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The challenge of introducing the subject of research and research methods to Business Undergraduates.

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Abstract

The research process is complex, involving many conceptually different steps. The identification of a suitable problem can be a challenge involving a high level of creativity, whereas applying a chosen research method must follow accepted and well defined rules. How researchers iterate between current discipline theory, subject knowledge and research methodology is usually opaque to the outside researcher. Students with no exposure to research find this puzzling because they are being encouraged to do something creative and original, and at the same time to adopt clearly defined language and a set of conventions associated with the chosen methodology.

Business students in their 1st year face many new situations. Most of them have little experience of what research is about or the various elements that are necessary for a successful project. The teaching at school level mostly focuses on imparting subject knowledge and instilling basic numeracy and literary skills. It does not prepare them so well for setting their own goals and working independently - the core of research. Traditional teaching methods can help them acquire the relevant subject knowledge and basic research methods. But putting these together in a piece of practical research requires in depth understanding and creative thinking. Problem-based learning (PBL) is a way to help UG students at the beginning of their research attempts to develop the mindset and skills needed. This paper makes the case for introducing Critical Thinking skills to Business Management students in their 1st year, using a problem-based Learning (PBL) approach.

Keywords: Problem-based learning, teaching research methods, first year UG business students, business research process

1 Introduction

The research process is complex, involving many conceptually different steps, all of which are unlikely to be familiar to business undergraduates. Management as a discipline is multi-faceted drawing on a number of related disciplines. These disciplines provide management researchers with a wide range of potential research methodologies. The research process demands both knowledge of these methods and the skills to apply them effectively. The extra-ordinary high rate of change in industries and the amazing turnover in firms ensures that subjects of interest to executives (and hence researchers) expand and change at just as fast a rate.

Most 1st year students come directly from school and are used to a well-structured learning environment. An environment, moreover, that sets the agenda of their learning, both decides and teaches the skills that they will need, poses the questions that they have to answer and then usually gives the answer or at least the methodology that will lead to the answer. The research process is not well structured and requires skills of a different nature such as setting their own learning goals, critical thinking and self -awareness.

This paper makes the case for introducing Critical Thinking skills to Business Management students in their 1st year, using a problem-based Learning (PBL) approach. It identifies the key skills needed for research in management (section 2) and establishes the new intake of undergraduates' relative lack of understanding of them (section 3). The paper then introduces PBL (section 4) and draws on the experience of teaching critical thinking skills in the first term of the first year of the business management undergraduate degree at Cass Business School (section 5).

2 The Business and Management Research Process

What constitutes the discipline of management is a contentious topic. As an activity now carried out by most of the population at some level we all have views on what it is and how best to do it. It is a practical discipline in that theories survive if they help the practising manager. Managers spend much of their time interacting with other people (Mintzberg, 1973) but must also be able to deal with the specific problems of their own industry. Managers deal with both the relatively 'hard' operational problems of their own company and the 'softer' ones relating to the people with whom they work. This provides a distinctive focus for the management researcher (Easterby-Smith et al, 1995; Easterby-Smith et al, 2018). This section describes what is required for each of the main steps in the research process and presents the key characteristics of management research that researchers need to address.

Business Schools have been developing and teaching business and management theory for over a century, drawing on knowledge and ideas developed in a wide range of different but related disciplines such as statistics, economics, social science and psychology (Boddy, 2017; Easterby-Smith et al, 2018). Practitioners - business managers have been learning, applying and criticising much of the theory for almost as long a period. Business organisations are continually innovating in product or service provision, culture and jobs, organisational structure and training. This provides a rich ever changing field for research, challenging existing theory, proposing new theory and above all researching actual practice. From the point of view of a management researcher, the focus on practical relevance of research results leads to an emphasis on empirical work. The changing business scene offers scope for original case material. But the central two factors of management – an organisation's operations and the people working within it, dictates the importance of researchers making use of other disciplines ideas. This offers an ever expanding range of research methods developed by other disciplines that management researchers can use.

The research process is usually presented as a sequence of between seven and ten distinct stages all of which must be completed for any piece of research to be credible (see Table 1 for a typical list) (Saunders et al, 2015). It is easy to get lost in the welter of detail required to successfully carry out the individual steps. By taking each step separately, Business Research methods text books (Saunders et al, 2015; Bryman and Bell,2015; Easterby-Smith et al, 2018), lectures, classes and workshops tend to support this outcome. But it is not a linear process. Researchers will iterate between these steps, perhaps revisiting various stages many times, as their understanding of the research problem develops and changes as a result of the findings from other steps such as data analysis and writing up. As table 1 shows, choices are involved at every step, but these are not independent of each other. The final decisions must ensure that the work carried out at each stage forms part of an integrated whole, both supporting and consistent with work carried out at all other stages. It is by writing up the work as it progresses that the researcher develops a more profound understanding of the contribution of each step. This deepening understanding may be one of the triggers for a rethink of work carried out at other perhaps previous stages. The process of writing up is critical to the project (Saunders et al, 2015) - for the researcher in progressing the work and for the ultimate audience in explaining what has been done, why it has been done and what has been found out. Writing skills are tested at every stage of the research process.

step	Required Knowledge, understanding, skills and Mind-set
Choice of Subject area of research and nature of problem area	Knowledge of subject deep enough to outline general nature of problem topic that interests you.
Extensive Literature review of subject area research and current accepted theories with close attention to recent published work	Up to date Knowledge of research in the subject area(s); Knowledge acquisition; mastery of detail; organisation and structuring of the literature to focus on the research question and support choices made at each subsequent step.
Development of Research Question (RQ)	Understanding of the problems posed by the subject area; Creative development of a doable and relevant RQ, outline of expected type of results aimed for
Choice of Philosophy of research; epistemology, ontology	Knowledge of range of options; choice of approach consistent with RQ, clarifying your personal worldview; implications for methodology to be applied
Research method chosen and reasons for choice	Up to date knowledge of range of research methodologies appropriate for business research; critical assessment of these methods, choice made consistent with RQ and results aimed for, reasons for choice
Overall Design of the research project – choice of data collection methods, analysis appropriate for chosen research method, reasons for choice	Mastery of the rules governing the application of the chosen research method; Mastery of Rules governing collection of the type of data being collected; critical assessment of reasons for choice of methods
Data Collection implementation	Knowledge of data collection potential problems; ways to manage problems and obtain good quality data

Choice of methods of Analysis of data; reasons and implementation	Mastery of appropriate methods of analysis; study of patterns revealed by the data; creative interpretation and comparison to similar work
Presentation of Results and interpretation	Insight and creativity in combining both results of data analysis and context of problem; critical assessment of the power of the analysis and results
Assessment of Contribution to knowledge	Subject area knowledge; critical assessment of work
Assessment of Limitations and further research that looks promising	Critical assessment of work; creativity in outlining future possibilities

Table: The steps in empirical research and what they involve.(based on authors experience, Saunders et al, 2015)

A number of characteristics of this type of work emerge from the analysis shown in the table:-

- The researcher, may have extensive support from colleagues, supervisors and business executives, but the myriad choices required, establishes that each project is a unique piece of independent work ; each piece of research poses problems for which there is not necessarily a routine or obvious solution
- A significant part of the project requires innovation and creativity but this in turn rests on subject knowledge and the researcher's skills in applying the well-defined rules governing the steps in the research process.
- All decisions require justification through critical assessment of alternatives and explanation of the basis for the choices made. This challenges the researcher's ability for reflection and self-assessment.
- The need for clear thinking throughout the process so that the final report and presentations can show a coherent, logical structure that makes sense.

Hence, although knowledge of the range of research methodologies and the subject knowledge are of great importance, the personal skills of the researcher in applying these theories are just as important. These include the ability to work independently setting own goals, to think in a clear, logical and critical way and to communicate the results effectively.

3 The 1st year business students' experience

Students arrive at university with little knowledge of the subject of management or research methods. Neither do they have much experience of practicing the personal skills required for research. By the last year of their degree they will be expected to carry out their own individual piece of research. These students face major change in their first year. Their degree (business management) embraces a wide range of disciplines each with a different pedagogic approach and widely varying types of assignments. Their educational background prepares them well for knowledge acquisition, but not for dealing with the conflicting theories presented to them by their university teachers.

Because management is such a diffuse subject embracing a range of constituent disciplines, it does not logically follow from any subject taught before the age of 18, except arguably business studies. Hence students arrive having studied a very broad range of subjects during the last few years of their time at school. Some arrive with a high level of existing knowledge in, for example, statistics or economics whereas others have little or no knowledge of them. To participate effectively in the later stages of the degree students need to have a thorough grounding in these subjects as well as having effective study skills. So a significant component of the 1st year is devoted to imparting knowledge in

a didactic manner. Moreover each sub-discipline in management is best suited to a different pedagogic approach. Both the pedagogic techniques and the expectations held by students of how they can be taught vary considerably across the content within a Business Management degree. From a student's perspective the 1st year can come across as a set of disjointed set of subjects with no clear unifying theme and no common approach to delivery of the material.

The students' level of preparedness to acquire knowledge in a complex and nuanced manner is frequently limited. Typically they have come from a school syllabus which focuses on clearly defined areas of knowledge and provides limited training in how to research matters for themselves. O'Donovan (2010) observed that a significant proportion of 1st year students saw knowledge purely in terms of a set of uncontested facts to be memorised, and noted behaviours and attitudes that mirrored this conception. She found that 1st year students frequently focused their efforts on memorising notes, recalling uncontested facts, and viewing the lecturer as an authority. Students at this stage were often puzzled by lecturers presenting them with multiple conflicting views of a situation. A further observation is that students often expressed negative views about particular activities within the 1st year, because these activities did not accord with their expectations of having knowledge transmitted to them.

The notion of threshold concepts (Land, 2016) refers to ideas and approaches which can be difficult for students to grasp, but which have the potential to move a student forward within a transformational process. Land illustrates this by pointing out that a common cause of errors made by experts in many fields is that they apply knowledge which would have been appropriate to a previous set of circumstances. He extends this to the student experience by suggesting that students are often limited because they apply knowledge, and acquire knowledge, using techniques that were appropriate while they were still at school. This is part of the argument for students to be encouraged to persevere with 'troublesome' ideas which, while uncomfortable in some ways, can encourage students to think in a way more appropriate to degree-level study.

The degree offers many opportunities to learn but essentially how much is learnt depends on students' choices – in particular the level of effort invested. This is the type of decision that first year students have not been asked to make before. They will face a number of new types of assignments. For example many of them will have access to research databases and a high quality library for the first time and need to learn a set of tools to navigate the information that they gain from these. They will be expected to use these tools to find out for themselves the information required for an assignment rather than being told the sources to use (as would have been the case at school). It is this type of assignment which challenges students' existing perceptions and encourages them to move on from the idea that learning is only about knowledge acquisition.

Maunder et al (2013) discuss the transition to university and set out to understand the university experience in its entirety. While their analysis extends to students' perception of their status as university students, and their tendency to form social groups with one another, they also note students' need to participate in independent learning as something that distinguishes university from earlier stages of study. Furthermore they stress that the transition continues to have an impact beyond the first year of an undergraduate course. As noted by Robinson et al (2013) there is an imperative to provide first year students with feedback which supports this transition.

In their analysis of the requirements placed upon higher education by a world of 'supercomplexity', Barnett and Hallam (1999) stress the need to emphasise learning processes more than student outcomes and also observe that, while academics frequently espouse the value of critical thinking, they do not always build effective practice that fosters critical thinking among students. Influenced by this reasoning, there is a strong argument for building critical thinking (Chatfield, 2018) and reflection into the 1st year of Business Management courses.

4 Activity based teaching and Problem Based Learning (PBL)

Skills are acquired through practice. It takes time and effort to first acquire and then develop a skill to a high level of expertise (Dreyfus and Dreyfus, 1988). Some skills (for example solving mathematics problems) are best learnt by practice on text book exercises worked in the classroom. First year students are experienced and generally proficient at these types of skills. The ‘Soft skills’ of dealing with other people cannot be learnt this way. For example, Linda Hill (1992) established that the most effective way of learning to be a manager was by the actual experience of doing the job. This somewhat hit or miss way of learning is costly and time consuming. Hence educationalists have sought to accelerate the process by creating practical activities that give students the chance to practice the required skills, within an academic or training environment, combining this with the provision of various forms of appropriate feedback. More broadly, Goodyear and Dimitriadis (2013) argue for application of ‘activity-centred design’ which takes a student-oriented perspective. This reflects a long-term trend from transmissive pedagogies, which are focused on knowledge flowing in one direction from lecturers to students, to constructivist pedagogies within which students build on what they already know, and gather more through their own efforts and under the guidance of a lecturer. In a business school where a significant proportion of students have some relevant pre-existing knowledge and experience, the constructivist approach is particularly worthwhile.

Problem-based learning is one approach that has been widely applied in medicine and with some success in higher education institutions such as Maastricht University in the Netherlands (Schmidt, 2010; Vardi and Ciccarelli, 2008). This is the approach used for the new module described below. PBL is based on posing a complex ill-structured problem within a realistic context, (to establish the relevance of the problem) to students (Loyens, S. M. M et al, 2011). The key elements of this approach are the design of the activity, student group working and the tutor role. In essence small groups of students work on and discuss a complex case problem relevant to their situation and subject learning aims of the course. Several additional skills are developed alongside the subject on which the case is based. These include collaboration, problem solving and self-driven learning. The success of PBL rests to a large extent on the design of the case problem. According to Loyens, S. M. M et al (2011) a case should build on prior knowledge (of the students), elicit discussion (by the student group), stimulate self-directed learning (through the implicit and explicit learning issues posed), encourage knowledge integration and transfer (with students pre-existing knowledge) and be relevant to the students’ future profession.

PBL typically introduces practical challenges: it is much more straightforward to address a cohort of students who are all together in a lecture theatre than to divide them into teams, or to allocate them to tutorial groups, and to set, administer, and evaluate a series of practical activities. There are many concerns about PBL teaching, just because the outcomes depend so critically on the student cohort’s contribution and hence behaviour. Vardi and Ciccarella (2008) show how labour and expertise intensive, designing and delivering a PBL course can be. With a large cohort this can only be delivered through the contribution of a team of educators working together.

There are a set of well understood tools for evaluating student response to such courses, but it can be difficult to evaluate the benefits of activity based learning. In the 1st year such activities can be set up to prepare students for later stages of their studies or for their future employment, and the true measure of success is either their eventual career trajectory or their ability to apply themselves to later stages of their course.

5 Practical example – Critical Skills module for Cass 1st year Business Management students

This was a new module delivered in the first term of the new intake. It was taught for the first time to the first year students in the 2018-19 academic year to a cohort of 360 students drawn from over 40 countries world wide. The core design is based on the concepts of Problem- Based Learning (Loyen S.M.M et al, 2011). Students study eight modules during the academic year and this was the only module using problem-based learning methods. The stated educational aims are to develop critical thinking skills. Specifically the module aims to develop student’s understanding of what is going on

in any given situation through the use of reasoning, the evaluation of evidence and self-reflection on their own thinking processes.

5.1 The case problem

The key concepts on which reasoning and critical thinking are based are presented in the course text book ('Critical Thinking' by Chatfield, 2018) with a wealth of fascinating examples. This forms the core knowledge for the module. Students are expected to read the whole of this book which is split into 2 parts. The first part deals with the basics of reasoning and logic. The second part entitled being reasonable in an unreasonable world introduces the concepts of rhetoric and bias. Chatfield gives a definition of critical reasoning highly relevant to research skills, 'when we are thinking critically, we are setting out actively to understand what is going on by using reasoning, evaluating evidence and thinking carefully about the process of thinking itself' (Chatfield, 2018, p6). Students are expected to read most of this book and develop their own reasoning skills through applying the ideas in the book chapter by chapter to the business case written for the module.

The case is based on Hailo, a taxi app launched in 2012 which then went through a several years long journey of highs and lows. The case closely mirrors what happened in the early years but adds a few wrinkles to the basic story to fit the needs of the course. Every week, the student group is confronted with a problem that Hailo also had to face. Each week's problem expands our knowledge of the company and its senior executives. Short video clips showing the founders and senior executives describing actual developments, are placed on the VLE. The case problem meets the five criteria required for PBL (Loyens S.M.M et al, 2011). It is based on 4-5 years operation of a real commercial company hence is relevant to the students career aspirations. It builds on their prior interest in and general knowledge of the way markets and companies work and develops their knowledge further by detailing actual way that one company handled start up and early development years. The questions set each week develops greater and greater understanding of the company generating ever greater interest and discussion over the term.

5.2 Weekly activities

Each student is placed in a tutorial group of between 12 to 16 students. The ten sessions of the module are entirely run by the student group supported by a tutor. Student groups set their own learning goals and these differ each week. They are based on each week's Hailo case problem and the relevant chapter set from Chatfield's book (both of which they should have read prior to the session). The group is expected to identify Hailo's current problem, brainstorm possible solutions, determine what knowledge is lacking within the group and then decide learning goals together. During the following week, each member is responsible for addressing the learning goals, so as to come to the following week's session ready to share their learning and review and perhaps change the solutions proposed for the previous week's problem. Hence each tutorial session has two parts: the first part deals with the previous week's learning objectives. In the second part the group goes on to deal with the week's Hailo case problem and set the next set of learning objectives.

There are three student roles – leader, reporter and group member. Every student member is allocated the leader role for one session together with a partner and the reporter role for another session. The tutor's role will vary somewhat depending on the group's profile and needs. He or she will act as coach to each leader and reporter and will intervene as appropriate to ensure that the key knowledge given in the module textbook is addressed by the group. The team of tutors agreed to interject at least one common learning objective for each week based on the week's text book chapter.

Students must attend all sessions and are marked by their group tutor for attendance and participation over the 10 weeks sessions. Assessment also includes a mark for the handling of the leadership role and for an individual essay on a topic related to the Hailo case.

5.3 Resource requirements and tutor's role

This type of teaching makes great demands on designers and tutors. Before the course commenced, the three faculty members leading the module, would have spent 60 – 80 hours in several preparatory

meetings and tasks: developing original content with a real business, preparing the weekly problem tasks, the tutor guides, understanding the problem-based learning technique.

There were 9 Tutors each with between 2-3 groups of students. Problem-based learning was a new experience for all but one of the tutors. All attended a training session with a tutor from Maastricht University on problem-based learning. These hours spent together in designing, training, and briefing have been crucial in ensuring a consistent message and learning experience for the students across the tutor groups. Since the tutors carried out all the marking, kept the group sessions on target and provided oral feedback to the group members, it was important that they agreed a common marking scheme and approach to directing the weekly sessions. During the module, the tutors regularly met twice every week for informal debriefing session so as to share ideas and best practices across the tutor groups

5.4 Evaluation

Evaluating the module and gathering feedback from both students and teaching staff has been a key part of the development process. For the critical thinking module a unique online evaluation process was built which focused on the benefits or otherwise of learning in small groups. Feedback received from students regarding the group activities was generally supportive, with a high proportion of students responding 'mostly agree' to statements such as 'working in a tutorial group setting has helped me to understand better the subject matter of the course'. There was also an opportunity for students to post discursive comments. These conveyed a more varied picture. Many were extremely positive and commented favourably on the level of engagement, the extent to which it had facilitated their own thought processes, and the support that they received from tutors. But a significant minority felt that the approach worked less well for them than conventional lectures, including one comment from a student, clearly unaware of the background to the approach, confidently predicting that problem-based learning would never attain widespread use, and another proudly suggesting that they were already familiar with all the critical thinking skills covered in the material. Others quite reasonably expressed concern that a format which depends on significant participation and input from students does not work effectively for those who are very introverted or who have other difficulties in communication.

This feedback afforded the opportunity to carry out a significant redesign in preparation for its delivery for the second time. Issues which were addressed included:

- The practical and logistic challenges associated with dealing with a large cohort working as a multiplicity of small groups.
- The pedagogic approach and its fit with other modules and with students' expectations. For example some students were uncomfortable with an approach which was focused on thinking and reasoning techniques and not on internalising a body of knowledge.

Key characteristics of the redesigned module to be delivered in the next academic year (2019-20) include a slight increase in the amount of lecture content to allow the key concepts to be framed more clearly and presented to students in the context which emphasises why they are important. The assessment process has been revised to reduce the opportunities for academic misconduct as the original approach was, at least in principle, open to 'contract cheating' where students pay for essays to be written to order. Nevertheless the inclusion of an assessment of participation as a central part of the module is being retained.

5 Conclusions

The module clearly focuses on developing both critical thinking and some of the personal skills which are important for empirical business management research. These are skills that, if internalised by first year students, will help them with the transition to university as well as in subsequent years of

their undergraduate studies and in their future careers. The problem-based learning structure poses challenges for both teaching staff and students. The success of this type of course depends on a number of factors, of which efficient organisation, student presence at and active participation in class and a common agreed approach to class interventions by tutors are perhaps the most important. Individual student 'buy in' is critical to the learning of the student group as a whole. The mixed response of students to the module highlights the importance of 'selling' the module more effectively to them. The delivery of this module in the next academic year stands to benefit greatly from this first experience of teaching using problem-based learning methods.

References

Barnett R and Hallam S (1999) Teaching for supercomplexity: a pedagogy for higher education in Mortimore P *Understanding pedagogy and its impact on learning* London: Paul Chapman Publishing

Boddy David (2017) 'Management an Introduction' 7th ed. Pearson

Bryman Alan (2016) ' Social research methods', 5th edition, Oxford University Press, Oxford

Bryman Alan & Bell Emma (2015) 'Business Research Methods' 4th edition

Chatfield T (2018) *Critical thinking: your guide to effective argument, successful analysis, & independent study* London, Sage

Dreyfus, H., & Dreyfus, S. (1988). *Mind over machine: The power of human intuition and expertise in the era of the computer*. New York: Free Press.

Mark Easterby-Smith, Richard Thorpe and Andy Lowe (1995) 'Management Research an Introduction' Sage publications Ltd

Mark Easterby-Smith, Richard Thorpe, Paul Jackson and Andy Lowe (2018) 'Management and Business Research' 6th edition, Sage publications Ltd

Goodyear P and Dimitriadis Y (2013): In media res: reframing design for learning. *Research in learning technology* 21

Hill, Linda (1992) 'Becoming a Manager: Mastery of a new identity' Harvard Business School Press, Boston

Land R (2016) Toil and trouble: threshold concepts as a pedagogy of uncertainty, in Land R, Meyer J, and Flanagan M: *Threshold concepts in practice* Rotterdam: Sense Publishers

Loyens, S. M. M., Kirschner, P. & Paas, F. (2011). Problem-based Learning. In K. R. Harris, S. Graham & T. Urdan (Eds.), *APA Educational Psychology Handbook: Vol 2* (p. a). Washington: American Psychological Association; at Research Online an open access institutional repository for the University of Wollongong

Maunder R, Cunliffe M, Galvin J, Mjali S, and Rogers J (2013) Listening to student voices: student researchers exploring undergraduate experiences of university transition. *Higher education* 66 (2) 139-152

Mintzberg H (1973) 'The nature of Managerial work' Harper and Rowe

Robinson S, Hope D, and Holyoak L (2013) Can we meet their expectations? Experiences and perceptions of feedback in first year undergraduate students. *Assessment and evaluation in higher education*. 38 (3) 260-272

Saunders Mark, Lewis Philip, and Thornhill Adrian, (2015) 'Research Methods for Business Students' 7th edition, Pearson Education Ltd

O'Donovan B (2010): Filling a pail or lighting a fire: the intellectual development of management undergraduates. *International journal of management education* 9 (1) 1-10

Schmidt H (2010): A review of the evidence: effects of problem-based learning on students and graduates of Maastricht medical school, in Van Berkel H, Scherpbier A, Hillen C, and Van Der Vleuten C: *Lessons from problem-based learning* Oxford: OUP

Vardi, Iris and Ciccarelli, Marina, (2008), 'Overcoming problems in problem-based learning: a trial of strategies in an undergraduate unit', *Innovations in Education and Teaching International*; 45, 4; p345-354