Next steps on Conceptual transfer and Interventions in second programming language learning

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ABSTRACT

Learning to program has been reported to be a challenge for students for the past four decades. An effort to mitigate these challenges has resulted in the evolution of multiple programming languages explicitly designed to ease how students learn to program. The adoption of these various programming languages in the classroom results in transition challenges experienced by students. To understand these challenges, I start by exploring and investigating how students transfer their understanding of concepts between PLs. I then explore teachers' experiences in teaching second and subsequent programming languages. Finally, I design and investigate transfer interventions in second language teaching. By studying the transfer phenomenon in PLs, I contribute to a deeper understanding of the nature of transfer in PLs and how it can help educators and students. Secondly, I provide pedagogical guidance that can help educators teach second PLs more effectively.

CCS CONCEPTS

• **Social and professional topics** → **Computer science education**.

KEYWORDS

programming language concepts, transfer, code comprehension, syntax, semantics

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1 PRELIMINARY STUDY

The preliminary steps for this research involved conducting an exploratory qualitative study that investigated five relative novices transferring from Python to Java for a semester. The findings indicated that during the initial stages of learning Java; learners relied on their syntactic matching between Python and Java and subsequent semantic transfer.

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2 MODEL OF PROGRAMMING TRANSFER

The next step was to develop a model of PL transfer(MPLT) based on the preliminary study findings and existing natural language research [1] and programming language research. I designed several quantitative studies to validate the model in the context of transfer from Python to Java [2]. Results indicate that students had little or no difficulty with transitioning when Python and Java syntax and semantics were similar while they had the most difficulty transitioning when the syntax was similar but semantics different. Students had little or no semantic transfer on concepts that had different syntax but similar semantics between the languages.

3 EXPLORING TEACHERS EXPERIENCES ON TRANSFER IN SCHOOLS

I then explored the views and strategies high-school teachers employ when teaching a second PLs from two European countries [3]. The findings indicate that many teachers initially use simple programming languages, hence creating an opportunity for transfer learning. Furthermore, teachers recognize both benefits and problems from the transfer between programming languages. Only a few teachers use transfer strategies, while most teachers do not see the need to implement transfer strategies.

4 TRANSFER INTERVENTIONS

I use the MPLT and investigate the effectiveness of explicit instruction in teaching a second programming language. I investigated the transfer interventions with undergraduate students from two Universities in Europe. The results of both studies show that students benefited significantly more from interventions that showed the differences between the languages.

5 IMPLICATIONS AND FUTURE WORK

This poster seeks to generate a discussion within the UKICER community about the research findings and ways to work with teachers on developing and implementing transfer strategies in the classroom-both in schools and universities.

REFERENCES

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