

# Chapter X

## Tailoring Multimedia Environments to Learner Cognitive Characteristics

### INTRODUCTION

Personalized adaptive multimedia environments provide individual learners or learner groups with experience that is specifically tailored to them. To achieve effective personalization, a variety of information about the learner is required. Tailoring multimedia environments to individual learner cognitive characteristics is becoming a major means for achieving a true learner-centered experience for learners through their interaction with multiple content sources, presentation formats, and delivery means. Personalized multimedia environments are capable of realizing advanced learning and instruction strategies based on a continuous process of adaptation between the learners and instructional systems. This adaptation process could be accomplished through personalized interaction and adaptive presentation of content, learner feedback, adaptive navigation and search, and different adaptation methodologies.

As was mentioned in earlier chapters of this book, a major instructional implication of the expertise reversal effect is the need to tailor dynamically instructional techniques and procedures, levels of instructional guidance to current levels of learner task-specific expertise. In online multimedia instructional systems, the levels of learner task-specific expertise change as students develop more experience in a specific task domain. Therefore, the tailoring process needs to be dynamic, i.e. consider learner levels of expertise in real time as they gradually change during the learning sessions.

This Chapter describes general approaches to the design of adaptive learning environments from the perspective of tailoring learning procedures and techniques to individual cognitive characteristics of learners. Studies in aptitude-treatment interactions offered a possible approach to adaptive instruction. Intelligent tutoring systems and adaptive web-based hypermedia systems use learner models to tailor learning tasks and instructional content to individual learner characteristics. This approach accommodates learner characteristics (e.g., knowledge, interests, goals) into explicit learner models that guide adaptive procedures. On the other hand, advisement and adaptive guidance approaches realize a greater learner control over instruction and provide individualized prescriptive information in the form of recommended material and tasks based on learner past performance.

## **APTITUDE-TREATMENT INTERACTIONS AND ADAPTIVE INSTRUCTION**

Tobias (1989) reviewed the state of research on aptitude-treatment interactions as the basis for adaptive instruction. He noted that the adaptation of instruction to student characteristics had been a much sought after idea with a long history of studies. However, it was very difficult to develop evidence-based theoretical approaches for such adaptations that could provide guidelines to practitioners. The idea of adaptive instruction was clearly articulated within the ATI approach. Cronbach (1967) and Glaser (1977) suggested that aptitude-treatment interactions and measures of aptitudes can be used for adapting instructional treatments to learner characteristics in order to reach learning goals more efficiently.

Cronbach (1967) distinguished several ways of adapting instruction to individual differences. Adaptation within a predetermined program assumes fixed sets of educational goals and instructional treatments. Possible modifications to meet individual needs in this environments include altering duration of schooling by sequential selection (e.g., dropping students out along the way) or training students to criterion on any skill or topic, which also results in altering the duration of instruction. The rate of learning is the key concept in this approach.

The second approach, the adaptation by matching goals to the individual, assumes differentiated or optional goals and fixed instructional treatments within an optional goal. Possible modifications to meet individual needs include providing a curriculum that prepares each student for her or his determined prospective adult role. The third approach, adaptation by erasing individual differences, assumes educational goals fixed within a course or program and alternative instructional treatments provided to students. Possible modifications to meet individual needs

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