



## Design of an adaptive learner directed model for e-learning

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This paper examines how and to what extent an adaptive system can aid learners to be effectively self-directed and self-regulated for online studies both at domain knowledge level and meta knowledge level in the subject of computer science. We will provide an overview of two learning theories - self-regulated learning theory (SRL) and experiential learning theory (ELT), - and show how these theories act as an interlaced framework underpinning the adaptive model. In addition, this paper outlines the initial design for the model.

Keywords: self-directed learning, adaptive system, self-regulated learning, experiential learning

### Introduction

In many e-learning contexts, materials are designed to be self-paced, with the content being available anytime, anywhere for learners to study independently. Commonly, without the presence and immediate feedback of an instructor, learners are left to their own devices to negotiate their learning path and to monitor their own progress. Furthermore, learning a complex topic structured in terms of various media and learning materials requires learners to make certain instructional decisions concerning what to learn and how to go about their learning and how to learn. In other words, self-paced learning requires a learner to self-regulate his/her own learning (Hadwin & Winne, 2001). Very often, learners have difficulty regulating learning when topics are complex and unfamiliar and it is not always clear to the learners if their instructional decisions are optimal (Azevedo et al, 2003). Research into adaptive e-learning systems has attempted to facilitate this process by providing recommendations, classifying learners into different preferred learning styles, or highlighting suggested learning paths (Brusilovsky, 1998). The aim of this research is to explore how an adaptive system can assist learners to self-regulate their online learning both in terms of domain knowledge and meta knowledge in the subject of computer science. We plan to utilize two educational theories: experiential learning theory (ELT) and self-regulated learning (SRL) to aid

learners' progression and competency in an Introductory Java Programming course. This paper outlines the initial design for the model, as well as the methodology of this research.

## **Experiential Learning Theory (ELT) and Self-Regulated Learning Theory (SRL)**

Experiential learning theory (ELT) states that learners need to be engaged in two sets of dialectically related modes of grasping and transforming experience: Concrete Experience (CE) and Abstract Conceptualization (AC) for grasping experience; Active Experimentation (AE) and Reflective observation (RO) (Kolb, 1984, Kolb & Kolb, 2005). A learner can progress through an experiential learning cycle with the four modes mentioned before: experience is translated through reflection into concepts. Concepts are in turn are used as guides for active experimentation and the choice of new experience. As a result, knowledge is constructed through creative tension between the four modes and learners will be exposed to all aspects of learning: experiencing, reflecting, thinking and acting. Based on this notion, our adaptive model course material will be designed along these modes: Concrete Experience-Abstract Conceptualization (CE-AC) and Reflective Observation-Active Experimentation (RO-AE).

When learners adapt their approaches to learning, learning is said to be self-regulated (Winne, 1997). Self-regulated learning (SRL) states that learners need to regulate their performance along with how they learn (i.e. meta knowledge). What sets self-regulated learners apart is their awareness of when they know a skill or fact and when they do not, at a meta knowledge level - i.e. they plan, set goals, organize, self-monitor, and self-evaluate thorough out their studies (Zimmerman, 1990). In addition, self-regulation works best when learners are provided with continuing feedback concerning the effectiveness of their learning approach (Zimmerman, 1990). This is something that an adaptive system can provide as it can support and reinforce self-monitoring techniques as well as self-regulated learning strategies. Our research aims to interlace ELT and SRL theories into the design of an online adaptive system where learners are presented with options as to what to learn, how to learn, and whether they are aware of what they know or not know of a new skill set.

## **Model design**

We plan to redevelop the 'Introduction to Java Programming' course content, instructional design and interaction to accommodate the interlacing of ELT and SRL theories. This course is a first year introduction to programming course aiming for students pursuing a Bachelors Degree in Computer Science. The model design is as follows:

In the proposed application, a learner would be required to enter login details, after which an introductory screen would present information on the topics available. Topics would be presented in the four learning modes of the ELT dimensions. Related activities might be designed in such a way as to map to the four learning modes proposed by the theory: thinking, observing, reflecting, and experimenting. For example, for experimenting, the material might be presented in an interactive game format. The learner is free to choose any of the activities to begin her study. She might or might not choose more than one; the decision is hers to make. In addition, as supplementary learning material, a SRL theory based content would be available on the same page to assist with learning about meta knowledge, for example, how to set learning goals for an interactive game. Once she finishes one activity, the system would ask if she is ready to take a quiz, testing the knowledge on the particular topic she just finished studying. If she chooses "yes", then she would proceed to take the quiz (if she chooses "no", the system will recommend further learning activities in the four modes remaining). The system will return with quiz results, if she passes (60% or higher), then the feedback would be directed towards helping her to set higher/better learning goals for the next topic. If she fails, the system will provide feedback on which area(s) she needs to revisit whilst also recommending which learning activity might be suitable to study next. In addition, the system would recommend self-regulated learning strategies and tactics such as how to take better notes online. This aims to help the learner to become more efficient in self-monitoring her learning. The use of the system will be evaluated to test the efficacy of the approach.

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