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On Requirements for Programming Exercises from an E-learning Perspective

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In this work, we deal with the question of modeling programming exercises for novices pointing to an e-learning scenario. Our purpose is to identify basic requirements, raise some key questions and propose potential answers from a conceptual perspective. Presented as a general picture, we hypothetically situate our work in a general context where e-learning instructional material needs to be adapted to form part of an introductory Computer Science (CS) e-learning course at the CS1-level. Meant is a potential course which aims at improving novices skills and knowledge on the essentials of programming by using e-learning based approaches in connection (at least conceptually) with a general host framework like Activemath (www.activemath.org). Our elaboration covers contextual and, particularly, cognitive elements preparing the terrain for eventual research stages in a derived project, as indicated. We concentrate our main efforts on

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reasoning mechanisms about exercise complexity that can eventually offer tool support for the task of exercise authoring. We base our requirements analysis on our own perception of the exercise subsystem provided by Activemath especially within the domain reasoner area. We enrich the analysis by bringing to the discussion several relevant contextual elements from the CS1 courses, its definition and implementation. Concerning cognitive models and exercises, we build upon the principles of Bloom's Taxonomy as a relatively standardized basis and use them as a framework for study and analysis of complexity in basic programming exercises. Our analysis includes requirements for the domain reasoner which are necessary for the exercise analysis. We propose for such a purpose a three-layered conceptual model considering exercise evaluation, programming and metaprogramming.

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