Chapter 1
Educational Recommendation in an Informal Intentional Learning System

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ABSTRACT
Recommender systems have become part of the standard toolkit of web personalization. These same tools and techniques are now making their way into educational and adaptive e-learning systems. In this chapter, we will discuss aspects of a prototype system, the Customized Learning Service for Concept Knowledge (CLICK), an application designed to provide digital library resources recommendations based on user’s concept knowledge demonstrated through automated evaluation and approximation of their knowledge state from essay writing. We present the underlying concepts behind recommender systems, review learner models as they are designed within the CLICK environment, and review the lessons learned. We will discuss aspects of how CLICK supports intentional learning as well as extensions to the existing technology to improve such support. Future challenges and directions for CLICK and related technologies are also discussed.

DOI: 10.4018/978-1-61350-489-5.ch001
INTRODUCTION

Intentional learners are learners that are intrinsically motivated to learn and seek out resources by themselves. The information seeking behaviors of today’s young learners (and arguably all learners) are predominantly focused online – whether through search engine queries, learning portals that provide highly structured educational materials backed by sound learning concepts or through informal learning tools. Furthermore, their behaviors suggest that they are performing their information seeking tasks in increasingly independent ways. Educational tools and resources will need to adapt appropriately to address not only the content requirements of today’s learners and learning environments, but also the learner’s needs – that is not only address the way they learn, but also effective ways to optimize their learning. To support learner needs completely, personalized models of learner states are required, including both the current state of the learner’s knowledge as well as the transitions the learner makes through various knowledge states. Such a personalized model must address the behavior of the individual learner over time.

Recommender systems have become vitally important tools for addressing web personalization. They have enjoyed varying degrees of success in e-commerce contexts, such as product recommendations and movie recommendations. These systems are largely designed around recommendation filtering concepts that rely either on the ratings a user has supplied about items they have purchased or consumed, or on the content of the item itself. Recommender systems within educational contexts are now becoming more widespread, as educational materials, particularly those found online, become the principal mode of learning. Personalization of these materials will be an imperative that cannot be overlooked or under-estimated and indeed will become central to the success of these systems as they continue to gain popularity and widespread use. Social recommendation is also becoming an important feature of educational personalization. For example, the CourseRank (Bercovitz, et. al, 2009) system provides undergraduate course planning assistance to students based on both the course ratings of other students as well as on courses that have already been taken towards the student’s intended major course of study. There is no doubt; tools like these will become part of the standard toolkit of future learners.

The objective of this chapter is to outline a science educational recommender system for high school students that can support robust student learning of science content by providing just-in-time personalized information retrieval of vetted science content to intentional learners in an informal setting. Supporting intentional learning has become high priority in many educational contexts, both public and private. Evidence of this can be found, particularly in the United States, where public school districts around the country are mounting concentrated efforts to reform traditional instruction, one part of which is to provide more robust curricular support for intentional learning. The need for supporting intentional learning is perhaps amplified by yet another concern, also especially relevant in the United States. Demographic trends across the country underscore the critical need to broaden access to personalized learning, highlighted by reports that suggest the next decade as the era of “extreme diversity” in K-12 classrooms, most notably in large urban school districts (KnowledgeWorks, 2006). This increasingly diverse student body possesses a wide range of background knowledge and life experiences, and an increased expectation that technology play a significant role in their learning (Hanson & Carlson, 2005). In recognition of the significance of this intellectual challenge and societal need, the National Academy of Engineering recently named personalized learning as one of 14 Grand Challenges for the 21st century, alongside providing energy from fusion and developing carbon sequestration methods (NAE,