie

Re: Vocabulary intervention in adolescents with language impairment

Thank you for forwarding amendments and clarifications regarding your project. These have now been reviewed **and approved** by the Chair of the School Research Ethics Committee.

Please find attached, details of the full indemnity cover for your study.

Under the School Research Governance guidelines you are requested to contact myself once the project has been completed, and may be asked to complete a brief progress report six months after registering the project with the School.

If you have any queries please do not hesitate to contact me as below.

Yours sincerely

[redacted]

Alison Welton
Research Governance Officer

[redacted]
020 7040 5704

Appendix 4B

Full text of survey questionnaire

Key: Q = Question

Bullet points represent tick boxes

Please tick below if you wish to participate in the study.

- Yes, I give my consent to take part in this survey, and for my responses to be used anonymously in the dissemination of the research.

Q1 What is your job role? (please tick all that apply)

- Mainstream secondary school teacher
- Special school teacher
- Special educational needs coordinator
- Specialist teacher
- Speech and language therapist

Q2 If you are a mainstream secondary school teacher, what subject do you teach? (please tick all that apply)

- English
- Maths
- Science
- History
- Geography
- Religious Studies/Citizenship
- Physical Education
- Art
- Music
- Technology
- Other (please specify) [free-text box]

Q3 If you are mainstream secondary school teacher, how many lessons per week, over how many weeks, do you spend on one topic?

Q4 If you are a mainstream secondary school teacher, on average how many minutes in any one lesson is given to teaching the new words of the lesson?

Q5 In which region do you work?

- Scotland
- Northern Ireland
- Wales
- North East and Cumbria
- North West
- Yorkshire and the Humber
- West Midlands
- East Midlands
- East of England
- South West
- South Central
- South East
- London
- Channel Isles/Isle of Man
- Outside the UK (please state where) [free-text box]

Q6 Approximately what percentage of the students, aged 11 – 16 years, with whom you work have a vocabulary deficit?

- 9%
- 10-19%
- 20-29%
- 30-39%
- 40-49%
- 50-59%
- 60-69%
- 70-79%
- 80-89%
- 90-100%.

Q7 How confident are you at teaching vocabulary to students aged 11 – 16 years with language impairment?

- Very confident

- Quite confident
- Not very confident
- Not at all confident
- Please give your reasons. [free-text box]

Q8 How important do you think it is for students, aged 11 – 16 years, to be able to learn new vocabulary?

- Very important
- Quite important
- Not very important
- Not at all important
- Please give your reasons. [free-text box]

Q9 What model of delivery do you use to teach vocabulary to students aged 11 – 16 years? (please tick all that apply)

- Team teaching (whole-class strategies carried out in collaboration between teacher and speech and language therapist)
- Whole-class strategies carried out by the teacher
- Individual intervention outside the classroom led by a teaching assistant
- Small group intervention outside the classroom led by a teaching assistant
- Individual intervention outside the classroom led by a speech and language therapist
- Small group intervention outside the classroom led by a speech and language therapist
- Other (please specify) [free-text box]

What factors influence your decision about which model of delivery to use?

[free-text box]

Q10 What strategies do you use/recommend to help students learn and remember new words and their meaning?

	Never	Seldom	Some-times	Often	Always
a) List key words in lesson plans					
b) List key words on the board at the beginning of a lesson					
c) Display key words with visual image					
d) Use a “must should could approach” i.e. Identify a small set of essential key words which all students must know, within a larger set which most should know, within a wider set which some could learn.					
e) Repeat the words often					
f) Give definitions					
g) Give examples of word usage in multiple contexts					
h) Ask students to look words up in the dictionary/glossary					
i) Encourage students to think of personalised experience relating to the word					
j) Develop student self-awareness by explicitly encouraging students to identify unknown words					
k) Ask students to self-rate their word knowledge e.g. red amber green					
l) Give students their own vocabulary book to record new words and their meanings					
m) Teach students how to derive meaning from context					
n) Teach students how to derive meaning from morphological features e.g. prefix, root, suffix.					
o) Teach semantic feature analysis e.g. function, location, association, part of speech, category					
p) Teach phonological awareness of the words (initial sound, syllable, and rhyme) e.g. phonological-semantic word maps, word grids, sound-and-meaning bingo.					
q) Ask students to say words aloud					
r) Ask students to use the words in a spoken sentence					
s) Ask students to write the word					
t) Ask students to use the words in a written sentence					
Other (please specify) [free-text box]					

Which of the above do you feel is the most effective? (list one or more) [free-text box]

Q11 Would you like to develop your knowledge about how to provide effective vocabulary intervention for secondary school students with language impairment?

- Yes
- No

Please state in which specific areas you would like to develop your knowledge. [free-text box]

Q12 Finally, please add any further comments that you feel were not captured in this questionnaire. [free-text box]

Appendix 4C

Data for all job roles and their use of strategies

			Give definitions			
			sometimes	often	always	Total
Job Role	MSST	Count	4	9	26	39
		% within Job Role	10.3%	23.1%	66.7%	100%
	Spec Sch T	Count	0	3	5	8
		% within Job Role	0.0%	37.5%	62.5%	100%
	Senco	Count	0	2	5	7
		% within Job Role	0.0%	28.6%	71.4%	100%
	Specialist T	Count	0	2	17	19
		% within Job Role	0.0%	10.5%	89.5%	100%
	SLT	Count	3	24	78	105
		% within Job Role	2.9%	22.9%	74.3%	100%
Total		Count	7	40	131	178
		% within Job Role	3.9%	22.5%	73.6%	100%

			List key words in lesson plans					Total
			never	seldom	sometimes	often	always	
Job Role	MSST	Count	0	2	10	9	17	38
		% within Job Role	0.0%	5.3%	26.3%	23.7%	44.7%	100%
	Spec Sch T	Count	0	0	2	2	4	8
		% within Job Role	0.0%	0.0%	25.0%	25.0%	50.0%	100%
	Senco	Count	0	2	0	1	4	7
		% within Job Role	0.0%	28.6%	0.0%	14.3%	57.1%	100%
	Specialist T	Count	0	1	2	8	8	19
		% within Job Role	0.0%	5.3%	10.5%	42.1%	42.1%	100%
	SLT	Count	5	8	19	27	44	103
		% within Job Role	4.9%	7.8%	18.4%	26.2%	42.7%	100%
Total		Count	5	13	33	47	77	175
		% within Job Role	2.9%	7.4%	18.9%	26.9%	44.0%	100%

			Use "must should could" approach					Total
			never	seldom	sometimes	often	always	
Job Role	MSST	Count	6	8	12	9	3	38
		% within Job Role	15.8%	21.1%	31.6%	23.7%	7.9%	100%
	Spec Sch T	Count	1	0	2	4	1	8
		% within Job Role	12.5%	0.0%	25.0%	50.0%	12.5%	100%
	Senco	Count	2	1	0	2	2	7
		% within Job Role	28.6%	14.3%	0.0%	28.6%	28.6%	100%
	Specialist T	Count	2	3	5	2	7	19
		% within Job Role	10.5%	15.8%	26.3%	10.5%	36.8%	100%
	SLT	Count	16	22	24	23	17	102
		% within Job Role	15.7%	21.6%	23.5%	22.5%	16.7%	100%
Total		Count	27	34	43	40	30	174
		% within Job Role	15.5%	19.5%	24.7%	23.0%	17.2%	100%

			Repeat words often				Total
			seldom	sometimes	often	always	
Job Role	MSST	Count	1	1	8	28	38
		% within Job Role	2.6%	2.6%	21.1%	73.7%	100%
	Spec Sch T	Count	0	0	4	4	8
		% within Job Role	0.0%	0.0%	50.0%	50.0%	100%
	Senco	Count	0	0	4	3	7
		% within Job Role	0.0%	0.0%	57.1%	42.9%	100%
	Specialist T	Count	0	1	6	12	19
		% within Job Role	0.0%	5.3%	31.6%	63.2%	100%
	SLT	Count	2	8	30	66	106
		% within Job Role	1.9%	7.5%	28.3%	62.3%	100%
Total		Count	3	10	52	113	178
		% within Job Role	1.7%	5.6%	29.2%	63.5%	100%

			Give examples of usage in multiple contexts					Total
			never	seldom	sometimes	often	always	
Job Role	MSST	Count	2	1	8	13	15	39
		% within Job Role	5.1%	2.6%	20.5%	33.3%	38.5%	100%
	Spec Sch T	Count	0	0	0	4	4	8
		% within Job Role	0.0%	0.0%	0.0%	50.0%	50.0%	100%
	Senco	Count	0	0	1	3	3	7
		% within Job Role	0.0%	0.0%	14.3%	42.9%	42.9%	100%
	Specialist T	Count	0	1	0	9	9	19
		% within Job Role	0.0%	5.3%	0.0%	47.4%	47.4%	100%
	SLT	Count	0	1	8	34	63	106
		% within Job Role	0.0%	0.9%	7.5%	32.1%	59.4%	100%
Total		Count	2	3	17	63	94	179
		% within Job Role	1.1%	1.7%	9.5%	35.2%	52.5%	100%

			Teach students how to derive meaning from morphology					Total
			never	seldom	sometimes	often	always	
Job Role	MSST	Count	10	6	8	8	6	38
		% within Job Role	26.3%	15.8%	21.1%	21.1%	15.8%	100%
	Spec Sch T	Count	1	2	2	2	1	8
		% within Job Role	12.5%	25.0%	25.0%	25.0%	12.5%	100%
	Senco	Count	0	1	3	0	3	7
		% within Job Role	0.0%	14.3%	42.9%	0.0%	42.9%	100%
	Specialist T	Count	0	2	4	7	6	19
		% within Job Role	0.0%	10.5%	21.1%	36.8%	31.6%	100%
	SLT	Count	8	19	36	25	16	104
		% within Job Role	7.7%	18.3%	34.6%	24.0%	15.4%	100%
Total		Count	19	30	53	42	32	176
		% within Job Role	10.8%	17.0%	30.1%	23.9%	18.2%	100%

			Ask students to say the word aloud					Total
			never	seldom	sometimes	often	always	
Job Role	MSST	Count	2	0	5	8	24	39
		% within Job Role	5.1%	0.0%	12.8%	20.5%	61.5%	100%
	Spec Sch T	Count	0	0	1	3	4	8
		% within Job Role	0.0%	0.0%	12.5%	37.5%	50.0%	100%
	Senco	Count	0	0	0	0	7	7
		% within Job Role	0.0%	0.0%	0.0%	0.0%	100.0%	100%
	Specialist T	Count	0	0	0	5	13	18
		% within Job Role	0.0%	0.0%	0.0%	27.8%	72.2%	100%
	SLT	Count	1	4	12	25	62	104
		% within Job Role	1.0%	3.8%	11.5%	24.0%	59.6%	100%
Total		Count	3	4	18	41	110	176
		% within Job Role	1.7%	2.3%	10.2%	23.3%	62.5%	100%

			Ask students to use the word in a spoken sentence					
			never	seldom	sometimes	often	always	Total
Job Role	MSST	Count	1	2	5	13	18	39
		% within Job Role	2.6%	5.1%	12.8%	33.3%	46.2%	100%
	Spec Sch T	Count	0	0	2	4	2	8
		% within Job Role	0.0%	0.0%	25.0%	50.0%	25.0%	100%
	Senco	Count	0	0	0	1	6	7
		% within Job Role	0.0%	0.0%	0.0%	14.3%	85.7%	100%
	Specialist T	Count	0	0	2	5	12	19
		% within Job Role	0.0%	0.0%	10.5%	26.3%	63.2%	100%
	SLT	Count	1	3	12	29	59	104
		% within Job Role	1.0%	2.9%	11.5%	27.9%	56.7%	100%
Total		Count	2	5	21	52	97	177
		% within Job Role	1.1%	2.8%	11.9%	29.4%	54.8%	100%

			Ask students to write the word					
			never	seldom	sometimes	often	always	Total
Job Role	MSST	Count	2	0	5	9	23	39
		% within Job Role	5.1%	0.0%	12.8%	23.1%	59.0%	100%
	Spec Sch T	Count	0	0	3	4	1	8
		% within Job Role	0.0%	0.0%	37.5%	50.0%	12.5%	100%
	Senco	Count	0	0	2	1	4	7
		% within Job Role	0.0%	0.0%	28.6%	14.3%	57.1%	100%
	Specialist T	Count	0	0	2	8	9	19
		% within Job Role	0.0%	0.0%	10.5%	42.1%	47.4%	100%
	SLT	Count	2	11	36	28	27	104
		% within Job Role	1.9%	10.6%	34.6%	26.9%	26.0%	100%
Total		Count	4	11	48	50	64	177
		% within Job Role	2.3%	6.2%	27.1%	28.2%	36.2%	100%

			List key words on the board					
			never	seldom	sometimes	often	always	Total
Job Role	MSST	Count	0	1	7	20	10	38
		% within Job Role	0.0%	2.6%	18.4%	52.6%	26.3%	100%
	Spec Sch T	Count	0	1	0	5	2	8
		% within Job Role	0.0%	12.5%	0.0%	62.5%	25.0%	100%
	Senco	Count	0	0	1	3	3	7
		% within Job Role	0.0%	0.0%	14.3%	42.9%	42.9%	100%
	Specialist T	Count	0	0	1	8	10	19
		% within Job Role	0.0%	0.0%	5.3%	42.1%	52.6%	100%
	SLT	Count	9	7	13	37	37	103
		% within Job Role	8.7%	6.8%	12.6%	35.9%	35.9%	100%
Total		Count	9	9	22	73	62	175
		% within Job Role	5.1%	5.1%	12.6%	41.7%	35.4%	100%

			Ask students to use the word in a written sentence					
			never	seldom	sometimes	often	always	Total
Job Role	MSST	Count	2	1	5	10	20	38
		% within Job Role	5.3%	2.6%	13.2%	26.3%	52.6%	100%
	Spec Sch T	Count	0	0	3	4	1	8
		% within Job Role	0.0%	0.0%	37.5%	50.0%	12.5%	100%
	Senco	Count	0	0	3	2	2	7
		% within Job Role	0.0%	0.0%	42.9%	28.6%	28.6%	100%
	Specialist T	Count	0	0	2	11	6	19
		% within Job Role	0.0%	0.0%	10.5%	57.9%	31.6%	100%
	SLT	Count	5	20	28	30	22	105
		% within Job Role	4.8%	19.0%	26.7%	28.6%	21.0%	100%
Total		Count	7	21	41	57	51	177
		% within Job Role	4.0%	11.9%	23.2%	32.2%	28.8%	100%

			Display key words with visual image					Total
			never	seldom	sometimes	often	always	
Job Role	MSST	Count	2	6	7	14	9	38
		% within Job Role	5.3%	15.8%	18.4%	36.8%	23.7%	100%
	Spec Sch T	Count	0	1	2	3	2	8
		% within Job Role	0.0%	12.5%	25.0%	37.5%	25.0%	100%
	Senco	Count	0	1	1	3	2	7
		% within Job Role	0.0%	14.3%	14.3%	42.9%	28.6%	100%
	Specialist T	Count	0	0	2	7	10	19
		% within Job Role	0.0%	0.0%	10.5%	36.8%	52.6%	100%
	SLT	Count	1	2	14	36	52	105
		% within Job Role	1.0%	1.9%	13.3%	34.3%	49.5%	100%
Total		Count	3	10	26	63	75	177
		% within Job Role	1.7%	5.6%	14.7%	35.6%	42.4%	100%

			Ask students to look words up in dictionary					Total
			never	seldom	sometimes	often	always	
Job Role	MSST	Count	3	8	15	6	7	39
		% within Job Role	7.7%	20.5%	38.5%	15.4%	17.9%	100%
	Spec Sch T	Count	0	3	3	2	0	8
		% within Job Role	0.0%	37.5%	37.5%	25.0%	0.0%	100%
	Senco	Count	0	1	2	3	1	7
		% within Job Role	0.0%	14.3%	28.6%	42.9%	14.3%	100%
	Specialist T	Count	0	1	5	9	4	19
		% within Job Role	0.0%	5.3%	26.3%	47.4%	21.1%	100%
	SLT	Count	2	9	28	43	22	104
		% within Job Role	1.9%	8.7%	26.9%	41.3%	21.2%	100%
Total		Count	5	22	53	63	34	177
		% within Job Role	2.8%	12.4%	29.9%	35.6%	19.2%	100%

			Relate to student's own experience					Total
			never	seldom	sometimes	often	always	
Job Role	MSST	Count	3	10	9	10	6	38
		% within Job Role	7.9%	26.3%	23.7%	26.3%	15.8%	100%
	Spec Sch T	Count	1	0	1	4	2	8
		% within Job Role	12.5%	0.0%	12.5%	50.0%	25.0%	100%
	Senco	Count	1	0	1	2	3	7
		% within Job Role	14.3%	0.0%	14.3%	28.6%	42.9%	100%
	Specialist T	Count	1	1	4	8	5	19
		% within Job Role	5.3%	5.3%	21.1%	42.1%	26.3%	100%
	SLT	Count	2	8	17	44	34	105
		% within Job Role	1.9%	7.6%	16.2%	41.9%	32.4%	100%
Total		Count	8	19	32	68	50	177
		% within Job Role	4.5%	10.7%	18.1%	38.4%	28.2%	100%

			Encourage students to identify unknown words					Total
			never	seldom	sometimes	often	always	
Job Role	MSST	Count	2	9	4	15	9	39
		% within Job Role	5.1%	23.1%	10.3%	38.5%	23.1%	100%
	Spec Sch T	Count	0	0	3	4	1	8
		% within Job Role	0.0%	0.0%	37.5%	50.0%	12.5%	100%
	Senco	Count	0	2	1	3	1	7
		% within Job Role	0.0%	28.6%	14.3%	42.9%	14.3%	100%
	Specialist T	Count	0	1	2	8	8	19
		% within Job Role	0.0%	5.3%	10.5%	42.1%	42.1%	100%
	SLT	Count	1	4	19	30	50	104
		% within Job Role	1.0%	3.8%	18.3%	28.8%	48.1%	100%
Total		Count	3	16	29	60	69	177
		% within Job Role	1.7%	9.0%	16.4%	33.9%	39.0%	100%

			Ask students to rate their own knowledge					
			never	seldom	sometimes	often	always	Total
Job Role	MSST	Count	15	9	7	3	4	38
		% within Job Role	39.5%	23.7%	18.4%	7.9%	10.5%	100%
	Spec Sch T	Count	0	3	4	0	0	7
		% within Job Role	0.0%	42.9%	57.1%	0.0%	0.0%	100%
	Senco	Count	2	3	1	1	0	7
		% within Job Role	28.6%	42.9%	14.3%	14.3%	0.0%	100%
	Specialist T	Count	4	1	6	1	7	19
		% within Job Role	21.1%	5.3%	31.6%	5.3%	36.8%	100%
	SLT	Count	13	15	30	25	21	104
		% within Job Role	12.5%	14.4%	28.8%	24.0%	20.2%	100%
Total		Count	34	31	48	30	32	175
		% within Job Role	19.4%	17.7%	27.4%	17.1%	18.3%	100%

			Give students their own vocabulary book					
			never	seldom	sometimes	often	always	Total
Job Role	MSST	Count	12	10	7	3	6	38
		% within Job Role	31.6%	26.3%	18.4%	7.9%	15.8%	100%
	Spec Sch T	Count	0	2	1	1	2	6
		% within Job Role	0.0%	33.3%	16.7%	16.7%	33.3%	100%
	Senco	Count	1	2	1	2	1	7
		% within Job Role	14.3%	28.6%	14.3%	28.6%	14.3%	100%
	Specialist T	Count	2	2	2	8	5	19
		% within Job Role	10.5%	10.5%	10.5%	42.1%	26.3%	100%
	SLT	Count	5	10	22	41	28	106
		% within Job Role	4.7%	9.4%	20.8%	38.7%	26.4%	100%
Total		Count	20	26	33	55	42	176
		% within Job Role	11.4%	14.8%	18.8%	31.3%	23.9%	100%

			Teach how to derive meaning from context					
			never	seldom	sometimes	often	always	Total
Job Role	MSST	Count	10	6	6	10	6	38
		% within Job Role	26.3%	15.8%	15.8%	26.3%	15.8%	100%
	Spec Sch T	Count	0	2	2	3	1	8
		% within Job Role	0.0%	25.0%	25.0%	37.5%	12.5%	100%
	Senco	Count	0	1	2	1	3	7
		% within Job Role	0.0%	14.3%	28.6%	14.3%	42.9%	100%
	Specialist T	Count	0	0	5	7	7	19
		% within Job Role	0.0%	0.0%	26.3%	36.8%	36.8%	100%
	SLT	Count	5	15	24	36	23	103
		% within Job Role	4.9%	14.6%	23.3%	35.0%	22.3%	100%
Total		Count	15	24	39	57	40	175
		% within Job Role	8.6%	13.7%	22.3%	32.6%	22.9%	100%

			Teach semantic feature analysis					
			never	seldom	sometimes	often	always	Total
Job Role	MSST	Count	11	9	10	6	2	38
		% within Job Role	28.9%	23.7%	26.3%	15.8%	5.3%	100%
	Spec Sch T	Count	1	2	3	1	1	8
		% within Job Role	12.5%	25.0%	37.5%	12.5%	12.5%	100%
	Senco	Count	2	2	2	1	0	7
		% within Job Role	28.6%	28.6%	28.6%	14.3%	0.0%	100%
	Specialist T	Count	1	1	2	4	11	19
		% within Job Role	5.3%	5.3%	10.5%	21.1%	57.9%	100%
	SLT	Count	0	3	11	28	64	106
		% within Job Role	0.0%	2.8%	10.4%	26.4%	60.4%	100%
Total		Count	15	17	28	40	78	178
		% within Job Role	8.4%	9.6%	15.7%	22.5%	43.8%	100%

			Teach phonological awareness					
			never	seldom	sometimes	often	always	Total
Job Role	MSST	Count	11	4	11	8	4	38
		% within Job Role	28.9%	10.5%	28.9%	21.1%	10.5%	100%
	Spec Sch T	Count	0	1	2	4	1	8
		% within Job Role	0.0%	12.5%	25.0%	50.0%	12.5%	100%
	Senco	Count	0	0	2	1	4	7
		% within Job Role	0.0%	0.0%	28.6%	14.3%	57.1%	100%
	Specialist T	Count	0	2	0	2	15	19
		% within Job Role	0.0%	10.5%	0.0%	10.5%	78.9%	100%
	SLT	Count	0	6	10	35	55	106
		% within Job Role	0.0%	5.7%	9.4%	33.0%	51.9%	100%
Total		Count	11	13	25	50	79	178
		% within Job Role	6.2%	7.3%	14.0%	28.1%	44.4%	100%

Appendix 6A

Ethical approval indemnity letter: intervention study

CITY UNIVERSITY LONDON

School of Health Sciences

Research Office
Northampton Square
London EC1V 0HB

Tel: +44 (0) 20 7040 5704

www.city.ac.uk

22 May 2015

Dear Hilary / Vicky

Reference number: PR/LCS/PhD/15-16/01
Name: Hilary Lowe / Vicky Joffe
Title of project: Vocabulary intervention in adolescents with language impairment

Your application has been reviewed and I am happy to approve the application from today's date.

Best of luck with your project.

Please note the above reference number which identifies this application and **must be quoted in all correspondence.**

Kind regards

[redacted]

pp Lucy A. Henry
Professor of Speech and Language
Language and Communication Science Division
City University London
Northampton Square
London EC1V 0HB
[redacted]

Appendix 6B

Information and consent forms: intervention study

Information sheet – Head Teacher

CITY UNIVERSITY LONDON

Vocabulary intervention in adolescents with language difficulties:

How to help young people learn and remember new words

I am a PhD student at City University London, and would like to invite you to take part in a research study I am conducting on teaching vocabulary. Before you decide whether you would like to take part it is important that you understand why the research is being done and what it would involve for you. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. This study has been approved by City University London School of Health Sciences Research Ethics Committee.

What is the purpose of the study?
Many students find it hard to learn and remember the vocabulary required to enable them to succeed in school. We know what works for helping primary school-aged children learn and remember new words, and this project explores what works best for word learning in secondary school students

Why have I been invited?
We are inviting schools to identify some of their year 7, 8 and 9 students who will benefit from extra help learning new words.

Do I have to take part?
Participation is voluntary. It is up to you to decide whether or not to take part. If you agree, you will be asked to sign a consent form. If you decide to take part, you are still free to drop out at any time, at any stage of the project, without giving a reason and without being disadvantaged in any way.

What will happen if I take part?
The project will run from the summer term 2016 until the spring term 2017. We will ask you to help identify Year 7, 8 and 9 students who may benefit from the project, according to selection criteria which we will discuss with you. We will also ask you to identify appropriate science teachers from your school to participate in the project. The researcher will work with your science teachers to identify up 20 key topic words that the year group will be covering during two science topics, and 10 key words from a future topic. The researcher will train the teachers in two one-hour training sessions, on specific word-learning activities to use. The teachers will teach the 10 new words from topic two in the classroom using the newly-learned strategies. Students will be individually assessed by a member of the research team at four points during the project, in sessions of up to one hour.

We will recruit students by making contact with their parents in the first instance, through the school. We will then also seek consent directly from the students.

What are the possible benefits of taking part?
Your staff have the opportunity to learn new ways of teaching vocabulary which they may find useful for students with speech, language and communication needs and indeed all students. Your students have the opportunity to learn new words, and to get better at learning and remembering new words on their own. This is to help them with their progress at school. Having a wide vocabulary helps children succeed in school which improves their employment opportunities after school.

What will happen when the research study stops?
Information will be stored securely for at least ten years. After this time the data will be securely destroyed.

Will my taking part in the study be kept confidential?
We will keep all information collected in confidence. Names will be changed to code numbers, and information will be kept in a locked filing cabinet and password-protected computer, with only research team members having any access to person-identifiable information. Exceptions to confidentiality include information concerning the personal safety of the student participants.

What will happen to the results of the research study?

You will receive a leaflet giving a summary of the project. The results of the research study will form part of my PhD thesis. It will be presented at conferences, and published in teaching and speech and language therapy journals and magazines. Anonymity and confidentiality will be kept at all times and published reports will not mention individuals.

What do I have to do?

If you agree to take part in this project, please return the signed consent form to Mrs Billie Lowe.

What if there is a problem?

If you have any questions at any time, please contact:
Mrs Billie Lowe, PhD Student
Division of Language and Communication Science
School of Health Sciences
City University London
Northampton Square, London EC1V 0HB
020 7040 5045
[redacted]

You can also contact:
Professor Victoria Joffe
Associate Dean, Taught Postgraduate Studies, and International
School of Health Sciences
City University London
Northampton Square, London EC1V 0HB
020 7040 4629
[redacted]

If you have any problems, concerns or questions about this study, you should ask to speak to a member of the research team (see below). If you remain unhappy and wish to complain formally, you can do this through the University complaints procedure. To complain about the study, you need to phone 020 7040 3040. You can then ask to speak to the Secretary to Senate Research Ethics Committee and inform them that the name of the project is: “Vocabulary intervention in adolescents with language difficulties: How to help young people learn and remember new words”.

You could also write to the Secretary at:

Anna Ramberg
Secretary to Senate Research Ethics Committee
Research Office, E214
City University London
Northampton Square
London
EC1V 0HB
[redacted]

City University London holds insurance policies which apply to this study. If you feel you have been harmed or injured by taking part in this study you may be eligible to claim compensation. This does not affect your legal rights to seek compensation. If you are harmed due to someone’s negligence, then you may have grounds for legal action.

Thank you for taking the time to read this information sheet.

Consent form Head Teacher

Vocabulary intervention in adolescents with language difficulties:

How to help young people learn and remember new words

Please initial box

1.	I agree to take part in the above City University London research project. I have read the Head Teacher information sheet, which I may keep for my records. I understand this will involve: • Identifying a key member of staff within school with whom the researcher can liaise. • Identifying, in collaboration with the researcher, appropriate student participants according to the inclusion criteria of the study. • Identifying, in collaboration with the researcher, appropriate teachers to approach for recruitment to the study. • Facilitating communication with parents during the recruitment process. • The selected teachers attending two 1-hour training sessions on vocabulary teaching delivered by the researcher. • Selected science teachers teaching specific vocabulary during one topic using word learning strategies given by the researcher. • Making available to the researcher relevant information from school records i.e. demographic information and attainment levels, subject to parental approval. • Arranging an appropriate place for individual assessments to take place. • Facilitating the research team's work in school through informing school staff of their presence and enabling access to relevant school areas.	
2.	I understand that any information which school staff provide is confidential, and that no information that could lead to the identification of any individual will be disclosed in any reports on the project, or to any other party. No identifiable personal data will be published or shared with any other organisation.	
3.	I understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being disadvantaged in any way.	
4.	I understand that this study will form part of the researcher's PhD thesis, and that any reports published will not identify any individuals.	
5.	I agree to City University London recording and processing this information about me. I understand that this information will be used only for the purposes set out in this statement, and that my consent is conditional on the University complying with its duties and obligations under the Data Protection Act 1998.	
6.	I consent to take part in the above study.	

____________________ _______________ ____________________ ________________

Name of Head Teacher Signature School Date

Please return form to Mrs Billie Lowe, City University London.

Information sheet – teacher

CITY UNIVERSITY LONDON

Vocabulary intervention in adolescents with language difficulties:

How to help young people learn and remember new words

I am a PhD student at City University London, and I would like to invite you to take part in a research study I am conducting on teaching vocabulary. Before you decide whether you would like to take part it is important that you understand why the research is being done and what it would involve for you. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. This study has been approved by City University London School of Health Sciences Research Ethics Committee.

What is the purpose of the study?
Many students find it hard to learn and remember the vocabulary required to enable them to succeed in school. We know what works to help primary school-age children learn and remember new words, and this project explores how secondary school students learn new words and what helps them.

Why have I been invited?
We are inviting teachers who teach science to students in Years 7, 8 and 9 who have been identified from school records as being students who will benefit from extra help learning new words. The head teacher of your school has agreed to take part in the study.

Do I have to take part?
Participation is voluntary. It is up to you to decide whether or not to take part. If agree, you will be asked to sign a consent form. If you agree, you are still free to drop out at any time, at any stage of the project, without giving a reason and without being disadvantaged in any way.

What will happen if I take part?
The project will run from the autumn term 2016 until the spring term 2017. The researcher will work with you to identify 20 key topic words that the year group will be covering during two science topics, and 10 key words from a future topic. In phase 1 (topic one) a member of the research team will observe a sample of lessons in order to record usual classroom practice. The researcher will then train you, in two 1-hour training sessions, on specific word-learning activities to use when teaching students new words. In phase 2 (topic two), you will teach the 10 new words from topic two in the classroom using the newly-learned strategies. You will be asked to keep a record of your use of the word-learning activities, and to complete a short questionnaire at the end of the project on your views about using the word-learning activities. You will receive support from the research team as required.

What are the possible benefits of taking part?
You have the opportunity to learn new ways of teaching vocabulary which you may find useful for students with speech, language and communication needs and indeed all students. Your students have the opportunity to learn new words, and to get better at learning and remembering new words on their own. This is to help them with their progress at school. Having a wide vocabulary helps children succeed in school which improves their employment opportunities after school.

What will happen when the research study stops?
Information will be stored securely for at least ten years. After this time the information will be securely destroyed.

Will my taking part in the study be kept confidential?
We will keep all information collected in confidence. Names will be changed to code numbers, and information will be kept in a locked filing cabinet and password-protected computer, with only research team members having any access to person-identifiable information. Exceptions to confidentiality include information concerning the personal safety of the student participants.

What will happen to the results of the research study?
You will receive a leaflet giving a summary of the project. The results of the research study will form part of my PhD thesis. It will be presented at conferences, and published in teaching and speech and language therapy journals and magazines. Your name will not be used in any of these publications or at conferences.

What do I have to do?

If you agree to take part in this project, please return the signed consent form to Mrs Billie Lowe, c/o …………………………….. in the enclosed addressed envelope by ……………………..

If you have any questions at any time, please contact:
Mrs Billie Lowe, PhD Student
Division of Language and Communication Science
School of Health Sciences
City University London
Northampton Square, London EC1V 0HB
020 7040 5045
[redacted]

You can also contact:
Professor Victoria Joffe
Associate Dean, Taught Postgraduate Studies, and International
School of Health Sciences
City University London
Northampton Square, London EC1V 0HB
020 7040 4629
[redacted]

What if there is a problem?
If you have any problems, concerns or questions about this study, you should ask to speak to a member of the research team (see below). If you remain unhappy and wish to complain formally, you can do this through the University complaints procedure. To complain about the study, you need to phone 020 7040 3040. You can then ask to speak to the Secretary to Senate Research Ethics Committee and inform them that the name of the project is: “Vocabulary intervention in adolescents with language difficulties: How to help young people learn and remember new words”.

You could also write to the Secretary at:

Anna Ramberg
Secretary to Senate Research Ethics Committee
Research Office, E214
City University London
Northampton Square
London
EC1V 0HB
[redacted]

City University London holds insurance policies which apply to this study. If you feel you have been harmed or injured by taking part in this study you may be eligible to claim compensation. This does not affect your legal rights to seek compensation. If you are harmed due to someone’s negligence, then you may have grounds for legal action.

Thank you for taking the time to read this information sheet.

Consent form teachers

CITY UNIVERSITY LONDON

Vocabulary intervention in adolescents with language difficulties:

How to help young people learn and remember new words

Please initial box

1.	I agree to take part in the above City University London research project. I have read the teacher information sheet, which I may keep for my records. I understand this will involve: • Identifying, in collaboration with the researcher, 20 key words that the class will be covering during two science topics, and 10 key words from a future topic. • Allowing a member of the research team to observe a sample of lessons during topic one in order to record usual classroom practice. • Taking part in two 1-hour training sessions, on specific word-learning activities. • Using these strategies when teaching the 10 topic two words within lessons for the duration of topic two. • Keeping a record of my use of the word-learning activities • Completing a short questionnaire at the end of the project on my views about using the word-learning activities.	
2.	I understand that any information I provide is confidential, and that no information that could lead to the identification of any individual will be disclosed in any reports on the project, or to any other party. No identifiable personal data will be published or shared with any other organisation.	
3.	I understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being disadvantaged in any way.	
4.	I understand that this study will form part of the researcher's PhD thesis, and that any reports published will not identify any individuals.	
5.	I agree to City University London recording and processing this information about me. I understand that this information will be used only for the purposes set out in this statement, and that my consent is conditional on the University complying with its duties and obligations under the Data Protection Act 1998.	
6.	I consent to take part in the above study.	

____________________ ________________ ______________ _________

Name of teacher Signature School Date

Please return this form to Mrs Billie Lowe, c/o ……………………. by ……………………………

Information sheet - parent

Vocabulary intervention in adolescents with language difficulties:

How to help young people learn and remember new words

I am a PhD student at City University London, and I would like to invite your child to take part in a research study. Before you decide whether you would like to take part it is important that you understand why the research is being done and what it would involve for you and your child. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. This study has been approved by City University London School of Health Sciences Research Ethics Committee.

What is the purpose of the study?
Many students find it hard to learn and remember the words required to succeed in school. We know what works to help primary school-age children learn and remember new words, and this project explores how secondary school students learn new words and what helps them.

Why have I been invited?
We are inviting young people in Years 7, 8 and 9 to take part, who have been identified from school records as being students who will benefit from extra help learning new words. Your child's school has agreed to participate in this project.

Do I have to take part?
Participation is voluntary. It is up to you to decide whether or not to take part. If you agree, your child will also be asked to give their consent, separately. If you decide to take part, you and your child are still free to drop out at any time, at any stage of the project, without giving a reason and without being disadvantaged in any way. Any speech and language therapy input or other specialist support provided to your child or the school will continue as normal.

What will happen if I take part?
The project will run from the autumn term 2016 until the spring term 2017. In the first phase, your child will be taught science topic words by the teacher in the classroom in the usual way. A member of the project team may observe some of these classes. In the second phase, your child will be taught science topic words in the classroom by the teacher using special word-learning activities. At four points during the project, your child will meet with a member of the project team to carry out some activities. These sessions will last between 30-60 minutes. The activities will be in the form of games involving listening, repeating and understanding sounds, words and sentences, naming pictures, finding shapes in visual patterns and talking about word learning. All these activities have been used with other students who have enjoyed them. If your child's responses give any cause for particular concern, this will be discussed with .... (Senco). Results can be made available to you on request. All the sessions will take place during school time, at a time agreed with the teachers, and on school premises. Some sessions will be audio recorded so that information can be checked afterwards.

What are the possible benefits of taking part?
Your child has the opportunity to learn new words, and to get better at learning and remembering new words on their own. This is to help them with their progress at school. Having a wide vocabulary helps children succeed in school which improves their employment opportunities after school.

What will happen when the research study stops?
Information will be stored securely for at least ten years. After this time the information will be securely destroyed.

Will my taking part in the study be kept confidential?
We will keep all information collected in confidence. Names will be changed to code numbers, and information will be kept in a locked filing cabinet and password-protected computer, with only research team members having any access to person-identifiable information. Exceptions to confidentiality include information concerning the personal safety of your child. In cases of disclosure of information concerning safety, this will be discussed with the Senco.

What will happen to the results of the research study?
You will receive a leaflet giving a summary of the project. The results of the research study will form part of my PhD thesis. It will be presented at conferences, and published in teaching and speech and language therapy journals and magazines. Your name and your child's name will not be used in any of these publications or at conferences.

What do I have to do?

If you agree for your child to take part in this project, please sign the attached consent form and return it to Mrs Billie Lowe, c/o …………… in the enclosed addressed envelope by …………….

If you have any questions at any time, please contact:
Mrs Billie Lowe, PhD Student
Division of Language and Communication Science
School of Health Sciences
City University London
Northampton Square, London, EC1V 0HB
020 7040 5045
[redacted]

You can also contact:
Professor Victoria Joffe
Associate Dean, Taught Postgraduate Studies, and International
School of Health Sciences
City University London
Northampton Square, London, EC1V 0HB
020 7040 4629
[redacted]

What if there is a problem?
If you have any problems, concerns or questions about this study, you should ask to speak to a member of the research team (see below). If you remain unhappy and wish to complain formally, you can do this through the University complaints procedure. To complain about the study, you need to phone 020 7040 3040. You can then ask to speak to the Secretary to Senate Research Ethics Committee and inform them that the name of the project is: "Vocabulary intervention in adolescents with language impairment: How to help young people learn and remember new words".

You could also write to the Secretary at:

Anna Ramberg
Secretary to Senate Research Ethics Committee
Research Office, E214
City University London
Northampton Square, London, EC1V 0HB
[redacted]

City University London holds insurance policies which apply to this study. If you feel you have been harmed or injured by taking part in this study you may be eligible to claim compensation. This does not affect your legal rights to seek compensation. If you are harmed due to someone's negligence, then you may have grounds for legal action.

Thank you for taking the time to read this information sheet.

Consent form parent/guardian

CITY UNIVERSITY LONDON

Vocabulary intervention in adolescents with language difficulties:

How to help young people learn and remember new words

Please initial box

1.	I agree to take part in the above City University London research project. I have read the parent information sheet, which I may keep for my records. I understand this will involve • My child taking part in listening and speaking activities individually with a member of the research team • My child being audio-recorded during some of the activities • My child being present in classes where word-learning activities are taking place	
2.	I understand that school may share with the researcher relevant information from my child's school records. I understand that all information provided is confidential, and that no information that could lead to the identification of any individual will be disclosed in any reports on the project, or to any other party. No identifiable personal data will be published or shared with any other organisation.	
3.	I understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without myself or my child being disadvantaged in any way.	
4.	I understand that this study will form part of the researcher's PhD thesis, and that any reports published will not identify any individuals.	
5.	I agree to City University London recording and processing this information about me. I understand that this information will be used only for the purposes set out in this statement, and that my consent is conditional on the University complying with its duties and obligations under the Data Protection Act 1998.	
6.	I consent to my child's participation in the above study.	

Main language spoken at home …………………………………………………………………………

Other languages spoken at home………………………………………………………………

If a language other than English is spoken at home, how long have you lived in the UK? ....

Has your child had a speech and language therapy assessment in the last 6 months? Yes / No

If yes, name and contact details for speech and language therapist:

………..

____________________ ______________ ______________ _________

Name of parent/guardian Signature School Date

Name of Child ____________________

Please return this form to Mrs Billie Lowe, c/o .... by …………………

Information sheet - student

Vocabulary intervention in adolescents with language difficulties:

How to help young people learn and remember new words

I am a student at City University London, and would like to invite you to take part in a project that I am doing on learning words. Before you decide whether this is something you want to do, it is important that you understand why we are doing the project and how you will be involved. Please take time to read this information sheet carefully and discuss it with your parents or teachers if you wish. Ask us if there is anything that is not clear or if you would like more information. The university has given me permission to do this project.

What is the purpose of the project?
Many students find it hard to learn and remember new words and this is important for school. We know about what helps young children learn new words, and we are doing this project to help us learn more about what helps older children, like you, to learn and remember words.

Why have I been invited?
We are inviting young people in Years 7, 8 and 9 to take part, who we think will benefit from extra help learning new words. Your school have already said they want to be part of the project and they suggested we talk to you about it.

Do I have to take part?
It is up to you to decide whether or not to take part. Your parents have already agreed that you may take part in this project if you want to. If you agree, you will be asked to sign a consent form. If you decide to take part, you are still free to drop out at any time, at any stage of the project, without telling us why, and without getting into any trouble.

What will happen if I take part?
The project will run from the autumn term 2016 until the summer term 2017. In the first phase, you will be taught science topic words by the teacher in the classroom in the usual way. A member of my project team may observe some of these classes. In the second phase, you will be taught science topic words in the classroom by the teacher using special word-learning activities. At four points during the project, you will meet with a member of my project team to carry out some listening and speaking activities. These sessions will last between 30-60 minutes and will include different games involving shapes, sounds, words and sentences. These activities and games have been used with other students of your age and they have enjoyed doing them. All the sessions will take place during school time, with the permission of your teacher, and on school premises. Some sessions will be audio recorded so that information can be checked afterwards.

What are the possible benefits of taking part?
You have the chance to learn new words, and to get better at learning and remembering new words on your own. This may help you do better at school. Having a bigger vocabulary helps young people succeed in school and gives them a better chance of getting a job after school.

What will happen when the research project stops?
Information will be stored safely for at least ten years. After this time the information will be destroyed.

Will my taking part in the project be kept confidential?
All the information you give us will be kept safe. Names will be changed to numbers, and information will be kept in a locked filing cabinet and password-protected computer. Only people from my team can get the information. We will only tell somebody else if we are worried about your personal safety.

What will happen to the results of the research project?
I will write up the project, and will tell you, your parents, and the school how it went. I will tell other teachers and speech and language therapists about it at meetings, and in teaching and speech and language therapy magazines. Your name will not be used at all.

What do I have to do?
If you are happy to take part in my project, please sign the consent form.

If you have any questions at any time, please contact:
Mrs Billie Lowe, PhD Student
Division of Language and Communication Science
School of Health Sciences
City, University of London
Northampton Square, London EC1V 0HB
020 7040 5045 to leave a message
[redacted]

You can also contact:
Professor Victoria Joffe
Professor, Associate Dean, Taught Postgraduate Studies, and International
School of Health Sciences
City, University of London
Northampton Square, London EC1V 0HB
020 7040 4629
[redacted]

What if there is a problem?

If you have any questions or are worried about anything, please speak to ………………………………… who can help you.

Thank you for taking the time to read this information sheet.

Consent form students

Vocabulary intervention in adolescents with language difficulties:

How to help young people learn and remember new words

Please initial box

1.	I agree to take part in the above City University London research project. I have read the student information sheet, which I may keep for my records. I understand this will involve: • Being present in classes where word-learning activities are taking place • Taking part in listening and speaking activities individually with a member of the research team • Being audio-recorded during some of the activities	
2.	I understand that any information I provide is confidential, and that no information that says who I am will be shared in any reports on the project, or with anyone outside the project team.	
3.	I understand that I can choose whether or not to take part in the project, and that I can drop out at any stage without getting into any trouble.	
4.	I understand that the researcher will write up the project, and that any reports published will not say who I am.	
5.	I agree to City University London recording and processing this information about me. I understand that this information will be used only for the purposes set out in this statement, and that the University must also carry out its duties under the Data Protection Act 1998.	
6.	If I have any questions I can ask Mrs Billie Lowe, or ………………………………	
7.	I agree to take part in this project.	

Name ……………………………………… Year………………… Date……………………………

Please return this form to Mrs Billie Lowe, City University London.

Appendix 6C

Biographical data of whole student cohort who were assessed at baseline (N=103)

Gender. Sixty-eight participants were boys and 35 were girls. (66%:34%)

Chronological age. Fifty-four students were in Year 7, 40 in Year 8, and nine in Year 9. The mean chronological age of student participants was 12:4 (*SD* = 9 months: range 11:3 – 14:0).

Socio-economic status. This information was available for 102 participants. Forty-two out of 102 participants were eligible for Pupil Premium.

Medical status. This information was available for 102 participants. Fourteen participants had a medical condition not usually associated with language disorder. These included: anaphylaxis (1); asthma (4); bladder control (1); button sigcostomy and poor balance and coordination (1); diabetes (1); eczema (1); hayfever (1); Hirschsprung's disease (1); liver disease (1); multiple allergies, asthma, and heart condition (1); and takes melatonin (1). Three students had a condition which is often associated with language disorder. These included: Down's Syndrome (1); foetal alcohol syndrome (1); and perforated eardrums (1).

Special educational needs status. This information was available for 100 participants. Sixty-five participants were on the special needs register of the school. Fourteen of these were in possession of a statement of educational need or EHCP. Twenty-nine were in receipt of school support (for seven of these, no SEN or medical need was listed). Six students not listed as being on the school special needs register had a need identified. Some participants had more than one need.

- Communication and interaction (autism spectrum disorder 4; SLCN 19)
- Social, emotional, and mental health (8)
- Cognition and learning (intellectual disability 5; dyslexia 18; dyspraxia 1)
- Sensory and physical needs (physical disability 1)
- “disengaged, struggles in small groups, lack organisational skills” (1)
- “English as an additional language” (1)
- “no specialist assessment” (1)
- “hyperactivity” (1)
- “Other difficulty/disability” (1)

Ethnicity. This information was available for 102 participants. Distribution of ethnicity as listed by schools was as follows:

Albanian (1); Any other Asian (1); Any other mixed (5); Asian (2); Bangladeshi (4); Black African (3); Black Caribbean (2); Black Somali (1); British (12); European (1); Indian (1); Not stated (6); Other (4); Other Black African (3); Pakistani (3); Turkish (1); White and other (1); White and Asian (2); White and Black Caribbean (2); White British (34); White English (10); White European (3).

English language status: This information was available for 99 participants. Eighty-two out of 99 parental consent forms (82.8%) stated that English was the main language spoken at home. Sixty-seven participants (67.7%) were monolingual English speakers, and 32 (32.3%) participants were bilingual or multilingual. Of the bilingual or multilingual students, one (ID 83) arrived in the UK one year prior to the study, and for one student (ID 58), this information was missing.

<u>Biographical characteristics of all participants assessed at baseline</u>

School	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total (%)**
Number of participants assessed at baseline	14	12	13	20	8	15	13	8	103 (100%)
Gender balance m:f	14:0	7:5	8:5	14:6	4:4	9:6	8:5	4:4	68:35 (66%:34%)
Mean chronological age	12:1	12:1	11:11	12:4	12:7	12:7	12:5	11:9	*M* = 12:4
Numbers of participants in receipt of Pupil Premium	10	1	4	14	3	7	3	0	42/102 (41.2%)
Number of participants with additional medical condition	3	1	6	0	1	3	2	1	17/102 (16.7%)
Number of participants with statement or EHCP	0	0	4	3	0	0	6	1	14/100 (14%)
Number of monolingual English speakers	3	11	16	4	8	7	11	7	67/99 (67.7%)

Appendix 6D

Full list of all the word sets

School / year / Word set	Topic 1 Usual teaching practice	Topic 2 Experimental	Passive control No intervention
School 1 Year 7 Word set A	Atoms elements and molecules	Mixtures and separations	
	chemical reaction	paper chromatography	Golgi apparatus
	irreversible	evaporation	phylogenetic
	observation	separation	phospholipid
	word equation	Bunsen burner	plasma membrane
	molecule	filtration	infarction
	element	solution	amylase
	reactant	condenser	hydrilla
	compound	solvent	allele
	symbol	funnel	stoma
	atom	solute	primate
School 1 Year 8 Word set B	The periodic table	Unicellular organisms	
	pH indicator	microorganism	Golgi apparatus
	alkali metals	unicellular	phylogenetic
	noble gases	disinfectant	phospholipid
	malleable	antiseptic	hierarchy
	property	chlorophyll	infarction
	periods	chromosome	amylase
	halogens	flagellum	hydrilla
	melting point	Petri dish	bond angle
	flexible	cilium	isomer
	brittle	fungus	stoma
School 2 Year 7 Word set C	Chemical reactions	Reproduction	
	neutralisation	infertility	inconsistency
	word equation	identical twins	mass spectrometer
	chemical change	menstrual cycle	plasma membrane
	reactants	placenta	hydrilla
	carbonate	menopause	parasite
	limewater	oviduct	efferent
	combustion	uterus	ileum
	sulphate	hormone	bolus
	oxide	testes	stoma
	corrode	foetus	lattice
School 2 Year 8 Word set D	Heating and cooling	Rocks and Weathering	
	thermal energy	biological	hierarchical
	evaporation	sedimentation	configuration
	changes of state	metamorphic	exothermic
	radiation	porosity	salinity
	conduction	abrasion	titration
	convection	weathering	herbicide
	density	erosion	infarction
	particle	igneous	vigorous
	contract	limestone	pigment
	expand	granite	lattice
School 2 Year 9 Word set E	Pressure and Movement	Bio-mimicry	
	turning effect	threshold level	plasma membrane
	counterbalance	hydrophobic	exothermic
	pneumatic	nanotubes	phototubes
	exerted	aquifer	thermistor

	transmitted	catalyst	phagocyte
	hydraulic	osmosis	meiosis
	pressure	synapse	enzyme
	piston	lignin	pectin
	pivot	chitin	lipid
	moment	vortex	redox
School 3 Year 7 Word set F	Elements and compounds	Forces	
	irreversible	accelerate	amalgamate
	observation	air resistance	segregation
	property	gravity	valency
	element	unbalanced	undiluted
	molecule	balanced	diluted
	conductor	friction	traction
	compound	streamlined	stringent
	atom	mass	pitch
	mixture	force	hertz
	symbol	weight	joules
School 3 Year 8 Word set G	Metal reactions	Sound	
	chemical reaction	rarefaction	replication
	transition metals	audible range	plasma membrane
	reactivity	ultrasound	amphipod
	conclusion	compression	infarction
	word equation	decibel	visceral
	property	frequency	latency
	metal oxide	vibrate	vacate
	melting point	echo	enzyme
	metal salt	hertz	joules
	alloy	pitch	pivot
School 4 Year 7(1) Word set H	Electromancer	Extinction	
	electromagnet	microhabitat	inconsistency
	insulator	decomposer	inhibitor
	magnetism	organism	hybridism
	ammeter	carnivore	thermistor
	component	crustacean	titration
	conductor	consumer	convector
	electron	migration	infarction
	filament	arachnid	phagocyte
	resistance	arthropod	amphipod
	repel	reptile	repose
School 4 Year 7(2) Word set I	Alien	Forensics	
	constellation	observation	adaptation
	magnetism	indicator	inhibitor
	luminous	corrosive	convective
	hemisphere	neutralise	segregate
	asteroid	alkali	amylase
	density	property	phagocyte
	displacement	diffusion	titration
	lubricant	irritant	efferent
	axis	acid	allele
	orbit	burette	pigment
School 4 Year 8(1) Word set J	Species at war	Live and kicking	
	microorganism	hydrogen carbonate	calcium hydroxide
	antibody	alveolus	endodermis
	bacterium	capillaries	cytology
	fermentation	ventilation	segregation
	ethanol	egestion	titration
	habitat	nutrients	efferent

	infectious	intestine	infarction
	physical	mineral	visceral
	resistant	reactant	repellent
	virus	villi	velum
School 4 Year 8(2) Word set K	Studio Magic	Live and kicking	
	angle of incidence	hydrogen carbonate	calcium hydroxide
	intensity	alveolus	endodermis
	oscilloscope	capillaries	cytology
	dispersion	ventilation	segregation
	amplitude	egestion	titration
	transparent	nutrients	efferent
	cochlea	intestine	infarction
	decibel	mineral	visceral
	translucent	reactant	repellent
	prism	villi	velum
School 5 Year 8 Word set L	The Periodic Table	Microbiology	
	electrical conductor	aerobic respiration	abnormal replication
	symbol equation	natural defences	threshold frequencies
	potassium	bacterium	reticulum
	properties	prediction	predation
	magnetic	infectious	infarction
	reactants	resistant	repellent
	atom	immune	allele
	mixture	microbe	micron
	compound	symptoms	spectrums
	product	mucus	bolus
School 6 Year 7 Word set M	Particles	Energy	
	saturated	renewable	adaptable
	melting point	fossil fuels	frontal lobes
	boiling point	solar cells	molar mass
	diffusion	kinetic	botanic
	soluble	kilojoules	lenticules
	solution	potential	sequential
	density	gravity	valency
	expand	sustain	submerge
	contract	transfer	trisect
	dissolve	thermal	dorsal
School 6 Year 9 Word set N	The Particle Model	Scaling Up	
	subatomic particle	differentiation	diversification
	thermal energy	surface area	threshold frequency
	heat capacity	water potential	mass spectrometer
	vaporisation	replication	segregation
	distillation	transpiration	tessellation
	condensation	concentration	convolution
	evaporate	mitosis	amylase
	density	diffusion	deflection
	kinetic	cardiac	botanic
	sublimate	stomata	substrata
School 7 Year 7 Word set O	Particles	Sound	
	condensation	compression	concretion
	element	decibel	visceral
	property	amplify	atrophy
	soluble	audible	pliable
	solution	vibration	venation

	compound	frequency	latency
	contract	reflect	constrict
	atom	echo	allele
	product	pitch	pivot
	solvent	hertz	joules
School 7 Year 8(1) Word set P	Forces and Motion	Light	
	resultant force	incident ray	plasma membrane
	accelerate	luminous	vigorous
	contact force	translucent	repellent
	extension	refraction	deflection
	unbalanced	transparent	efferent
	distance	normal	dorsal
	newton	spectrum	phylum
	streamlined	opaque	allele
	upthrust	reflect	trisect
	weight	scatter	stamen
School 7 Year 8(2) Word set Q	Skeletal and Respiratory Systems	Light	
	aerobic respiration	incident ray	plasma membrane
	alveoli	luminous	vigorous
	inhalation	translucent	repellent
	diffusion	refraction	deflection
	ligament	transparent	efferent
	bronchioles	normal	dorsal
	diaphragm	spectrum	phylum
	asthma	opaque	allele
	contract	reflect	trisect
	tendon	scatter	stamen
School 7 Year 8(3) Word set R	Properties and Materials	Skeletal and Respiratory Systems	
	reactivity	aerobic respiration	abnormal replication
	insulator	alveoli	armadillo
	density	inhalation	tessellation
	displacement	diffusion	deflection
	polymer	ligament	efferent
	composite	bronchioles	petiole
	conductor	diaphragm	convector
	brittle	asthma	allele
	corrode	contract	trisect
	tarnish	tendon	traction
School 8 Year 7(1) Word set S	Life Processes	Light	
	asexual reproduction	angle of incidence	Golgi apparatus
	fertilisation	primary colour	life expectancy
	adaptation	reflection	infarction
	gestation	refraction	titration
	placenta	spectrum	phylum
	cuttings	colour	culture
	gamete	normal	primate
	offspring	diffuse	deflect
	species	scattered	stamen
	clone	light	pitch
School 8 Word set T Year 7(2)	Particles	Separation	
	solidifying	solubility	selectivity
	transition metals	chromatography	configuration
	word equation	distillation	tessellation
	properties	solution	infarction
	condensing	filtering	deflecting
	boiling	solute	primate
	melting	solvent	sapling

	compound	dissolve	dorsal
	atom	factor	frenum
	state	pure	pitch
School 8 Year 7(3) Word set U	Life Processes	Separation	
	asexual reproduction	solubility	selectivity
	fertilisation	chromatography	configuration
	adaptation	distillation	tessellation
	gestation	solution	infarction
	placenta	filtering	deflecting
	gamete	solute	primate
	cuttings	solvent	sapling
	offspring	dissolve	dorsal
	species	factor	frenum
	clone	pure	pitch
School 8 Year 8 Word set V	Effect of Forces	Biological Energy Transfer	
	non-contact force	carbohydrates	dehydrated
	balanced forces	trophic level	plasma membrane
	gravity	producer	propulsion
	density	chlorophyll	chrysalis
	Newtons	biomass	baobab
	upthrust	omnivore	ileum
	volume	consumer	convector
	friction	carnivore	thermistor
	mass	starch	hertz
	weight	prey	pitch

Appendix 6E

Sample information on phonological complexity, imageability, concreteness, and frequency

Imageability is rated on a scale between 100 (low) to 700 (high), taken from the MRC psycholinguistic database (Wilson, 1987). Frequency is stated as a value on the Zipf scale between 1 (low) and 7 (high) (Van Heuven et al., 2014). The MRC psycholinguistic database and the Zipf scale database do not give information for phrases, therefore values for each word are listed separately. Where the database contains no information about a word, it has been ascribed the value of 0.

Word set A School 1 Year 7 Participants 1,2,4,5,6,7,8,12,13																	
Active control Usual teaching practice						Experimental Word Discovery intervention						Passive control No exposure					
Topic 1 Atoms elements and molecules	Syllables	Phonological structure	Zipf frequency	Imageability	Concrete/abstract	Topic 2 Mixtures and separations	Syllables	Phonological structure	Zipf frequency	Imageability	Concrete/abstract		Syllables	Phonological structure	Zipf frequency	Imageability	Concrete/abstract
chemical reaction	6	cvcvcvc cvvccvc	4.11 4.64	0 395	A	paper chro-matography	7	cvcv ccvcvcvccvc v	1.60	590 0	C	Golgi apparatus	6	cvccv vcvcvcvc	0 3.44	0	A
irreversible	5	vcvcvcvcvc	2.86	0	A	evaporation	5	vcvcvcvcvc	2.65	0	A	phylogenetic	5	cvcvcvcvcvc	0	0	A
observation	4	vccvcvcvc	3.70	345	A	separation	4	cvcvcvcvc	3.66	435	A	phospholipid	4	cvccvcvcvc	0	0	A
word equation	4	cvc vccvcvc	5.29 3.74	0	C	Bunsen burner	4	cvccvc cvcv	2.85 3.66	0 488	C	plasma membrane	4	ccvccv cvcccvc	3.38 3.33	0	A
molecule	3	cvcvccvc	3.17	470	A	filtration	3	cvcccvcvc	2.42	0	A	infarction	3	vccvccvc	2.13	0	A
element	3	vcvcvcc	4.46	0	A	solution	3	cvcvcvc	4.56	391	A	amylase	3	vcvcvc	2.37	0	A
reactant	3	cvvccvcc	1.65	0	A	condenser	3	cvccvccv	2.40	0	C	hydrilla	3	cvccvcv	0	0	C
compound	2	cvccvcc	3.79	0	A	solvent	2	cvccvcc	2.83	0	A	allele	2	vcvc	2.00	0	A
symbol	2	cvccvc	4.23	447	C	funnel	2	cvcvc	3.26	0	C	stoma	2	ccvcv	1.95	0	A
atom	2	vcvc	3.61	499	A	solute	2	cvccvc	1.18	0	A	primate	2	ccvcvc	3.17	0	C

Word set B School 1 Year 8 Participants 3,9,10,11,14																	
Active control Usual teaching practice						Experimental Word Discovery intervention						Passive control No exposure					
Topic 1 The periodic table	Syllables	Phonological structure	Zipf frequency	Imageability	Concrete/abstract	Topic 2 Unicellular organisms	Syllables	Phonological structure	Zipf frequency	Imageability	Concrete/abstract		Syllables	Phonological structure	Zipf frequency	Imageability	Concrete/abstract
pH indicator	6	CV VC VCCVCVCV	3.00 3.37	0 0	C	microorganism	6	CVCCVVCVCVCV C	1.39	0	A	Golgi apparatus	6	CVCCV VCVCVCVC	1.47 3.44	0	A
alkali metals	5	VCCVCV CVCVCC	2.76 3.60	432	A	unicellular	5	CVCVCVCCVCV	1.39	0	A	phylogenetic	5	CVCVCVCVCVC	0	0	A
noble gases	4	CVCVC CVCVC	4.11 3.60	0 383	A	disinfectant	4	CVCVCCVCCVCC	2.69	529	A	phospholipid	4	CVCCVCVCVC	0	0	A
malleable	4	CVCVCVC	2.56	0	A	antiseptic	4	VCCVCVCCVC	2.81	0	A	hierarchy	4	CVC	3.44	0	A
property	3	CCVCVCV	5.37	466	A	chlorophyll	3	CCVCVCVC	2.56	0	A	infarction	3	VCCVCCVC	2.13	0	A
periods	3	CVCVCC	3.89	429	C	chromosome	3	CCVCVCVC	2.69	0	A	amylase	3	VCVCVC	2.37	0	A
halogens	3	CVCVCVCC	2.17	0	A	flagellum	3	CCVCVCVC	1.70	0	A	hydrilla	3	CVCCVCV	0	0	C
melting point	3	CVCCVC CVCC	3.78 5.60	0 481	A	Petri dish	3	CVCCV CVC	2.56 4.94	0 0	C	bond angle	3	CVCC VCCVC	4.46 4.45	380 503	A
flexible	3	CCVCCVCVC	3.98	0	A	cilium	3	CVCVVC	1.17	0	A	isomer	3	VCVCV	1.30	0	A
brittle	2	CCVCVC	3.38	0	A	fungus	2	CVCCVC	3.48	0	C	stoma	2	CCVCV	1.95	0	A

Appendix 6F

Student language and cognitive profiles of whole student cohort who were assessed at baseline (N=103)

Assessment	**Mean SS (*SD*)**	**Minimum**	**Maximum**	**Number (%) with SS <85**
CATV (N=77)* †	77.85 (6.68)	59	104	100 (97.1%)
CATNV (N=94)** †	87.67 (8.32)	73	111	39 (41.5%)
BPVS-3	79.79 (9.68)	69	111	77 (74.8%)
WASI-2 Vocabulary	88.66 (9.13)	67	109	32 (31.1%)
WASI-2 Matrix Reasoning	92.63 (11.15)	64	125	26 (25.2%)
CELF-4 UK Recalling Sentences	81.00 (14.89)	56	120	56 (54.4%)
PhAB Spoonerisms	89.80 (8.82)	69	119	22 (21.4%)
WMTBC Listening Recall	90.31 (18.05)	57	127	34 (33%)

* Access Reading Test standard scores for participants from school 8.

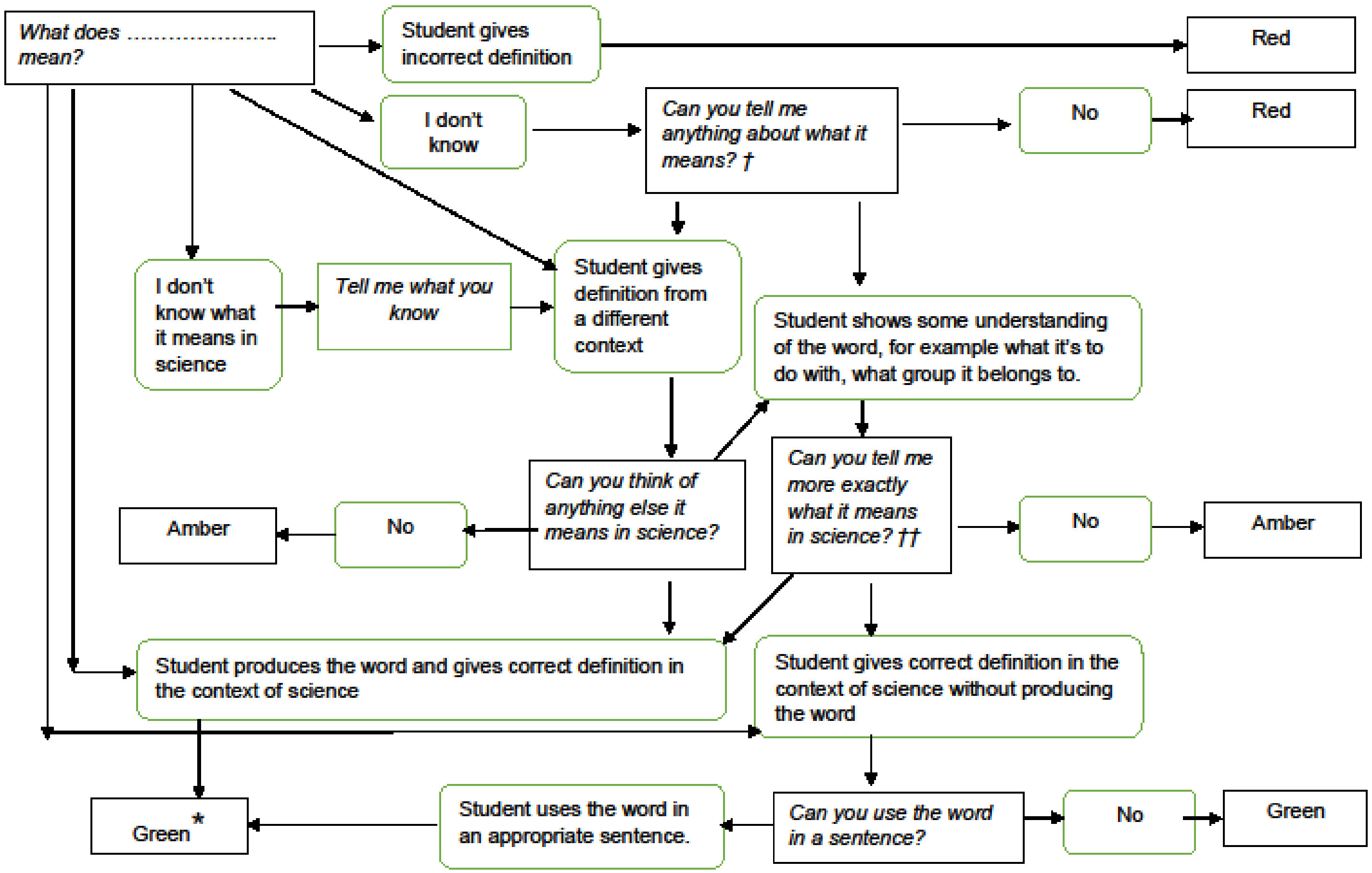
**No non-verbal measure available for participants from school 8.

† School did not supply data for ID 65.

Appendix 6G

Word knowledge assessment flow chart

(read sections in *italics*)



† Once the student is familiar with the protocol, this question can be omitted if it is clear that the student has thought about it before giving a "red" response.

†† Once the student is familiar with the protocol, this question can be omitted if it is clear that the student has given their best answer, e.g. if they say "and that's all I know."

Appendix 6H

Sample word knowledge assessment scoring guidelines

School 7 Y7 (blank entries indicate no responses were received)

	Word	Red	Amber	Green
1	venation			The arrangement of veins in a leaf or in an insect's wing. The system of venous blood vessels in an animal.
2	echo		Bounces off object (no mention of sound) Gives example of place Sound carries on / repeats In a cave it can echo	a reflection of a sound wave by an object so that a weaker version is detected after the original *Sound bounces back off the walls*
3	joules	What women wear A cell	Measuring something Something with energy	The SI unit of energy, equal to the work it takes to make a watt of power for a second, or to move a body one meter with a one-Newton force.
4	amplify			To make louder
5	pivot	A dot	A point Describes pivoting on your foot in sport	The point around which a lever turns.
6	atrophy			To waste away, to decline due to underuse
7	property	Be careful with the school's property Buy a house Where I live Stolen someone's property Step onto someone's property	Something you own / belongs to you Each element has a property. How big it is.	How a material behaves and what it is like.
8	solvent	A chemical Mixture	The liquid Water is the solvent	The liquid in which a substance dissolves to make a solution.
9	reflect	You see someone That is reflecting something	What a mirror does	to throw back by a surface light, heat, or sound without absorbing it.
10	concretion			A hard, solid mass formed by the local accumulation of matter, especially within the body or within a mass of sediment.
11	audible		Got something on audio.	Able to be heard

12	decibel	A sound wave	Volume	A unit of sound intensity or loudness *A measure of sound*
13	visceral			Relating to the internal organs of animals in the thoracic and abdominal cavities
14	atom	Part of your body A circle A star A cell A planet Circles in a square box	Inside a particle A round thing in objects Molecule is 2, atom is 1 Solid – together: liquid – spread out: gas – more spread out. Gives example	The smallest particle from which all substances are made.
15	pitch	Pitch black, pitch white How you say something Volume	Speaking/singing high or low Voice goes up and down football pitch	A property of sound determined by its frequency *How low or high a sound is*
16	compression		something pushing against something [no mention of particles] gestures pressing together	The squashing together of particles
17	latency			A time interval between the stimulation and response, or between cause and effect
18	soluble	Strong The thing you put in the solution	Solid to not solid	A substance that will dissolve in a liquid
19	contract	Metal contracts heat	Describes [ʻkɒntrakt] e.g. football, house Describes contractions e.g. when a woman gives birth	Get smaller
20	vibration	When an object vibrates Bounces off the wall	movement [and gestures] Your phone vibrates [indicates movement] Making a noise and shakes Sound waves moving	Movement continuously and rapidly to and fro
21	frequency	You measure it Volume How much Rub your hands	How many times Closer = higher, further = lower	The number of complete waves produced in one second (measured in hertz)
22	product	Make a product Item	Something you make Something you buy	New chemical formed in a chemical reaction.
23	allele			Each of two or more alternative forms of a gene that arise by mutation and are found at the same place on a chromosome.
24	condensation	In your house mi	On the window Steam	When a substance changes from gas to liquid
25	hertz	electricity	measures something	The SI (International System of Units) unit of frequency. Equals the number of cycles per second

26	constrict			Make narrower, especially by encircling pressure
27	solution	Plan Conclusion Finish Result Guess the answer	a solution to a problem solvent and something else = solution idea a plan for when something bad happens	When a substance has dissolved in a liquid. Solutions are transparent.
28	compound	A bunch of words Solid Tight substance Something inside another	two things stick together [describes] a compound sentence Cake is a compound [indicates] a fenced area A dog place Pushing down on something makes it one compound things together (+gesture)	A substance made of two or more elements joined together. *An example is given.* *Two atoms put together*
29	element	The main thing	Earth, fire, water, air You're in your element – you're really happy Gives examples Type of molecule Microscopic things you can't see Bigger than an atom but smaller than a compound	Substances consisting of atoms of only one type
30	pliable			Easily bent; flexible.

Appendix 6I

Independent word-learning assessment passages

1 The girl's arsonphobia was so severe and perseverant that she could not even light the candles on her birthday cake.

2 Claire heard a sudden crash up in the loft. She was all alone and felt really scared. She slowly and timorously climbed up the stairs. The noise was loud and piercing and reverberated through the house.

(Joffe, 2011, pp.295 & 291)

Appendix 6J

Independent word learning assessment scoring guidelines

Passages		
	score 1	**score 0**
arsonphobia	disease / sick scared fear-of-fire / afraid of candles	phobia / infection / allergic / condition / problem afraid of something incorrect e.g. guns can't move, light
perseverant	Persistence Keeps going	keep trying bad / severe persevere
timorously	fear / nervous / worried / timid insecure	quietly / slowly / carefully
reverberating	shaking / carrying on / echoing / repeating / vibrating	through the house loud travelling
piercing	sharpness / shrillness / squeaky / high-pitched annoying for your ears	through the house really loud put a hole in it
loft	upstairs place in the house	place
Severe	really bad	

Strategies	
score 1	**score 0**
ask peer e.g. friend / sibling	guess / just try / think / figure it out
ask adult e.g. teacher / parent / put hand up	revise
look it up: google / internet / website / iPad / search / research / investigate	leave it out
look it up: dictionary / glossary / vocab book / thesaurus / library / displays	practise
break word down / spell it out / look at the word / look at the syllables	read books / read your science book
use a different word and see if it makes sense	use a different word
look at the rest of the sentence	write it in your vocab book
try to use it in a sentence	draw a picture
See it's a noun, verb, or adjective	listen

Appendix 6K

Sample topic 1 strategies record completed (T.5)

School 2 Year 7 Class 5 IDs 15, 16, 17, 18, 22

<table>
<tr><th>Term 3 Chemical reactions</th><th>Date word was introduced as new</th><th>How many times did you say each new word?</th><th>What strategies/activities did you use to teach new words?</th></tr>
<tr><td>reactants</td><td>6th Jan</td><td>5</td><td rowspan="17">All new key words are on all power point slides and the students at the start of the lesson indicate if they know the meaning of the word. Students repeat the key words three times out loud.

When the key word is used in an explanation, the key word is pointed to on the powerpoint slide.

Differentiated questions are used at some point during the lesson and the students choose the question they can answer. If this involves writing sentences the key words that they have to include are shown in the question.

At the end of the lesson the key words are returned to and the students write a definition or words that go with the key word depending on their ability.

Bingo is used as a plenary, this is a definition

Splat is used as a plenary. Definition of words are given and the students have to race each other to splat the correct word.

Round the world is a plenary where students are asked questions and the answer is one of the key words, first one to shout it wins.</td></tr>
<tr><td>neutralisation</td><td></td><td></td></tr>
<tr><td>carbonate</td><td>11th Jan</td><td>8</td></tr>
<tr><td>hydrocarbon</td><td></td><td></td></tr>
<tr><td>fuels</td><td>16th Jan</td><td>10</td></tr>
<tr><td>chemical change</td><td>4th Jan</td><td>15</td></tr>
<tr><td>products</td><td>6th Jan</td><td>10</td></tr>
<tr><td>sulphate</td><td></td><td></td></tr>
<tr><td>carbon dioxide</td><td>11th Jan</td><td>10</td></tr>
<tr><td>limewater</td><td>11th Jan</td><td>10</td></tr>
<tr><td>corrode</td><td>6th Jan</td><td>3</td></tr>
<tr><td>explosives</td><td>18th Jan</td><td>3</td></tr>
<tr><td>word equation</td><td>11th Jan</td><td>5</td></tr>
<tr><td>oxide</td><td>18th Jan</td><td>10</td></tr>
<tr><td>hydrogen</td><td>8th Jan</td><td>10</td></tr>
<tr><td>combustion</td><td>16th Jan</td><td>10</td></tr>
<tr><td>physical change</td><td>4th Jan</td><td>15</td></tr>
</table>

Appendix 6L

Student questionnaire

Now I'm going to ask you a few questions about what you've been doing in science lately.

Have you done any new things in class to help you learn and remember new words?

Yes

No

I'm going to show you some things that your teacher may have used in science in the last few weeks. You can tell me if you can remember them and how helpful they were for learning and remembering new words. This is a smiley face checklist. Do you remember doing one of these?

What activities did you do?

……………………………………………………………………………………..

……………………………………………………………………………………...

(Show each activity one by one and show rating scale)

How helpful was it for helping you learn new words on a scale from 1 to 5; was it not at all helpful, not very helpful, you don't know whether it was helpful or not, quite helpful, or very helpful?

	Not at all helpful	Not very helpful	Don't know	Quite helpful	Very helpful	Can't remember activity	Comments
Smiley face checklist	1	2	3	4	5		
Word map	1	2	3	4	5		
Word-wise quickie	1	2	3	4	5		
Word bingo	1	2	3	4	5		
Word detective prompt card	1	2	3	4	5		
Key word sheet	1	2	3	4	5		
Your teacher might also have put up pictures on the walls with the words next to them. Can you remember that? (If yes) *How helpful was it?*							
Words displayed with a picture	1	2	3	4	5		

When you've got new words to learn, what would be the best way for ***you*** *to learn and remember new words? Would you prefer to do activities like these:*

a. *As a* ***whole class*** *in lessons*

b. *In* ***small groups*** *out of class with a teaching assistant*

c. ***One to one*** *out of class with a teaching assistant*

d. *Or* ***something different****?* (If so) *What?*

………………………………………………………………………………………………

(for all options) *Why?*

………………………………………………………………………………………………

………………………………………………………………………………………………

Appendix 6M

Likert scale prompt card

Not at all helpful	Not very helpful	Don't know	Quite helpful	Very helpful	Can't remember activity
1	2	3	4	5	

Model of delivery prompt card

			?
Whole class *in lessons*	***Small groups*** *out of class*	***One to one*** *out of class*	*Or* ***something different****?*

Appendix 6N

Teacher questionnaire post-intervention

Name (optional)……………………………………… Date …………………..

Please circle the number which best matches your agreement with the following statements.

1 **"I am confident at teaching vocabulary to students aged 11 – 16 years who have language difficulties."**

Strongly disagree	Disagree	Undecided	Agree	Strongly agree
1	2	3	4	5

2 **Had you ever used any of these activities before?**

Self-rating assessment	Yes / No
Key words displayed with visual image	Yes / No
Word detective	Yes / No
Word map	Yes / No
Word wise quickie	Yes / No
Sound and meaning bingo	Yes / No
Key word sheet	Yes / No

3 **"The activities were easy to implement."**

	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
Self-rating assessment	1	2	3	4	5
Key words displayed with visual image	1	2	3	4	5
Word detective	1	2	3	4	5
Word map	1	2	3	4	5
Word wise quickie	1	2	3	4	5
Sound and meaning bingo	1	2	3	4	5
Key word sheet	1	2	3	4	5

4 **“The activities were effective in enabling students to learn the curriculum vocabulary.”**

	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
Self-rating assessment	1	2	3	4	5
Key words displayed with visual image	1	2	3	4	5
Word detective	1	2	3	4	5
Word map	1	2	3	4	5
Word wise quickie	1	2	3	4	5
Sound and meaning bingo	1	2	3	4	5
Key word sheet	1	2	3	4	5

5 **“I will use these activities again.”**

	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
Self-rating assessment	1	2	3	4	5
Key words displayed with visual image	1	2	3	4	5
Word detective	1	2	3	4	5
Word map	1	2	3	4	5
Word wise quickie	1	2	3	4	5
Sound and meaning bingo	1	2	3	4	5
Key word sheet	1	2	3	4	5

6 **“I found the teacher / speech and language therapist collaboration helpful.”**

Strongly disagree	Disagree	Undecided	Agree	Strongly agree
1	2	3	4	5

7 Has participating in this project changed your practice? Yes / No

If yes, how? …………………………………………..

....

8 Please add any further comments you wish to about the project ....

…………………………………………………………………………………………….....

....

It would be helpful if you would answer a few questions about yourself:

9 Your gender. M / F

10 What subject did you study for your degree?..

11 How many years' overall teaching experience do you have? ....

12 How many years' experience do you have teaching science in secondary school?..................

13 How much training in speech, language and communication needs have you had?

………….. days ………….hours

Details of training ....

Thank you for all your help with our project.

Please return this questionnaire to Mrs Billie Lowe.

Appendix 6O

Sample self-rating checklist template

Name…………………………………………………Date ……………………………

How well do I know what these words *mean*?

Word	 Not at all	 A bit	 Very well
amplify			
audible			
compression			
decibel			
echo			
frequency			
hertz			
pitch			
reflect			
vibration			

Appendix 6P

Sample self-rating checklist completed (ID 83)

Name.. Date 26/04/17

End of topic

How well do I know what these words *mean*?

Word	Not at all	A bit	Very well
chromatography	✓		
dissolve		✓	
distillation	✓		
factor		✓	
filtering	✓		
pure		✓	
solubility	✓		
solute		✓	
solution		✓	
solvent		✓	

83

Separation – word learning booklet

T 28

Name .... Date ....

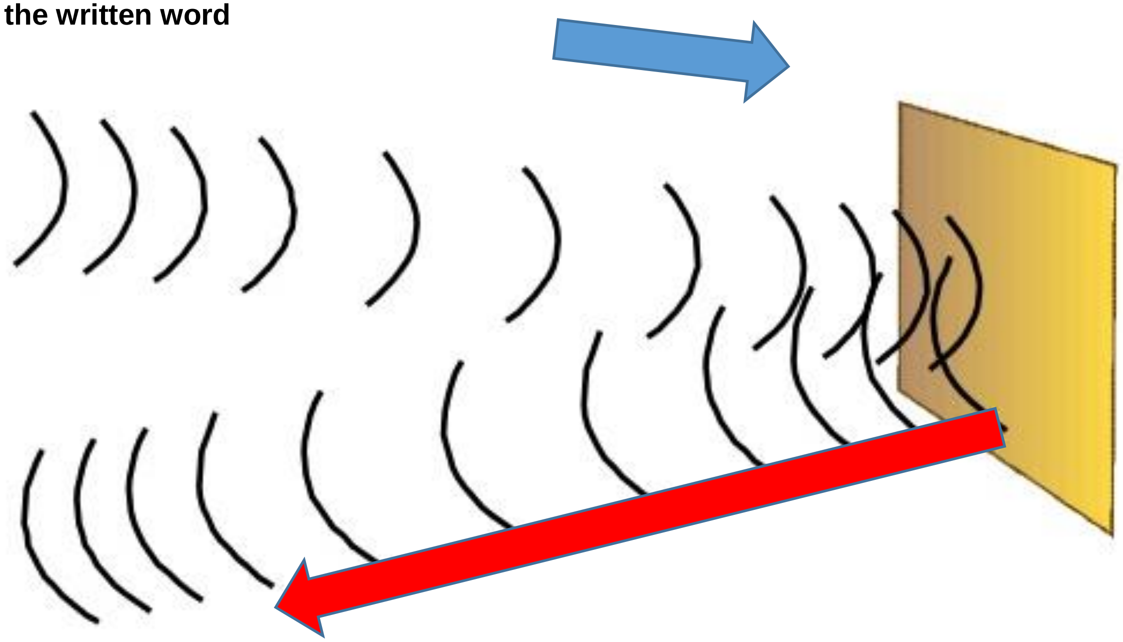
Start of topic

How well do I know what these words *mean*?

Word	Not at all	A bit	Very well
chromatography	✓		
dissolve		✓	
distillation	✓		
factor	✓		
filtering	✓		
pure	✓		
solubility	✓		
solute	✓		
solution	✓		
solvent		✓	

Appendix 6Q

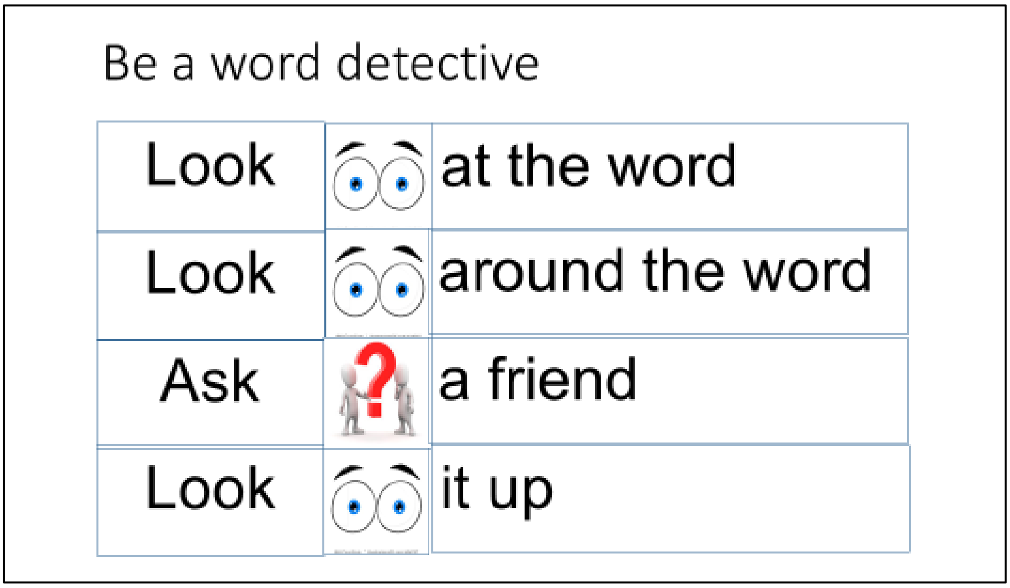
Sample visual image displayed with the written word



reflect

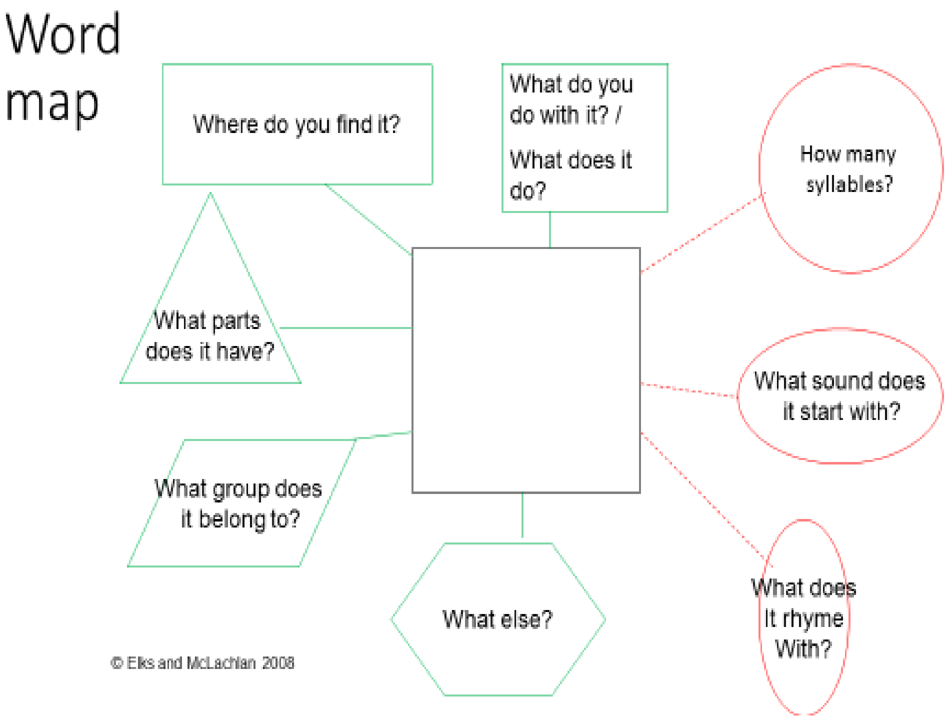
Appendix 6R

Word detective prompt card



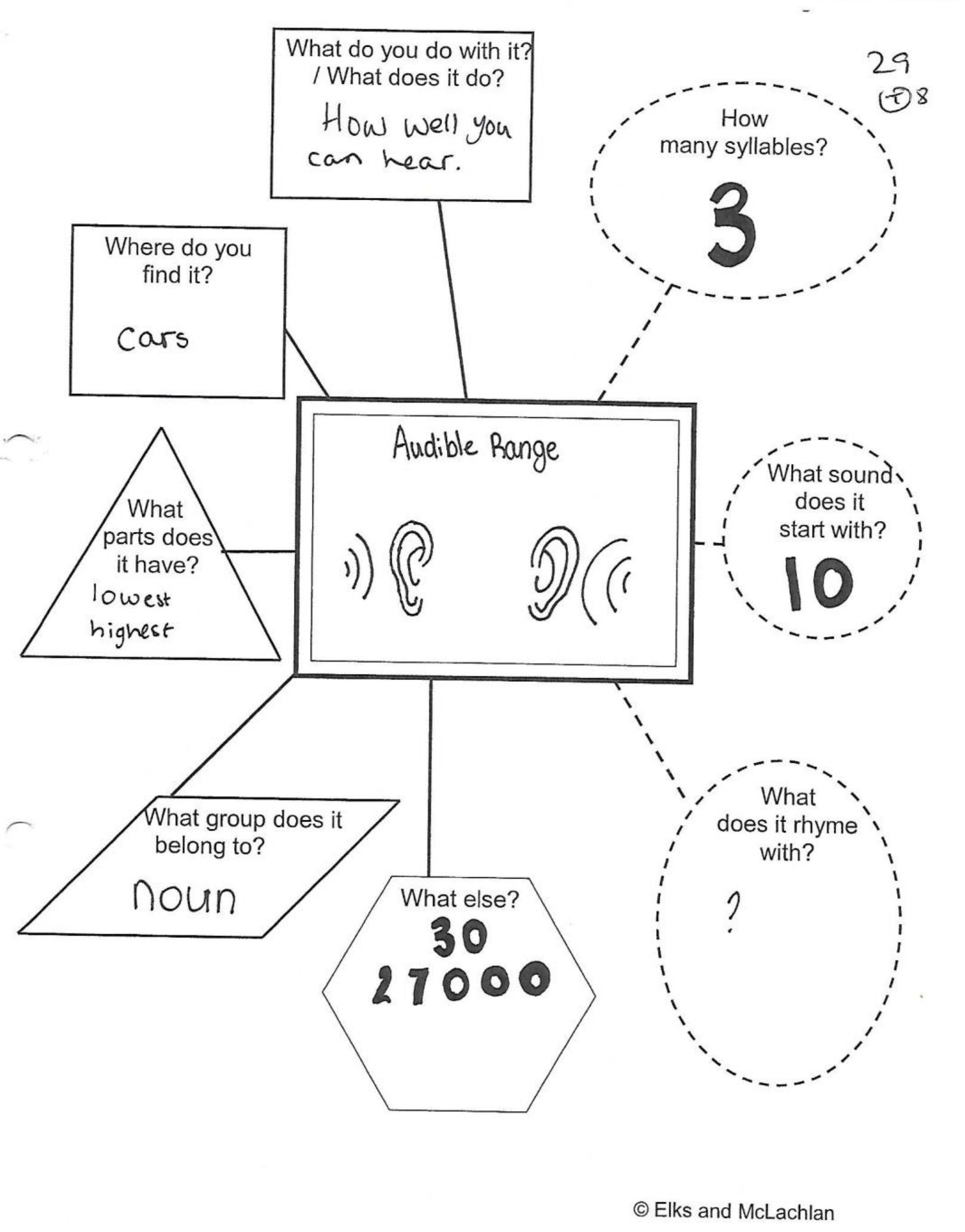
Appendix 6S

Word map



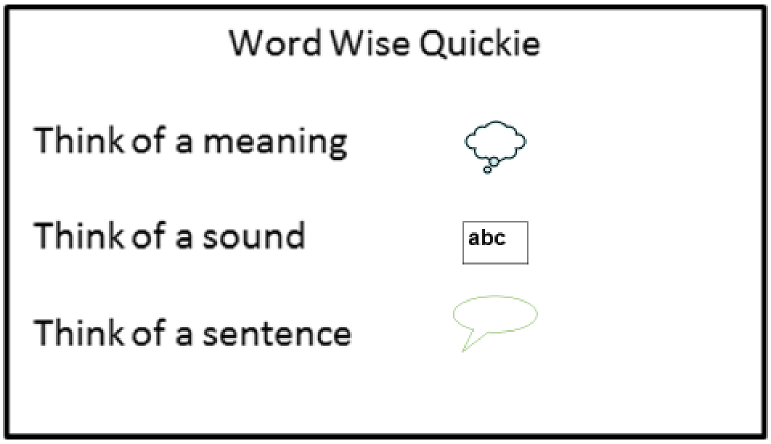
Appendix 6T

Example of a completed word map (ID 29)



Appendix 6U

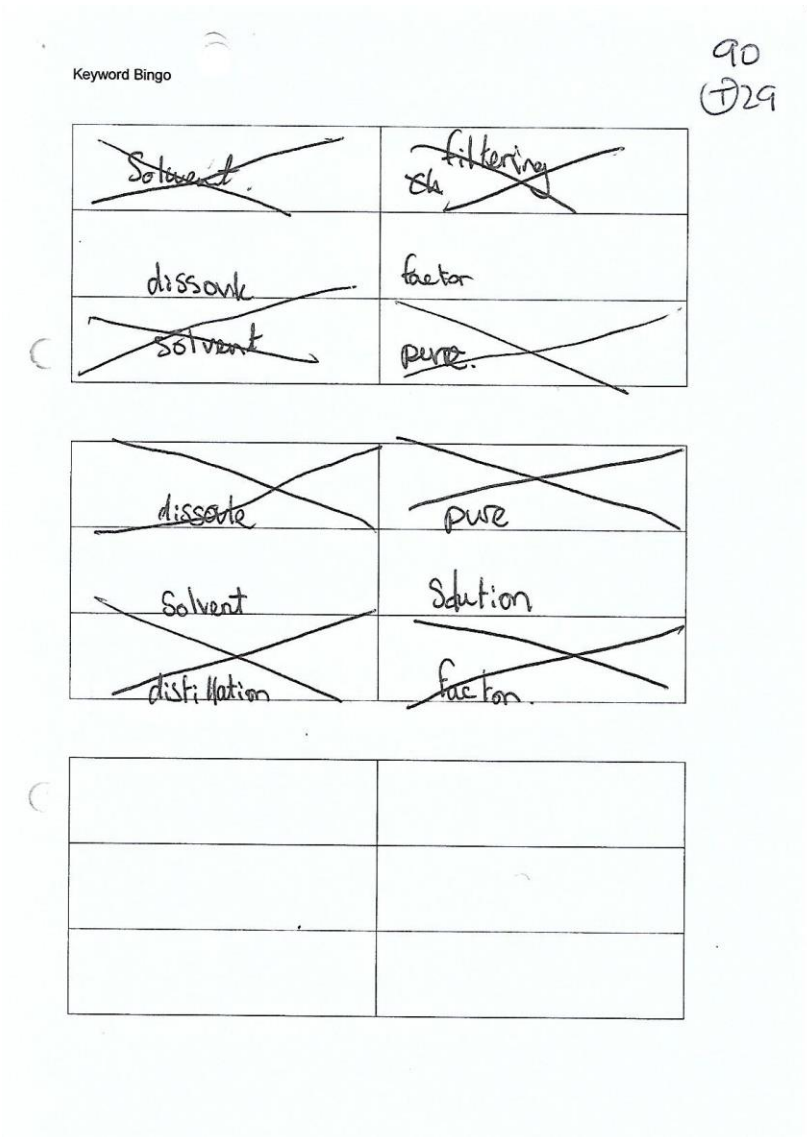
Word-wise quickie



(Elks & McLachlan, 2008)

Appendix 6V

Example of a completed bingo sheet (ID 90)



Keyword Bingo

90
(T)29

~~Solvent~~	~~ch filtering~~
dissolve	factor
~~solvent~~	~~pure~~

~~dissolve~~	~~pure~~
Solvent	Solution
~~distillation~~	~~factor~~

Appendix 6W

Key word sheet

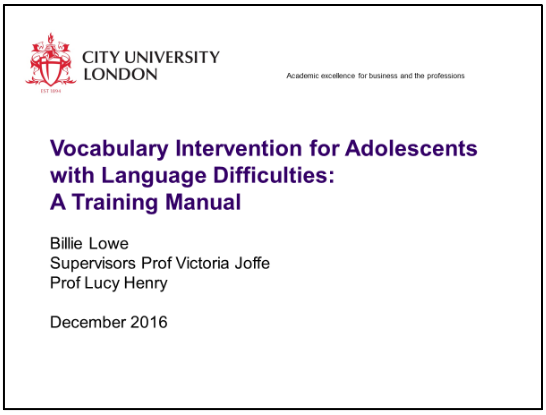
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
V
W
X
Y

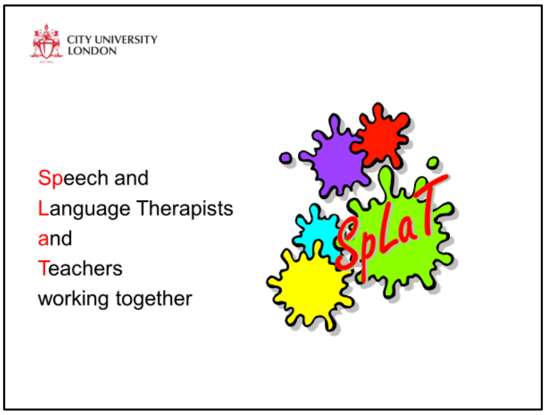
Appendix 6X

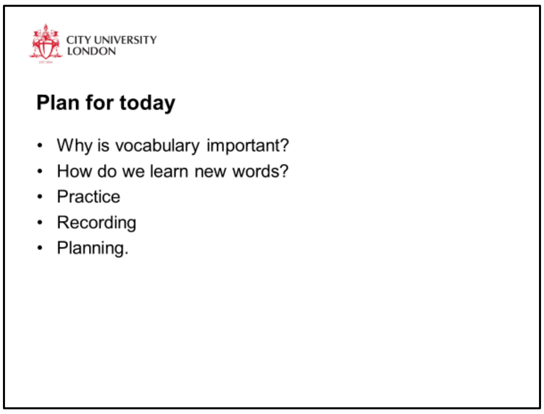
Example of a completed key word sheet (ID 27)

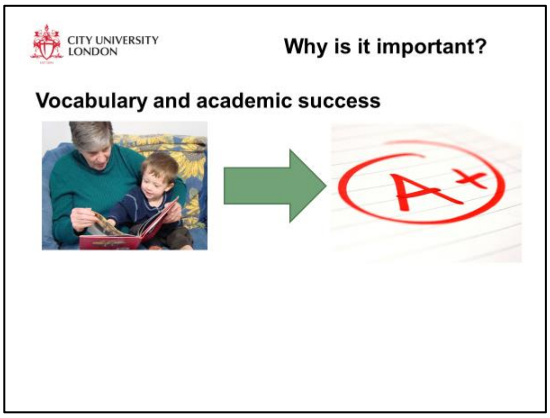
Appendix 6Y

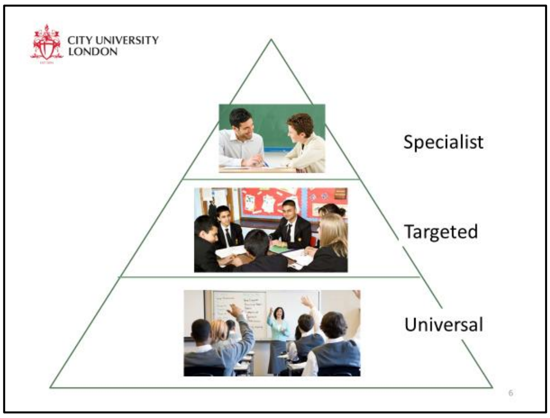
Sample teacher training presentation

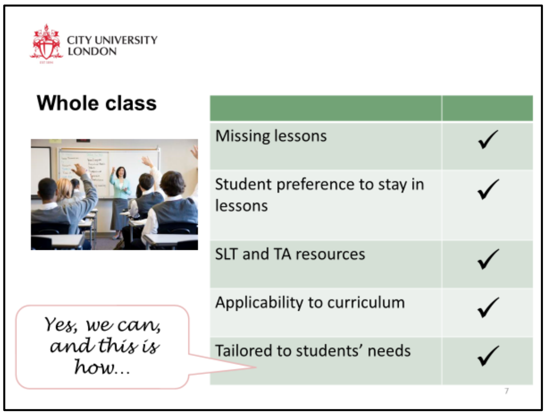






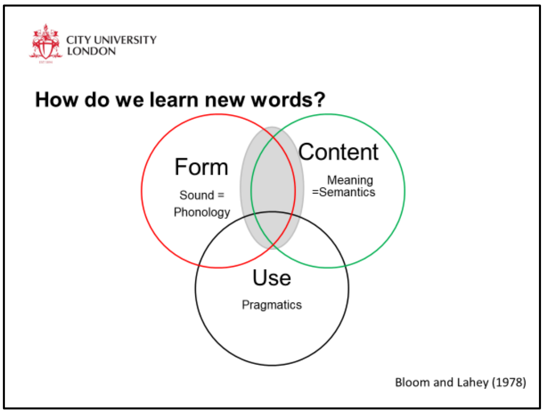


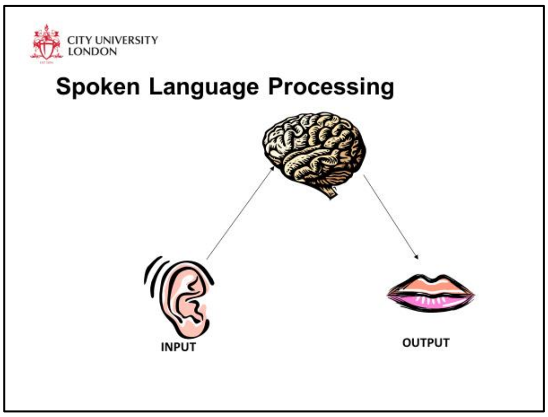


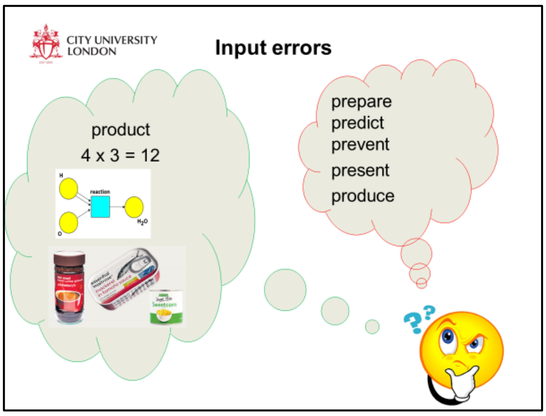

CITY UNIVERSITY LONDON
Whole class

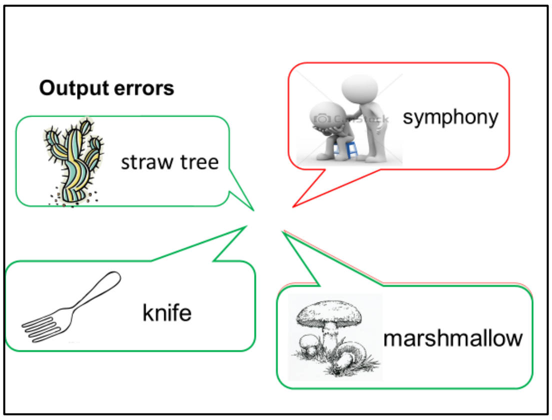
Missing lessons	✓
Student preference to stay in lessons	✓
SLT and TA resources	✓
Applicability to curriculum	✓
Tailored to students' needs	✓

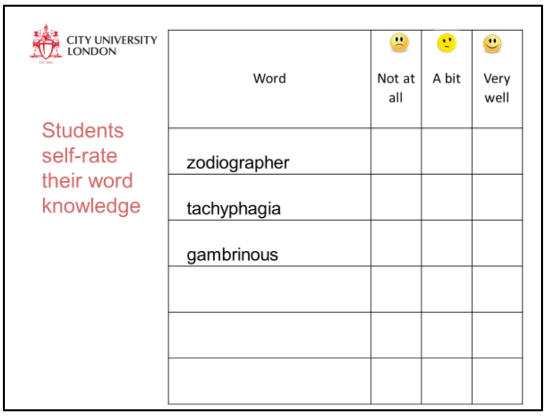
Yes, we can, and this is how…
7


CITY UNIVERSITY LONDON
How do we learn new words?
Form
Sound = Phonology
Content
Meaning =Semantics
Use
Pragmatics
Bloom and Lahey (1978)

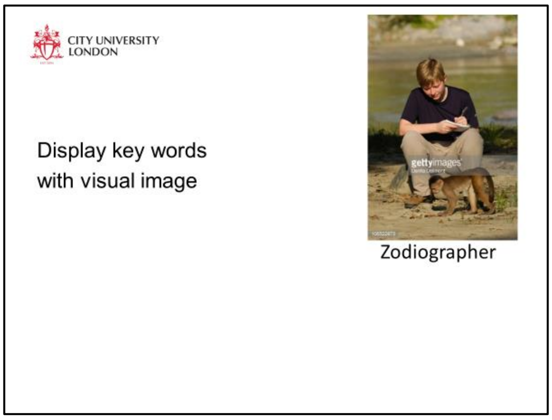

CITY UNIVERSITY LONDON
Spoken Language Processing
INPUT
OUTPUT

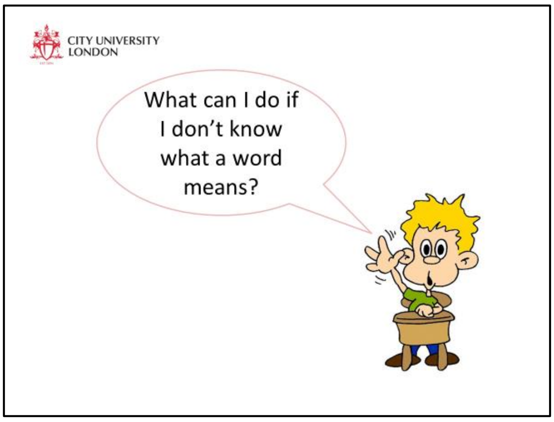

CITY UNIVERSITY LONDON
Input errors
product
4 x 3 = 12
prepare
predict
prevent
present
produce

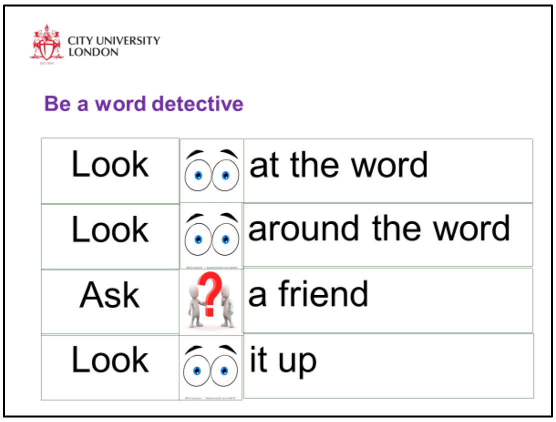

Output errors
straw tree
symphony
knife
marshmallow

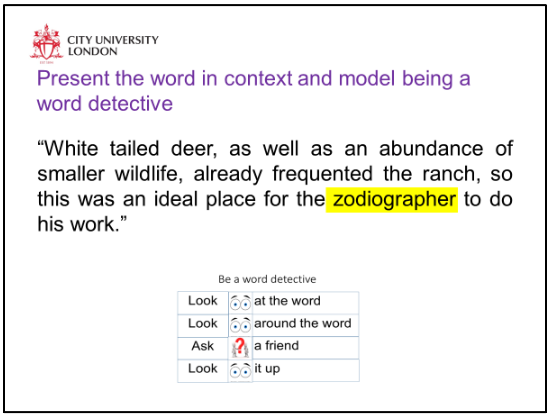

CITY UNIVERSITY LONDON
Students self-rate their word knowledge

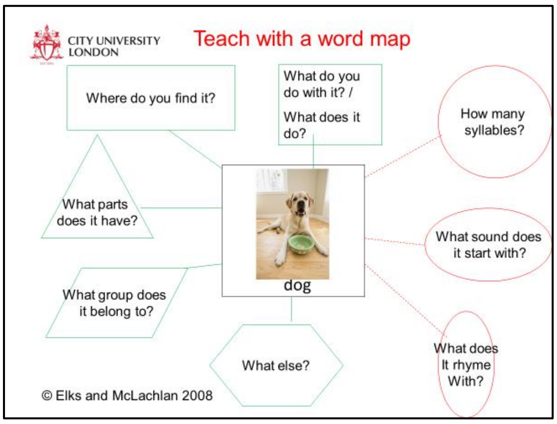
Word	Not at all	A bit	Very well
zodiographer			
tachyphagia			
gambrinous			

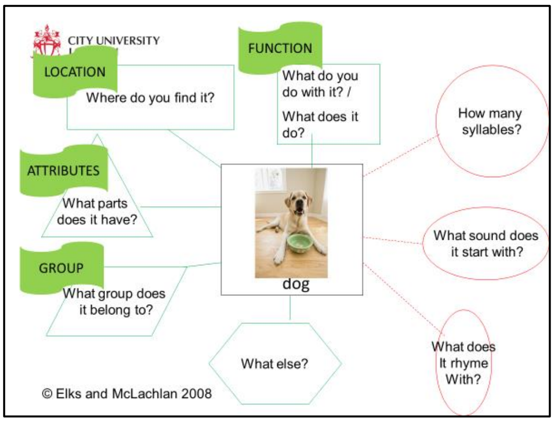

CITY UNIVERSITY LONDON
Display key words with visual image
Zodiographer

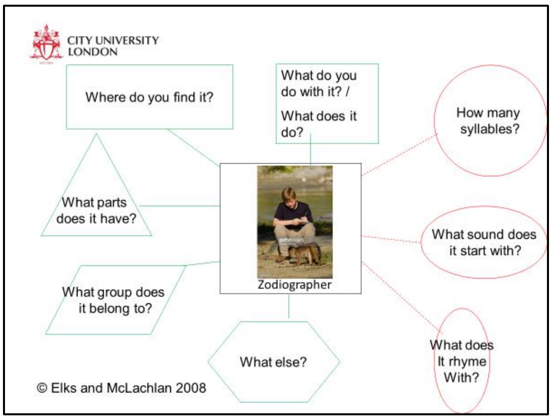

CITY UNIVERSITY LONDON
What can I do if I don't know what a word means?

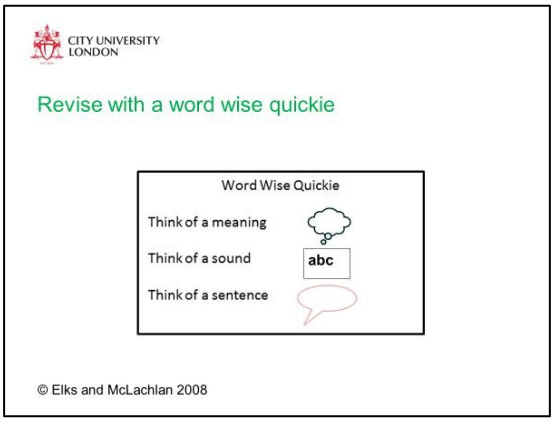

CITY UNIVERSITY LONDON
Be a word detective
Look at the word
Look around the word
Ask a friend
Look it up

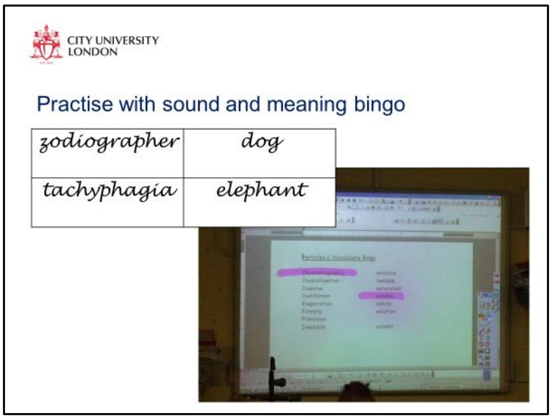

CITY UNIVERSITY LONDON
Present the word in context and model being a word detective
"White tailed deer, as well as an abundance of smaller wildlife, already frequented the ranch, so this was an ideal place for the zodiographer to do his work."
Be a word detective
Look at the word
Look around the word
Ask a friend
Look it up

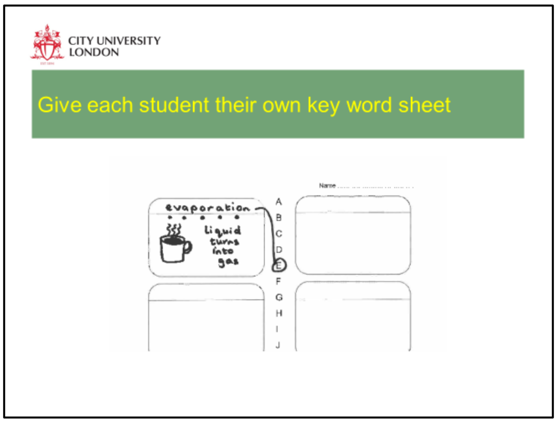

CITY UNIVERSITY LONDON
Teach with a word map
Where do you find it?
What do you do with it? / What does it do?
How many syllables?
What parts does it have?
What sound does it start with?
What group does it belong to?
dog
What else?
What does It rhyme With?
© Elks and McLachlan 2008


CITY UNIVERSITY LONDON
FUNCTION
LOCATION
Where do you find it?
What do you do with it? / What does it do?
How many syllables?
ATTRIBUTES
What parts does it have?
What sound does it start with?
GROUP
What group does it belong to?
dog
What else?
What does It rhyme With?
© Elks and McLachlan 2008


CITY UNIVERSITY LONDON
Where do you find it?
What do you do with it? / What does it do?
How many syllables?
What parts does it have?
What sound does it start with?
What group does it belong to?
Zodiographer
What else?
What does It rhyme With?
© Elks and McLachlan 2008


CITY UNIVERSITY LONDON
Revise with a word wise quickie
Word Wise Quickie
Think of a meaning
Think of a sound
abc
Think of a sentence
© Elks and McLachlan 2008


CITY UNIVERSITY LONDON
Practise with sound and meaning bingo
zodiographer
dog
tachyphagia
elephant


CITY UNIVERSITY LONDON
Give each student their own key word sheet
evaporation
liquid turns into gas
A
B
C
D
E
F
G
H
I
J

CITY UNIVERSITY LONDON

Remove key words and visual images

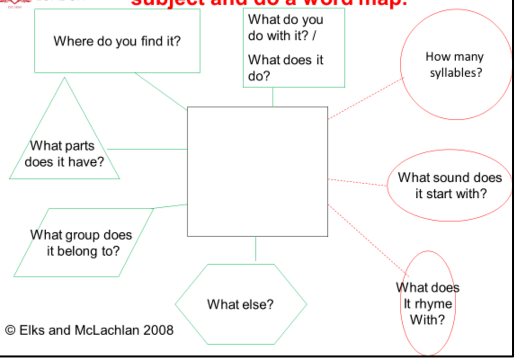
CITY UNIVERSITY LONDON

Students self-rate their word knowledge again

Word	Not at all	A bit	Very well
zodiographer			
tachyphagia			
gambrinous			

CITY UNIVERSITY LONDON

Choose a word from your own subject and do a word map.



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Y7(2)

chromatography	pure
dissolve	solubility
distillation	solute
factor	solution
filtering	solvent

Y8

biomass	omnivore
carbohydrates	prey
carnivore	producer
chlorophyll	starch
consumer	trophic level

Y7(1)

angle of incidence	primary colour
colour	reflection
diffuse	refraction
light	scattered
normal	spectrum

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Planning

- Incorporate the 10 experimental words into your planning
- Each word to have *either* a word map *or* a word wise quickie
  - Decide on 5 to explain using a word map
  - Decide on 5 to revise using the word wise quickie
- Decide on 3 words to practise being a word detective
- Think of clues for sound and meaning bingo.

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Lesson	Starter	In body of lesson	Finisher 1	Finisher 2
1	Self-rating 5	Word map 15		Key word sheet 4
Before next lesson, display words with visual image				
2	Word detective 4	Word map 10		Key word sheet 2
3	Word detective 2	Word map 10		Key word sheet 2
4	Word detective 2	Word map 10		Key word sheet 2
5		Word map 10	Word wise quickie 2	Key word sheet 2
6			Word wise quickie 1	Key word sheet 2
7	Sound and meaning bingo 8		Word wise quickie 1	Key word sheet 2
8	Sound and meaning bingo 6		Word wise quickie 1	Key word sheet 2
9	Sound and meaning bingo 6		Word wise quickie 1	Key word sheet 2
Before next lesson, remove words and visual images				
10	Key word sheet 2		Self-rating 3	

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And finally...

- Display word detective, word map, and word wise quickie.
- Keep participating students' worksheets
- Record of attendance
- Lesson observations
- Keep in touch: hilary.lowe@city.ac.uk

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Academic excellence for business and the professions

Speech and
Language Therapists
and
Teachers
working together

SpLaT

Thank you!

Appendix 6Z

Sample topic 2 strategies record completed (T.31)

Id 92
99

(T) 31

Strategies record

Name of teacher

Topic 2 Term 3/4 Light	Date word was introduced as new	How many times did you say each new word on that date?	What activities did you use to teach key words?					
			Word detective (3)	Word map (5)	Word wise quickie (5)	Sound and meaning bingo (3)	Key word sheet (10)	Visual images displayed
			Date	Date	Date	Date	Date	Date
incident ray	9/2/17	6			9/2/17		9/2/17	2/2/17
luminous	31/1/17	5				23/2/17	9/2/17	2/2/17
normal	9/2/17	5		9/2/17	9/2/17		9/2/17	9/2/17
opaque	2/2/17	6		2/2/17		23/2/17	2/2/17	2/2/17
reflect	31/1/17	6	31/1/17.			2	2/2/17	9/2/17
refraction	31/1/17	4				23/2/17		9/2/17.
scatter	21/2/17	3				23/2/17	9/2/17	9/2/17
spectrum	31/1/17	5	31/1/17				9/2/17	9/2/17
translucent	1/2/17	5		1/2/17			2/2/17	2/2/17
transparent	1/2/17	6		1/2/17			9/2/17	2/2/17

Other: please list:

Please keep a record of participating students' attendance

Appendix 7A

Group mean scores for depth of word knowledge: all timepoints

	Time 1 *M* (*SD*)	Time 2 *M* (*SD*)	Time 3 *M* (*SD*)	Time 4 *M* (*SD*)
Usual teaching practice condition out of 20	4.14 (2.75)	5.72 (3.29)	5.38 (3.36)	5.59 (3.261)
Experimental condition out of 20	3.14 (2.42)	3.50 (2.51)	6.96 (3.87)	6.17 (3.80)
No-intervention condition out of 20	.92 (1.27)	.99 (1.47)	.90 (1.37)	1.19 (1.77)

Group mean scores for expressive word use: all timepoints

	Time 1 *M* (*SD*)	Time 2 *M* (*SD*)	Time 3 *M* (*SD*)	Time 4 *M* (*SD*)
Usual teaching practice condition out of 10	.58 (.91)	.96 (1.39)	.97 (1.37)	1.06 (1.13)
Experimental condition out of 10	.33 (.62)	.45 (.73)	1.78 (1.80)	1.49 (1.65)
No-intervention condition out of 10	.15 (.40)	.08 (.31)	.14 (.35)	.19 (.51)