Problem-solving strategies must be taught implicitly

Raising the awareness of in-service and pre-service computer science teachers to problem-solving strategies

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Abstract. Problem solving is one of the central activities performed by computer scientists as well as by computer science learners. Whereas the teaching of algorithms and programming languages is usually well structured within a curriculum, the development of learners' problem-solving skills is largely implicit and less structured. Students at all levels often face difficulties in problem analysis and solution construction. The basic assumption of the workshop is that without some formal instruction on effective strategies, even the most inventive learner may resort to unproductive trial-and-error problem-solving processes. Hence, it is important to teach problem-solving strategies and to guide teachers on how to teach their pupils this cognitive tool. Computer science educators should be aware of the difficulties and acquire appropriate pedagogical tools to help their learners gain and experience problem-solving skills.

Keywords: Problem solving, Problem solving strategies, Teaching problem solving strategies

1   Introduction

The workshop is dedicated to pedagogical tools that can scaffold learners in solving problems in the discipline of computer science. The focus will be on algorithmic solutions that can be implemented in different programming languages. Several main problem-solving strategies will be presented; the advantages and disadvantages of each will be discussed and ways of imparting them to in-service and pre-service teachers will be addressed.

2   Workshop topics

- Define the various required stages in the problem-solving process: problem understanding, solution design, solution examination, reflection.
- Present main problem-solving strategies: focus on variables (rules of variables [2, 7, 12]); focus on problem decomposition (stepwise refinement [1]); focus on algorithms (algorithmic patterns [3, 4, 8, 9]).
- Discuss advantages and disadvantages, limitation of usage and needed attentiveness when using each strategy.
- Discuss whether there are differences between solving problems in different programming paradigms or different topics within CS such as computational models [5].
- Discuss ways to impart problem-solving strategies to in-service and pre-service teachers [6, 10, 11].

The workshop will be based on various participant activities and group work.

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