Developing a Competency Model for Teaching Computer Science in Schools

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ABSTRACT
This poster presents the methodology and the first results of the KUI-Project that aims to develop a competency model for teaching CS in schools. By means of qualitative content analysis we are developing a structured model for this purpose. We present first results of the investigation of German curricula for teacher education.

Categories and Subject Descriptors
K.3.2 [Computers and Education]: Computer and Information Science Education—Computer science education

Keywords
competency model, secondary education, non-cognitive competencies, pedagogical content knowledge, CSE in schools

1. INTRODUCTION
In summer 2012, the project KUI (German title "Kompetenzen für das Unterrichten in Informatik") was founded. This project, which is funded by the German Federal Ministry of Education and Research (BMBF), aims to describe and improve the education of computer science (CS) teachers by developing a suitable competency model for teaching CS. This poster presents our research methodology and the first results of a qualitative content analysis of 43 curricula for CS teacher education at German universities.

2. METHODOLOGY
Our competency model will comprise three parts: subject content competencies, competencies on pedagogical content knowledge and non-cognitive competencies. The facets of the main categories of our model are derived by a qualitative content analysis of literature.

As a reference framework for the subject matter content knowledge, we chose the most recent ACM/IEEE curriculum [1]. Second, we assembled our text corpus from the curricula of all German universities that offer a program for the education of CS teachers. Aiming to identify the subject matter knowledge that is regarded most important by the universities, we performed a qualitative content analysis on this corpus, coding it by the main- and subcategories of the chosen framework. Twelve of the 43 curricula were coded by two coders with an intercoder difference from 70% to 80%. After eliminating three curricula with only a few codings, we found five main categories that are represented in 95% of the curricula: algorithms and complexity, architecture and organization, information management, programming languages and software engineering.

Based on Shulmans proposal [2], we derived our categories of pedagogical content knowledge (PCK) by analyzing general literature on PCK, national standards for teacher education, publications about PCK of other school subjects and research papers about CS education. By now, this analysis has resulted in 19 top level categories and 613 subcategories, which have to be validated by further analysis of the 43 curricula.

The non-cognitive competencies were restricted to those that are directly connected to CSE. In this field we will apply a similar content analysis methodology as for the PCK, coding standards, theories and conceptions of general educational research, aiming to derive a suitable category system. Finally, we will search non-cognitive competencies in the German curricula for the education of CS teachers and code them with the help of this category system.

3. CONCLUSION
By now, we were able to identify the competencies that the CS teachers should have achieved during their course of studies. In an next step, we will specify and validate our model by interviewing experts according to the critical incident theory.

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