A Taxonomy of Errors for Computer Science Education

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Abstract
Research in students’ errors has been done since the early 20th century. While the impact on the learning process was denied first, researchers agree that there are better responses to errors than a negative assessment nowadays. Nevertheless it has not been proved what exactly influences the learning process and how this can be achieved. This has been the issue of several empirical studies assessing the outcome and benefit of a general and also content-specific dealing with failures and the role of the lecturer. The “negative knowledge”, which was developed by Oser et al (1999) is based on the thesis that the knowledge of what is wrong protects the knowledge of what is right. This implicates a “positive error culture” that allows room for making mistakes. Although this seems to be an isolated and independent concept, the teacher is still the key factor, who does not ignore or even avoid students’ errors, but uses them to analyze and extinguish difficulties or even hurdles in the learning process. Shulman describes this as a component of his pedagogical content knowledge (PCK): “If those preconceptions are misconceptions [...], teachers need knowledge of the strategies most likely to be fruitful in reorganizing the understanding of learners” (Schulman, 1986 pp. 9-10).

The ability to support underachieving students is an important issue in the education of computer science teachers. Because of the broad range of the students’ previous knowledge, learning groups are often inhomogeneous, which presents the teacher with the challenge to encourage overachievers and support underachievers concurrently. This can be seen as a desirably ability for any teacher, but has a particular importance in computer science courses.

To classify and facilitate the analysis of errors, taxonomies have been created for both interdisciplinary and content-specific areas with a focus on mathematics and science. Although mathematics and computer science education have a lot in common, there are profound differences that limit the possibility of an adoption of mathematical concepts to the didactics of computer science. This shows the need for a computer science-specific taxonomy of errors, considering content-specific perceptions like the proposal for a computer science-specific learning taxonomy by Fuller et al (2007), which describes the use of the taxonomy by Anderson and Krathwohl (2001) in computer science education. Furthermore the competence model for computer science education from the MoKoM project will also be useful to structure and organize contents.

Keywords
computer science education, informatics education, pedagogical content knowledge, errors, taxonomy
REFERENCES

Biography
Laura Ohrndorf is a research assistant at the university of Siegen, chair for Didactics of Informatics and E-Learning. She received a diploma in computer science education. Her current studies involve students’ errors in computer science education and their analysis.

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