

Learning for Practice Through Research Results in the Information Management Field

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Abstract

In spite of decades of research on higher education approaches to well prepare students for practice, the increasing complexity of the professional world demands require to constantly improve our teaching and learning methods. One of the main challenges is to prepare the students to be aware of the state-of-the-art scientific knowledge and at the same time to understand the constraints of the real world when transferring them to practice. In this paper we describe our approach to tackle this problem in teaching the design of information artefacts for two types of information professionals: information managers and informatics engineers. The approach is situated along three dimensions: technical/technological, research/innovation and practice/profession. The distinctive feature of the educational approach above is twofold: on the one side there is an emphasis in research results as initiators of the topics learning and on the other side a big relevance is attributed to the sharing of professional experiences as a strong motivator for learning.

Keywords: (Design-based learning; theory-practice gap; information artefacts design)

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1 Introduction

There is a continuous challenge in information management higher education in filling the gap between theory and practice. The academic knowledge base is important but not sufficient (Jensen and Purlito, 2013) for training the information professionals of the future that are pressed to be scientific and technically solid, competent in complex problem solving and, simultaneously able to take risks and be innovative. In the areas of information management and information systems design, the challenges are even more demanding as it is required that the information professionals are capable of integrating social/organisational and technical/technological skills to be applied in increasingly complex situations. It is thus necessary to devise richer teaching and learning approaches for the information schools fulfill their mission.

The University of Porto iSchool is a collaboration between the School (Faculty) of Engineering (FEUP) and the School (Faculty) of Arts (FLUP). It offers the three cycles of studies - bachelor, master and doctorate - in a range of programs addressing information as a subject.

The case study reported in this paper concerns to two different courses in two different programmes: the Integrated Master in Informatics and Computation Engineering (MIEIC) - integrates the first and second cycles of study - and the Master in Information Science (MCI) - second cycle of study.

MIEIC is a ten semesters programme (300 credits/ECTS) that aims to train high quality informatics engineering professionals. In the last four semesters (corresponding to the second cycle of studies) the students can opt for a specialisation: (i) Networks and Information Technologies; (ii) Intelligent Systems and Multimedia; and (iii) Software Engineering and Information Systems.

MCI is a four semesters programme (120 credits/ECTS) aiming to train information professionals specialised in information management in organisations. MCI does not provide specific paths of specialisation but elective courses are offered on communication, consultancy management, innovation, digital preservation, social networks, data analytics.

This paper reports our teaching and learning experience with two courses, one of each program, that aim at preparing the students for planning and designing information artefacts. The Requirements Engineering for Information Systems (REIS) course objective is to train the future informatics engineers enrolled in the MIEIC program in designing and managing the process of establishing the requirements for an information system, from the construction of the system's vision to its detailed specification. The Consultancy in Information Management (CIM) course objective is to train the future information managers enrolled in the MCI program in designing and managing an intervention in an organisation that diagnoses its problems and opportunities regarding the management of its information assets and defines

an information management strategy and plans its implementation. REIS is offered in the 8th semester of the integrated master programme, while CIM is offered in the 2nd semester of the 2nd cycle master programme (8th semester if the first cycle bachelor programme is taken into account). This means that the students of both courses are at the same level of their studies.

2 Learning for practice through research results

2.1 Dimensions of learning for practice

The two courses reported in this paper aim at preparing the students to professionally intervene with success in organisational contexts by solving problems or developing improvement opportunities involving information management and information systems. The learning outcomes required rise up to the category of *knowledge utilization* (decision making, problem solving, inquiry, investigation) on top of the category of *analysis* (matching, classifying, generalizing, specifying) (Marzanno, 2000). These outcomes are expected to confer to the students' competencies to plan and manage the organisational intervention process, being the focus on the planning part in this case.

The knowledge domain addressed in the two courses is the design of information management and systems which encompasses: (i) business/organisational analysis; (ii) intervention planning (including organisational change); (iii) requirements elicitation, analysis, documentation and validation and (iv) systems design (socio-technical system i.e, systems involving technical/technological and social/organisational subsystems).

The courses rationale, as conveyed to the students, lies in three dimensions: technical/technological, research/innovation and practice/profession.

Technical/Technological. The technical and technological competencies are of course central to the relevance and effectiveness of the new professional. Learning methodologies, methods, techniques and models in a two sided dialogue with research and professional practice reinforces the meaningfulness of the learned artifacts.

Research/Innovation. By being aware of the state-of-the-art and the recent scientific knowledge about the requirements engineering and enterprise content management knowledge domains, the new graduates will be more prone to innovate in their professional activities and contexts.

Practice/Profession. In anticipating the activities and roles that they will undertake after graduation, the students confirm the relevance and utility of the technical learning -- metacognitive system: specifying and monitoring learning goals (Marzanno, 2000) -- and get additional motivation to further explore the subjects.

2.2 Teaching and learning process

As referred previously, both courses focus on the design of information artefacts, one more centred in information management, the other more on information systems. The focus on the design process, as well as the intended close link to real organisational problems naturally led to design the courses around the well established educational approaches of project-based learning (PBL) and design-based learning (DBL). The integration of PBL and DBL methods provides a teaching and learning framework fostering an environment in which students engage in solving real-life problems by designing creative and innovative hands on solutions, while reflecting on the learning process. (Chandrasekaran *et al.*, 2013; Mehalik and Schun, 2006; Wijnen, 1999).

Upon this framework, the courses' activities are centred in a group project. Three sets of activities take place coordinated with the group project: analysis and debate of selected research results, sharing of professional practices and theoretical explanations.

The classes are organised in two parts (3-4h per week): a first part for the discussion of a topic or set of topics triggered by a the previous reading of a research article and a second part for a theoretical or practical consolidation related to those topics. In some sessions (about one third of the total) short seminars are held by professionals from companies and institutions which are providers or clients of information management technologies and/or services. The students are organised in small groups in the beginning of the course, which are maintained until the end.

2.2.1 Scientific papers discussions

Paper discussions are weekly sessions of 60-90 minutes conducted by one of the group of students. They consist of a presentation of the main points of the research reported in the paper, followed by a debate around the results and methods. The paper is read beforehand by all the students that must write a paper reading sheet and submit it in the learning management system (moodle) for evaluation. The group

scheduled to that week must prepare a presentation about the article to support the discussion involving all the students and the instructor. The group is required to stimulate interaction and debate by means of identifying the main ideas and controversial points of the article, elaborating a set of questions to be answered on the discussion and, lastly, attempting to discuss how the article contributes to the future professional activity.

2.2.2 Group project

Throughout the semester, and in parallel with the weekly activities, each group of students undertake a project whose subject is the design of artefacts related with information management or information systems. This activity is mostly undertaken extra-class, with some control points for feedback and coaching. During the weekly activities, the instructor tries to connect, whenever is possible, the topics addressed with the several ongoing projects.

2.2.3 Sharing professional experiences

Linking the learned subjects to the professional practice is a fundamental issue in the learning experience of students. It is well known that the anticipation of the practical outcomes of the subjects being taught is a strong motivator for the learning effectiveness. In some of the weekly sessions, invited guests from industry and services organisations come to present their visions, methodologies, technologies, management practices, professional career paths, issues and problems, etc. These sessions are always challenging for the students as they, at this point of their studies, are eager to find out "how the world is out there".

3 Cases

3.1 Course 1: Consultancy in Information Management

This course aims to introduce and integrate theoretical, methodological, technological and practical knowledge in the area of information management to impart skills to diagnose problems, and plan and manage interventions for the improvement of information management in organizations. By completing successfully the course, the students should be able to (i) describe and discuss the various interpretations of the concept of enterprise content management and its need in the management of organizations, (ii) describe and carry out the process of developing and implementing an enterprise content management strategy, (iii) develop a critical analysis of the different approaches of information audits and develop an information audit plan and (iii) framing information audit activities in the creation/implementation of strategic information management. The topics addressed are the concept, components and process of Enterprise Content Management, information audits and its processes, and the information audit for strategic information management.

3.1.1 Scientific paper discussions

The weekly scientific papers discussion aim, as explained above, at debating aspects related with research results on the design of methodologies, methods, techniques and models for enterprise content management as well as results that describe and explain how those artefacts perform in real-world situations. Two examples of papers discussed in class are the following "Critical Success Factors in Enterprise Content Management: Toward a Framework for Readiness Assessment"¹ and "Factors in the Acceptance of Enterprise Content Management Systems"². The former concerns to the development of a method, model and recommendations for successful enterprise content management implementation while the later is an empirical study on the acceptance of technologies and approaches

3.1.2 Group project

The goal of the group project is to develop an enterprise content strategy for a real organisation. For that, the students have to identify and plan the work with a company or institution, chosen from personal contacts or from the set of organisations that are somehow connected to the program. In this course all the groups follow the same approach to strategy development which is selected from the literature beforehand by the instructor. The results are presented and discussed in a final workshop at the end of the semester.

¹ Andrea Herbst, Alexander Simons, Jan vom Brocke and René Derungs (2014). Critical Success Factors in Enterprise Content Management: Toward a Framework for Readiness Assessment in Jan vom Brocke, Alexander Simons (Eds.) Enterprise Content Management in Information Systems Research: Foundations, Methods and Cases

² Laurent Wiltzius, Alexander Simons, Stefan Seidel and Jan vom Brocke (2014). Factors in the Acceptance of Enterprise Content Management Systems in Jan vom Brocke, Alexander Simons (Eds.) Enterprise Content Management in Information Systems Research: Foundations, Methods and Cases

3.1.3 Invited sessions

The invited sessions are chosen in a way to privilege the diversity of contexts and situations. Examples of organisations invited are solution providers -- e.g., enterprise content technology software houses -- consultancy services providers, end-users of enterprise content management -- e.g., local administration services.

3.2 Course 2: Requirements Engineering for Information Systems

This course objective is to teach the requirements engineering scientific and technical approaches emphasising the interaction between the social/organisational and technical/technological dimensions of the design of information systems in organisations. By completing successfully the course, the students should be able to (i) describe and explain the requirements engineering process and its importance in the success of an information system; (ii) describe and apply the requirements engineering methods, models and techniques; (iii) critically evaluate the applicability of methods, models and techniques in given problem situations and (iv) reflect on the professional practice of the requirements engineering role.

The topics addressed are the concepts and theory of requirements engineering, requirements engineering as a socio-technical endeavour, requirements elicitation, analysis, documentation and validation and requirements management.

3.2.1 Scientific paper discussions

As in the previous case, the weekly scientific papers discussion aim at debating aspects related with research results. In this case they are related to the design of methodologies, methods, techniques and models for requirements engineering. Furthermore, results that assess the feasibility and performance of those artefacts in real-world situations are also considered. Two examples of papers discussed in class are "System Requirements Engineering in Complex Situations"³ that discuss how to approach requirements engineering in the challenging context of complex systems and "What Stakeholders Will or Will Not Say: A Theoretical and Empirical Study of Topic Importance in Requirements Engineering Elicitation Interviews"⁴ which presents an empirical study on interviewing for requirements elicitation.

3.2.2 Group project

The group project in this case aims to involve students in a realistic problem situation of requirements engineering, motivating the hands-on learning of selection, evaluation and reflection on methods, models, and techniques. The specific goals of this project are the development of the vision of the system, addressing a problem/opportunity situation and the planning of the remaining RE process including the methods, models and techniques to be used. As in previous course the cases are chosen from personal contacts or from the set of organisations that are somehow connected to the program. Additionally, some groups can choose simulating a start-up company that intends to transform a business idea for a new solution (mobile application, information system, etc.) into a system design.

3.2.3 Invited sessions

In this case, the invited organisations are information technology providers and consultant companies in information technology and systems.

4 Discussion

The distinctive feature of the educational approach reported above is twofold: on the one side there is an emphasis in research results as initiators of the topics learning and on the other side a big relevance is attributed to the sharing of professional experiences as a strong motivator for learning. Of course, the group project is the pivot of the approach within the framework of PBL/DBL.

The research papers debated in class come essentially from two types of research: explanatory research and systems design research. The first type of papers report empirical evidences about the deployment and use of methodologies, methods, techniques and models while the second type report its design and application arguing the originality and potential advantages of the new proposals. The combination of the two types of research results fosters the students debate in class during the course and discloses the link between rigour and relevance in research.

³ Katina, P. F., Keating, C. B., & Jaradat, R. M. (2014). System requirements engineering in complex situations. *Requirements Engineering*, 45–62. doi:10.1007/s00766-012-0157-0

⁴ Burnay, Corentin, Ivan J. Jureta, and Stéphane Faulkner. 2014. What Stakeholders Will or Will Not Say: A Theoretical and Empirical Study of Topic Importance in Requirements Engineering Elicitation Interviews. *Information Systems* 46 (November): 61–81. doi:10.1016/j.is.2014.05.006

The awareness that not all the research results, at a given time, are applicable or usable in practice, and being able to distinguish why, is an important point to narrow the perceived gap when moving from between the research/academic and the practice/professional contexts.

The glue that joints the three components are the short lectures that the instructor gives in points as the session unrolls. Besides having the role of orchestrating the class activities, he/she must intervene to make connections between the class components and to introduce theoretical, conceptual and practical insights when appropriate.

The approach discussed here is close to that which are presented on Pais *et al.* (2009), stating short lectures, group exercises (Paper Reading Sheets and Paper Discussions) and assignments (Group Project and Individual Essay) as far accurate to "bridge the research-practice gap as new cognitive structures (...) from their previous practical experiences and knowledge". The impact of these strategies and also the role of instructor, acting more as a coach by providing

practical experiences on research and industry, allows the students to be more active on expressing their ideas, and also on analyzing and evaluating scenarios.

Furthermore, the reading material (starting with the fundamentals, how experts do it, etc.) which is proposed to the students, allows them to iteratively gain knowledge about designing information artifacts and better discuss those topics, providing concrete facts and innovative ideas on how to solve certain issues.

As discussed in Connor (2009) the gap between research and practice (in this specific case in requirements engineering) can be overcome by an adequate teaching learning strategy. Explicitly requiring students to investigate "research concerning practice" and then to demonstrate "practice informed by research", can create a shared understanding of the students regarding both worlds.

We believe that our approach goes a step further by integrating the three dimensions of learning for practice and is likely to improve the innovation potential of the future information professionals.

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