Features for Suitable Problems:
IT Professionals' and IT Students' Opinions

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ABSTRACT

One cannot be a problem solver without deep understanding of what constitutes a problem. Failing to recognise and define problems presents obstacles in constructing and applying knowledge in problem solving. This has been the motivation for the authors to re-examine in the context of IT (Information Technology) the concept, nature and types of a problem. The most and least important features of a problem are scrutinized, considering the problem-based learning experts' opinions and a collection of IT students' viewpoints. The authors (i) identify and critically comment on the features of a problem that are still needed in problem-based learning, and (ii) provide insights and guidelines on the position and use of problems for IT curriculum designers and IT professionals in problem-focused higher education.

Keywords: IT Professionals, IT Students, Problem Features, Problem-Based Learning (PBL), Problem-Focused Education (PFE)

INTRODUCTION

Life is full of problems and problem-solving activities. According to Popper (1999) "*all life is problem-solving*". Multiple problems materialise throughout people's life; some are presented to us -no need to find them ourselves. Some need to be (re-)discovered and recognised. Sometimes, problems do not exist unless we invent them (Pretz *et al.*, 2004). Often, the solutions of problems introduce new problems. Learning, though, through solving real-life problems is not normally practised in Higher Education HE (Berki & Valtanen, 2007; Valtanen *et al.,* 2009). The selection, design/construction and use of problems in curricula have received limited attention. Very few Universities offer Problem-Based Learning PBL, where the *whole* curriculum is built around real-life, occupational problems. HE still

favours Subject-Based Learning SBL curricula, which prioritise subject-specific content. Margetson (2001) points out that it is a mistake to believe that bodies of knowledge have priority over problems. This is precisely what Dewey (1938, p. 108) meant by stating that *"without a problem, there is blind groping in the dark."*

There is, however, a danger that HE students get used to solve *only* certain problems, *only* in certain ways. Thus, how could educators be sure that the future knowledge workers do not get only a very simplistic understanding of problems and problem solving processes?

An approach would be to broaden the narrow understanding of the concept of 'problem' (e.g., Valtanen, Berki, Georgiadou, Hatzipanagos, Ross, Stamelos, & Staples, 2011). Another is to improve the ineffective ways to foster PBL in HE and training schemes, where many variations of problems (Valtanen *et al.,* 2009), solving processes and solving methods exist (Berki & Valtanen, 2007). In practice this means offering students experiences of tackling many types of problems that demand different (i) cognitive skills (Jonassen, 2000), (ii) type of knowledge (Schmidt & Moust, 2000), (iii) epistemological readiness and (iv) conceptual change (Margetson, 2001).

A third way is to focus on the features of problems. Surprisingly, very few studies have specified in detail the important features of a suitable problem. These features are needed for designing guidelines for selecting, constructing, and integrating suitable problems for curricula. Particularly, research-based -not just experience or intuition based- guidelines are needed for explaining what kind of problems are and are not suitable (Dolmans *et al.*, 1997).

Previous studies of problem features have focused only on (i) students (e.g., Jacobs *et al.*, 2003), (ii) tutors (e.g., Kim *et al.*, 2006) or (iii) experts' views (e.g., Des Marchais, 1999). Combinations of views are rare. In fact, the very first study combining students and tutors views was made by Sockalingam *et al.* (2011).

Our study combines IT students' and IT professionals' views. The focus is on IT students' preferences and IT professionals' recommenda-tions. The aim is to reveal students' opinion on the most and least important problem features.

Our research question is:

Which are the views of Problem- Based Learning professionals and IT students for the use of problems in higher education?

Answers are needed in order to provide (i) a learning needs analysis and (ii) an improved understanding of the IT students' conceptualisations of problems and problem-solving processes. These could guide the educators in selection, construction, and use of suitable problems in curricula for enhancing the future IT professionals' deep learning and building a convincing curriculum for all.

PROBLEM SOLVING IN IT

Problem solving as part of PBL/PFE, is regarded as the most important, complex cognitive activity in occupational contexts and everyday life (Jonassen, 2000). Problem solving has always been easier to talk about than to foster in educational programmes. However, the learning and teaching of problem-solving seems to be more complex.

There is a need for HE curricula to accommodate more problems for learning (Valtanen *et al.,* 2009; Valtanen, Berki, Georgiadou, Ross, & Staples, 2011). In IT and Software Engineering (SE) curricula success stories exist of utilising real problems and fostering problem solving strategies for the sake of developing various competencies (Berki & Georgiadou, 2001; Colomo-Palacios *et al.*, 2010; Georgiadou & Berki, 1997; Oriogun & Georgiadou, 2000). Concerns and weaknesses, however, are still evidenced in the learning process (Berki & Valtanen, 2007; Kampylis & Valtanen, 2010; Moust *et al.*, 2005). The emphasis has been more on problem-solving than on the understanding of the concept of problem (Valtanen, 2005). In the case of systems analysis and design Checkland (1981) supports that discussing, depicting, representing, and understanding the problem

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