A Model for Improving the Quality of Teaching in Informatics in Primary and Secondary Schools

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Abstract. The quality of teaching plays a crucial role in informatics at schools. Important elements that influence the quality is the teaching process. Consequently, some standards to assess the teaching process of informatics in primary and secondary schools should be looked at closer in respect to quality. Within this aim, we propose a Teaching Maturity Model (TeaM), built by the collection of the best practices from informatics teachers.

Keywords: CMMI, Teaching Maturity Model, Primary and Secondary Education, Informatics Teachers

1 Introduction

When talking about the quality of informatics classes at schools, a lot of facets are to be considered. One of them is the question of how to assess and improve quality of teaching. Some authors do it by mainly focusing on teachers (preparation, communication, engagement), pupils/students, course content and environment [3], [1], [7], [5], [9]. Quality assurance was also a serious issue in SEI of Carnegie Mellon University [1] until they created the Capability Maturity Model to manage and assess the quality of the process for producing software [4]. Based on this idea, some other authors address the quality of teaching informatics in schools by assessing and improving the curricula, the institution itself [8], or the course design [6]. Only Chen et al. established a maturity model for observing the teaching process for universities [2].As a future study, they pointed out the extension of their model also for informatics at primary and secondary schools but there is still no approach concerning this.

Our work aims at having a holistic view by addressing the quality of teaching in relation to the whole teaching process. Hence, like Chen et al. [2], we focused our model on the teaching process and addressed its quality by a similar approach introduced in SEI's CMMI [4]. But unlike Chen et al., the TeaM model does not consider only tertiary teachers but also primary and secondary teachers.
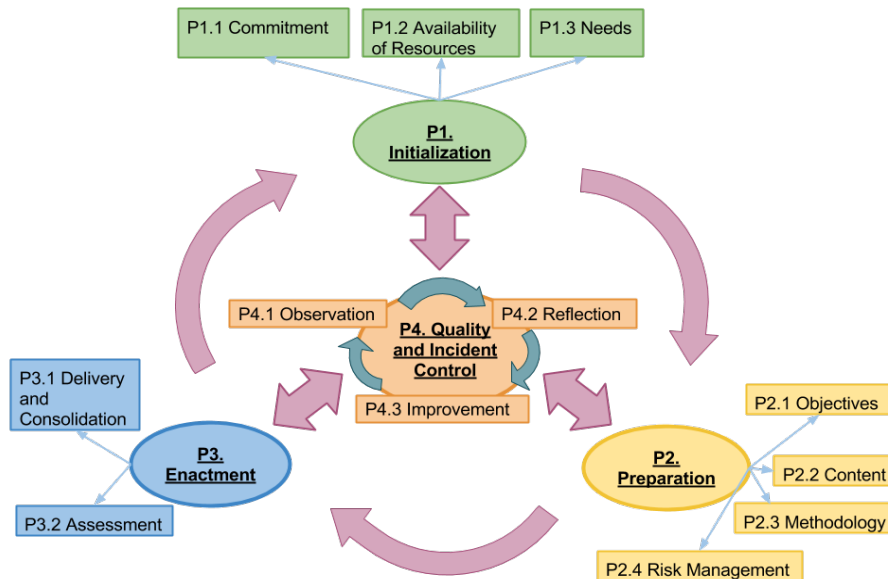
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[1] http://www.sei.cmu.edu/

Fig. 1. The graphical representation of the teaching process.

2 The Study

In order to come up with the TeaM model, in the first phase of the study, three types of resources (textbooks about teaching quality, CMMI [4], and the T–CMM model [2]) were investigated. In a follow–up step, we evaluate the TeaM model by a CMMI expert and, finally, we prepared everything for assessing the intermediate model by conducting a qualitative study. To do so, the teaching process was defined (see Fig. 1) and by elaborating the sub–phases of each phase of the teaching process, comparing them also to CMMI and T-CMM, the ground activities and goals of the models were established. This data helped to build up a questionnaire, used than in the second phase of the study for conducting individual interviews with four informatics teachers, being also active in the field of the curricula development and competence models in Austria. The aim was to test the understandability and acceptability of the model and to collect a set of best practices from the experience of the involved teachers by also defining what should be added or deleted to/from the model. The questionnaire was splitted into four main parts (corresponding to the four phases from the definition of the teaching process), and each part contained questions about the goals associated to each practice of the teaching process's phases. Each interview lasted about an hour and a half. It was always the same person conducting the interview and documenting every input from the interviewers.

By analyzing and processing the research results, the TeaM model was built. Within the first step of the study the following content was created: the definition of the teaching process, the TeaM's own representation forms (Maturity and Capability Levels), the TeaM's Process Areas (12 PAs in total) and the TeaM's Specific Goals (SG) [2] . The analization of the teachers' feedbacks from the second step of the study, suggested to remove one SG (Manage Incidents (MI)) and to add a new one (Deal with Incidents (DI)), the rest remained the same. Moreover those feedbacks helped us to defined the Specific Practices (SP) as well as to group the PAs in respectively Maturity Levels.

3 Discussion and Further Research

By the means of this research, TeaM model was understandable and acceptable by the informatics teachers. The applicability of the model can help the teachers to assess themselves in order to check at which level they are, and which level they want to achieve, by simple implementing the TeaM's practices related to each level.

The TeaM model is an ongoing project running at the institute of Informatics didactics at Alpen-Adria-Universität, Klagenfurt and currently, we are working on defining the Generic Goals and Practices and the next step aims at testing the model in informatics classes at schools. For uncomplicated usability and applicability of the model in practice, a digital tool will also be created. At the poster session we will demonstrate the TeaM model in more details and hope to obtain further feedbacks and suggestions.

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