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# Book review of Developing Adaptive and Personalized Learning Environments

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## Introduction

Technology continues to offer expanding opportunities for learners to gain knowledge in any environment, with all manner of devices. With the growth of open learning environments, online learning, ubiquitous computing, and learning analytics, adaptive and personalized learning environments have the potential to optimize learning and collaboration. This promise comes with a complex set of challenges, and Kinshuk has written a thorough and well-structured book to walk instructional designers and instructors through many of the key factors to be considered.

## Structure

The book comprises four sections (a) an overview, (b) theoretical underpinnings of adaptive and personalized environments, (c) considerations for implementation, and (d) methods for evaluating and optimizing learning environments, with a look at directions for future research. Several key features make this useful both as a possible textbook, and as a reference manual for practitioners: reflection activities, tests for understanding, references for further reading, and links to useful resources. The structure provides a logical progression from foundations to theory to implementation and evaluation.

### Part One

The first chapter defines adaptation and personalization, the different levels of each that can be applied, and the benefits and limitations of adaptation and personalization. Chapter 2 outlines the concepts of adaptivity and personalization in the context of lifelong learning. In Chapter 3, Kinshuk defines context as referring to the physical environment, the mode of communication, the discipline of the content being learned, and the interaction between the learner and their device.

### Part Two

Part Two highlights the theories that form the basis for adaptive and personalized learning environments, such as cognitive theory, learning styles, and the ways in which a learning environment can be structured to respond to the needs of the learner, based on a range of feedback.
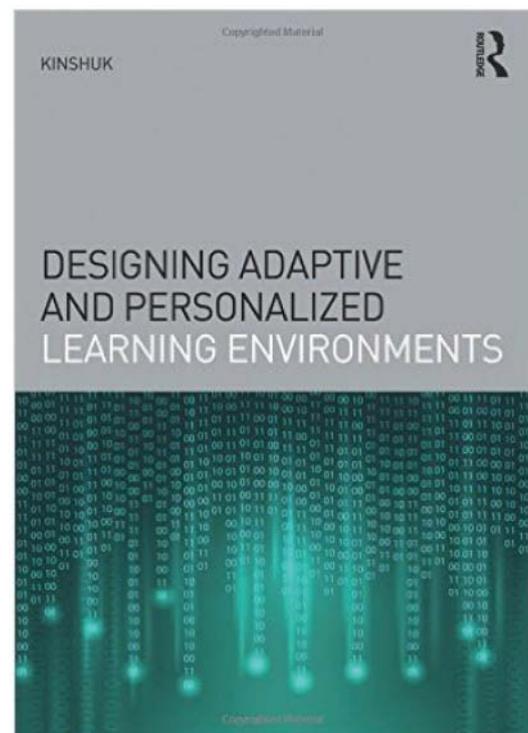
In Chapter 4, there is discussion of cognitive theory, and some of the key characteristics that affect a student's capabilities and learning style. Kinshuk describes how a learning environment can gather data to create a cognitive trait model for each student, and use that information to make decisions about how and when to present a student with certain content. Chapter 5 deals with the ways in which a learning environment can present content. Examples include the decision to present text, audio, images, or video, based on the needs of any given scenario.

The next two chapters deal with the different types of adaptation that can be applied to exploratory learning and mobile or ubiquitous learning. Students must be given the freedom to choose their own learning path and the format of the content that they wish to receive. However, in a completely open virtual environment, the sheer number of choices may be overwhelming. An effective learning environment will constrain the number of choices available. In mobile and ubiquitous environments, there are a number of ways in which a system can personalize the learning process. Ubiquitous computing offers the opportunity for students to have authentic learning experiences based on their location. Specific location-based lessons can be created and validated by instructors anywhere in the world, and students can be alerted to learning opportunities when they are nearby.

## *Part 3*

The third section of the book focuses on implementation and practical considerations. Chapter 8 describes a model for implementing adaptive and personalized learning environments. In this section, Kinshuk outlines several principles that should be considered when implementing a system. A key concept here is that the system should empower the student to learn in the absence of an instructor, and the learning must be available at different levels, depending on the needs of the student. Chapter 9 deals with cognitive skills acquisition, using a method called cognitive apprenticeship, as well as the potential effectiveness of simulated environments. Chapter 10 deals with the concept of reusability in adaptive learning environments. Kinshuk describes the need for content repositories and the clear need for standardization, and at present, there are multiple formats and styles for packaging content.

## *Part 4*

In Part 4, the book discusses various methods of validating learning environments, and looks to the future of adaptive and personalized learning. Chapter 11 outlines the evaluation principles that can be applied to both internal and external evaluation of adaptive and personalized learning environments. The evaluation process is presented as two essential questions: how does the environment impact student learning, and is the desired effect achieved?

Chapter 12 describes the potential for adaptive and personalized learning environments in the future. As the power of mobile devices and the connectivity of wireless networks continues to expand, opportunities for authentic, context-based learning can be created. Advances in sensor technology will lead to further adaptation and personalization, as biophysical cues can trigger the system to adjust the pace or complexity of the content to match the student's cognitive load. Kinshuk concludes with a description of a smart learning environment, an ecosystem of data, content, devices, and interaction among students and instructors.

## Summary

As technology and access continue to improve, and if adaptive and personalized learning systems gain wider adoption in a variety of learning contexts, there will be a need for guidelines to build effective environments. The explosive growth of online and blended education increases the

importance of systems that can assist students in the absence of a human instructor, and those same systems create value for instructors who face increased need for differentiated instruction online. Personalization and adaptation are critical to the future of distance and blended learning, as well as the emerging applications of mobile and ubiquitous learning. Kinshuk has provided a concise explanation of the key theories behind adaptive and personalized learning systems. He has also given many practical examples and recommendations for evaluating learning environments. Finally, he looks to the future, and considers the potential of mobile and ubiquitous computing, combined with the personalization and optimization that will be made possible by data mining and learning analytics.

The book is structured in a logical progression of concepts, from the underlying theory, to implementation, to validation and future directions. Kinshuk presents the relevant theories and design considerations in a manner that make it accessible to educators, instructional designers, and programmers alike. This is not a step-by-step guide to building a personalized learning environment. Rather, the book provides a theoretical and practical framework for how an adaptive and personalized learning environment could be conceptualized, designed, and evaluated. The many learning activities and reflection questions would make this book suitable as a textbook. The well-designed structure and practical examples also make this a useful manual for the practitioner interested in personalized and adaptive environments. For anyone interested in adaptive and personalized learning environments, this book will serve as a valuable foundation and reference. There is a growing body of evidence that personalization and adaptation will be at the core of many educational technology developments in the immediate future. This book provides a comprehensive look at the concepts, challenges, and opportunities that are presented by personalized, adaptive learning environments.