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Introduction to Teaching and Learning in Information Retrieval

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1. Introduction

For a number of years the editors of this volume have attempted to provide a higher profile for teaching and learning as applied to information retrieval (IR), either by organising workshops such as the Teaching and Learning in IR workshops run in 2007 (Huete et al, 2007) and 2008 (MacFarlane et al, 2008), or editing special issues on the subject in learned journals (Fernández-Luna, Huete & MacFarlane, 2009). This book continues this effort, and addresses a number of significant issues in the discipline, which had been identified either by us or by colleagues who have written papers to be presented at the workshops we organised or published in journals.

It was felt by us, when first starting out this journey, that insufficient attention was made to an important aspect of academic's lives – teaching. There has been very little work done on pedagogical research in IR, apart from the notable effort of Edward Fox and colleagues to address the issue of what should be in the curricula for various types of students at the tertiary level - Undergraduate, Masters and PhD (Fox, 1996).

The objective of this book is to provide ideas and practical experience of teaching and learning for IR, for those whose job requires them to teach in one form or another, and delivering IR courses is a major part of their working lives. In doing this we hope to share best practice and encourage the dissemination of ideas which are known to work well with real students, and in doing so provide a better profile for the field as a whole. We also where necessary tackle the theoretical ideas in teaching and learning which need to be addressed by any practitioner.

In this introduction, we briefly introduce a taxonomy of teaching and learning in IR, and show how this taxonomy is applied to the structure and organisation of the main themes address in this book. A conclusion is given at the end.

2. A Taxonomy of Teaching and Learning

While undertaking a large scale review of the literature in teaching and learning in IR (Fernández-Luna et al, 2009), a taxonomy was derived which reflects the main aspects of the activities addressed in this book (see figure 1).

Level 1

[A] Technical Levels (non-technical to highly technical)
[B] Educational Goals:

[b1] Library and information Science
[b2] Computer Science

Level 2

[1] Teaching and Learning methods:

[1a] classroom
[1b] e-learning (distance learning)

[1c] use of IR systems for teaching

[2] Assessment and feedback
[3] Curricula

Figure 1: A Taxonomy of Teaching and Learning

The taxonomy has two levels: one is more subject focused and provides a classification for the various fields in which IR can be applied, as well as the technical levels (Level 1); one focuses on the pedagogical aspects of teaching and learning as applied to IR, such as teaching and learning methods, assessment and student feedback and curricula design (Level 2). As there are clear overlaps between the two levels and for the sake of brevity, we focus on Level 2 in this chapter to explain the books overall purpose and organisation in section 3. Level 1 issues are tackled explicitly were necessary.

3. Book structure and Organisation

1.1 Teaching and Learning methods 1: Classroom

A number of different classroom techniques can be used for delivering material to students including lectures. Mizzaro provides a brief overview of presentations used to get students' to engage in the material by providing an overview of a research paper or a key technology (such as ranking techniques). Using an analogy with building methods, Halttunen describes a 'scaffolding' method in which the teacher provides the overall framework for the student to

learn, gradually taking away the 'support' from the student who can then engage with the material without any help. This has the advantage of allowing students to learn at their own pace. Weekly web-exercises are used in this framework. Students are 'anchored' into the material and tutorial support 'fades' as they demonstrate they can engage with the ideas independently. Similarly, a problem based learning approach can be used as advocated by Thornley, which starts with a given problem and leads to some solution or solutions. Thornley's educational philosophy is to start with the educational objectives, giving them conceptual frameworks to tackle problems, understanding the some problems are difficult, and being comfortable with that fact. The author then provides frameworks for students to work through problems independently. Sanderson also advocates a problem lead approach to teach web search. A particular issue in IR is the need for understanding of relevance, and the evaluation of sources in this context. Mothe & Sahut describe a method whereby examples of different sources are use to get students' to think about the information quality issue, both as a consumer and providers of information. The allows the student to gain and understanding of the skills required to evaluate documents and judge relevance whilst searching.

1.2 Teaching and Learning methods 2: Online Learning

The internet and web, provides other opportunities to use different techniques in order to instruct students. Online learning, E-Learning or Distance learning is a very clear example, and is now widely used in teaching for both remote and face to face students. Popular online learning systems are WebCT and Moodle. Martinez-Comeche & Cacheda-Seijo describe the use of a number of online tools in order to support student learning including forums and Wiki's. Forums are used by encouraging the students to share problems, thereby identifying issues in the cohort. Questions are also posed in order to gauge the understanding of a particular topic e.g. an understanding of recall. Wiki's are used to disseminate information among students, and they are engaged to write for the Wiki, in the context of group work**.** Fox and colleagues describe the use of Second Life – a shared virtual environment - as a teaching for learning in such activities as project meetings. Bell presents her experiences in designing an entirely online Information Retrieval course, her successes, failures, modifications and planned changes. It is of particular interest how she uses screen capture software for the creation of demonstrations and tutorials. The course management system is Desire2Learn which is similar to other well-established systems, such as Blackboard including content areas, a discussion board, survey and quizzing functions, an electronic dropbox and grading system, and detailed tracking functions (who has looked at what, how many times, and for how long).

1.3 Teaching and Learning methods 3: use of software/IR systems

General web tools are very useful for any subject being taught (see section 1.2 above), however the teaching of IR has particular problems which must be addressed by the use of various types of search tools. Lopez-Garcia & Cacheda-Seijo describe a set of software libraries which allow students to build IR components such as crawlers and searchers and how these are used to support the learning of Computer Science (CS) students. Johnson and Fox et al point to a number of open source tools which can be used for the same purpose. Halttunen by contrast shows how search tools are used to support learning for Library and Information Science (LIS) students, including the examination of the output from these tools to examine issues such as evaluation. Similarly Johnson describes different types of web tools used to support understanding of how to design search in the context of visualisation techniques. Sanderson and Warner also describes the use of web tools for learning.

1.4 Assessment and Feedback

After delivery of material it is normal to test the student to assess their learning, and to what degree they have absorbed the material. In order to assist student learning, feedback is given to further help the student with their learning. This can be formative (unmarked to assist learning with certain issues for example) or summative (marked which goes towards the qualification which the student is undertaking). There are many forms of assessment methods such as exams, courseworks, online tests etc. Mizzaro briefly describes the use of term projects as an optional assessment, together with a final mandatory oral examination. Halttunen conducts a survey at the beginning of the module delivered, and then uses a variety of methods to assess students learning, including a reflective essay and practical search, collecting quantitative data in the later. Martinez-Comeche & Cacheda-Seijo use formative online assessments to assist student learning, and then use a class exam to provide a final mark for the student. Results on two different types of delivery are examined and conclusions drawn. Thornley advocates the use of traditional forms of assessment including essays, group work and class tests. MacFarlane focuses on the use of Multiple Choice Questions (MCQ's) to support the learning of students unfamiliar with the underlying mathematics needed for search, such as Boolean logic and evaluation measures (e.g. precision/recall). The use of this method for formative assessment is advocated, and a strategy is provided which provides the reader as to how to construct a set of questions to support student learning. Blank and colleagues describe a number of different practical assessment which can be used to assess student learning including searching online systems and the use of programming problems e.g. either a project or implementing a component such as ranking. Sanderson and Warner focus on web search and the different components in such activities such as querying and evaluation, making flaws a feature of the exercise which students could reflect on and learn from these flaws. They describe an in-class feedback session where the

results of searches were discussed in the context of conducting scientific experiments. Since the course of Bell is entirely online the use of prompt feedback is essential. The email has been proved to be an effective tool to get both, regular and immediate feedback. The students appreciate the friendly and enthusiastic tone of the communications. In order to engage the students a detailed and personalized feedback on assignments were provide.

Teaching and learning is not just about assessing the performance of students – a good teacher will try and reflect on what they have done and attempt to improve their methods to help students who will take the module in the future. In order to do this it is desirable to get feedback from students on their experience of learning. The use of anonymous feedback is very common, and work described in this book is no exception. Lopez-Garcia & Cacheda-Seijo describe feedback which allows the students to provide information on the difficulties they faced while implementing components for the coursework as well as teaching materials made available. This information can be used by a reflective teacher to improve the delivery of their subject. Mizzaro also uses feedback to collect not only the students experience of the course, but also prior experience to undertaking the module. The latter can be used to tailor the course to student needs. Mizzaro uses a highly structured questionnaire which gathers quantitative data using the Likert scale, as well as qualitative data (an example questionnaire is provided in the appendix). Yang and colleagues describe the use of feedback from graduate students to develop IR curricula. Bell gather formal feedback on the course through two online surveys each semester: a standard one, fourteen Likert scale statements and three open-ended questions, and a survey she designed using SurveyMonkey to ask questions specifically about the content of this course. The input from both surveys has proved valuable and informative, and provided guidance for changes.

1.5 Curricular

A key question is – given the breadth and depth of knowledge gained on information over the past 50 years – what material do we deliver to the students. This will often start with educational goals or learning outcomes, which can drive our thoughts on what knowledge we want our students to have on completion of our modules. Johnson focuses on educational goals for different types of students including CS and LIS. Mizzaro focuses on the issue of teaching web IR and traditional IR techniques to CS students. Blank and colleagues take account of knowledge from LIS, but focus on more technical issues such as understanding of data structures for CS students. Fox and colleagues also focus on more technical issues, but for graduate students. Mothe and Sahuts educational goes are more focused on assessing the quality of sources, useful for any student at any level of education. Sanderson focuses more on LIS students, and the needs of users and using web search to meet those needs. Yang and colleagues give an example of educational goals derived for curricula using the

example of 'image retrieval' module, which can be used by the reader to think about how to write their own learning objectives. Bell presents an entirely online course focussed on LIS students, with the objective of understand the basics of using electronic information retrieval systems in order to obtain information, emphasizing internet and commercial services.

Once the educations goals have been derived, teachers can think about curricula for their modules. All the papers in this book give reference to the material which can be delivered either implicitly or explicitly. For example Blank et al and Mizzaro take their educational goals and show what is delivered on their modules. A key chapter in the development of curricula and other educational resources is Yang et al's chapter, which focuses on the development of such for information retrieval courses, but in a Digital Library context. They take important aspects of both LIS and CS disciplines to build a set of topics which can be tailored to students, in the context of a generic digital library curricula previously defined. This is an important effort in bringing together ideas from the various disciplines in order to address both system oriented and service oriented issues, which many types of student can benefit from. A method or process to continually update the syllabuses of IR courses is described – evaluation of what is being delivered is a hallmark of a reflective teacher. Resources developed by this resource is are made publically available.

4. Conclusion

The chapters in this book provide an excellent overview of teaching learning in IR, any all types of teacher, whether they are new to the field, new to teaching or looking to incorporate new ideas into their current teaching has a lot to gain from reading them. The overview we provide above allows the reader to identify particular interests in the various chapters, but there is much to be gained by reading all the chapters in the book and thinking about how the techniques and ideas outlined could help in improving teaching. We hope that this volume will become a valuable source of information for those who undertake the delivery of ideas to students – a handbook of teaching and learning in information retrieval.

References

Fernández -Luna JM, Huete JF, MacFarlane A, Efthimiadis EN, (2009). Teaching and learning information retrieval, Inf Retrieval 12:201-226.

Fernández -Luna JM, Huete JF, MacFarlane A, (2009). Introduction to the special issue on Teaching and learning in information retrieval, Inf Retrieval 12:99-101.

Fox, E. (1996). Courseware, training and curriculum in information retrieval. In: Frei, HP, Harman, D, Schauble, P, Wilkinson, R, Proceedings of the 19th Annual ACM SIGIR Conference and Research and Development in Information Retrieval, doi:10.1145/243199.243321.

Huete J, Fernández -Luna JM, MacFarlane A, Ounis I, (Eds) First International Workshop on Teaching and Learning of Information Retrieval (TLIR 2007). http://www.bcs.org/server.php?show=nav.8704. Accessed 27th October 2010.

MacFarlane, A, Fernández -Luna, JM, Huete JF, Efthimiadis E, (Eds). Second international Workshop on Teaching and Learning in Information Retrieval (TLIR 2008). http://www.bcs.org/ewic/tlir2008. Accessed 27th October 2010.