Chapter 11
Adaptive Sequencing of Information for Lifelong Learners

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ABSTRACT

Educational technologies have experienced an impressive change in recent years. This, in turn, is having a clear impact on educational practices and processes. Two important consequences for lifelong learning experts are the new possibilities of reusing learning material from different sources, and the need of adapting learning resources to different learners instead of using one-size-fits-all approaches. This chapter deals with the problem of sequencing learning material from both points of view: how to create adaptive sequencings of learning units, and how to share them with other systems by using the semantics of a well-known standard like IMS-LD. The complexity of the process puts the spotlight on the limitations of this widespread IMS specification.

INTRODUCTION

Information technologies have produced significant changes in education. Pedagogical methods and techniques are closely linked to available resources and techniques: new technologies allow us to extend the range of resources at our disposal and think seriously about challenges that have been unfeasible until now, like the design of lifelong learning (LLL) scenarios. The impact of new technologies takes many forms: enhanced communication possibilities for distance learners [Okamoto et al., 2000], use of artificial intelligence techniques to guide students on their pedagogical and/or planning decisions (Gutierrez-Santos & Mavrikis, 2008), development of reliable and

efficient communication mechanisms, adaptation of mobile communication devices for everytime-everywhere learning (Brown, 2005; Shudong & Higgins, 2006), or use of informal resources like blogs (Klamma et al., 2007), to mention but a few.

There is a significant amount of courses on the internet, appropriate for all levels from secondary school to professional training. Initiatives that aim at complementing traditional classes with online material or new channels of communication (from email to voIP) are becoming widespread.

This chapter focuses on the problem of combining and sequencing learning resources: modularity, reuse, and recombination are the main goals. Combination and reordering of information define —in essence— the challenging problem of adaptive sequencing of learning material. Informally, the problem of adaptive sequencing can be illustrated by the process of reading a technical book (i.e. not a novel). Technical books are usually not read linearly, start-to-end; on the contrary, the readers rather tend to jump back and forth, according to their needs and previous knowledge; in many cases, pages from other books will also be read in between. Two different readers will thus follow two different paths, tailored to their needs and goals. In other words, the original sequence of the book is changed into another sequence adapted to the reader.

The chapter presents an approach to define adaptive sequencings based on graphs. This approach has several advantages: it is simple to understand, and this results in authoring tools that are easy to use; it is designed for scalability by using hierarchical structures; it is flexible to allow cycles in the sequencing to be defined easily; and it relies on hierarchy and compartmentalization to facilitate reuse. With respect to this last point, the chapter will explore the possibility of using IMS Learning Design as a medium to interchange adaptive sequencings. The main challenges involved will be explained, as well as the main lessons learnt in the process about the limits of IMS Learning Design.

In other words, the main goal of this chapter is presenting a viable approach to the problem of adaptive sequencing definition. The solution presented is especially appropriate for lifelong learning scenarios due to its flexibility, simplicity, and reusability.

The structure of the chapter is as follows. The next section will present the necessary background showing the importance of reusability and adaptivity for lifelong learning scenarios, as well as explaining what are the main goals when designing adaptive sequencing techniques for systems for lifelong learners. Then, the sequencing graphs are presented, showing how they fulfill the four goals presented before. Afterwards, the expression of sequencing graphs using IMS Learning Design semantics is discussed, drawing important conclusions about the limits of this specification. Finally, the chapter draws the main conclusions and lines for future work.

BACKGROUND

The Importance of Reuse in LLL

Maybe the strongest force for change in education has been the massive push that digital technologies provide for sharing and reusing educational material. In a digital world, where perfect duplicates are free to generate, educational pieces of content can be shared with very little to lose and a lot to gain. Teachers and lecturers all around the world have started to share educational content: presentation slides, on-line exercises and tutorials, or even whole courses (Vest, 2004). This process has evolved into the concept of Reusable Learning Objects, or RLO (Wiley & Edwards, 2002; LTSC, 2002), which —in a way— aims at adapting the object-oriented programming paradigm to the world of educational material. The concept has roots in the instructional practice and research led by the American security forces, which saw a great development in the middle of the XX

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