Applicative Personalized Learning: How Gamification is Driving Learning

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ABSTRACT
As technology has advanced, educational establishments are faced with this question: Are we investing enough funds and resources to provide college students with effective learning tools that could help them succeed not only by alerting them when they are at risk, but also providing them with personalized remedies while studying? Recently, students became more familiar with the notion of recommendation systems through their experience with social media tools, but does education fit this paradigm? In this paper, the authors review the recent advancement of technologies in personalized learning. They also examine the role of course redesigning where instructors can teach students what they need to learn as effectively as possible while tailoring their feedback to students based on automated performance dashboards with the highest granularity level as needed.

KEYWORDS
Adaptive Learning, Applicative, Learning Analytics, Personalized Learning, Predictive Analytics, Prescriptive Analytics

INTRODUCTION
Since 2011, the U.S. Department of Education (ED) and the U.S. National Science Foundation (NSF) have made increasing investments in education research and development seeking to established guidelines for improving the quality and pace of knowledge development in science, technology, engineering and mathematics (STEM) education as well as other content areas to increase student achievement, and engagement (Snyder & Dillow, 2015). The key focus areas of research are foundational, exploratory, design and development, efficacy, effectiveness, and scale-up research (Aud, Wilkinson-Flicker, Nachazel, & Dziuba, 2013). The rise of open/online distance learning has continuously changed the relationship between education and information and communication technologies.

Education has been crucial in the success of communities in the 21st century and will continue to face challenges regarding population demographics, analytic methods, advanced technology, and limited funding. These changes will require the current educational system to continuously adapt (Kaplan, Slivecko, Gardner, & Turner, 2014). On one hand, students witnessed a significant evolution in E-commerce pertaining to recommender systems such as Amazon, Netflix, Facebook, etc. Since 1994, Amazon started integrating various concepts, methods, and technical architectures of recommender systems into their E-commerce storefront (Zhuhadar & Nasraoui, 2010). On the other hand, for almost a decade, faculty members from a mid-western university have been working on designing a variety of intelligent systems, such as CaseGrader (Crews & Murphy, 2007) and
HyperManyMedia (Zhuhadar, Nasraoui, & Wyatt, 2008), to personalize student learning experiences. In CaseGrader, Crews et al. used intelligent methods to provide personalized automated scoring to students based on their performance in solving mathematical or business problems within Microsoft Excel, whereas the HyperManyMedia platform provided recommendations to students based on their previous browsing activities. These recommendations are based on artificially intelligent algorithms where ontology is defined and semantic webbing is utilized to provide the most accurate recommendations to students based on their level of understanding within the course. For more details, refer to our previous research (Zhuhadar, Nasraoui, & Wyatt, 2007; Zhuhadar, Nasraoui, & Wyatt, 2009a, 2009b; Zhuhadar, Nasraoui, Wyatt, & Romero, 2009; Zhuhadar, Nasraoui, Wyatt, & Yang, 2010; Zhuhadar & Yang, 2012).

As educators in higher education, we noticed, over the last 2-3 years, well-known publishing companies such as Pearson, McGraw-Hill, Wiley, and CengageBrain have begun to invest heavily in the design of intelligent personalized learning systems specifically for higher education. Within these systems, not only can faculty predict if a student is at risk, but students can get instant notifications (alerts) about their performance on specific tasks, no matter the type (i.e., homework, quizzes, etc.). This alert mechanism of student performance could be related to a simple task such as answering a question related to a reading comprehension section or could be involved in solving a complex equation.

In this paper, a pilot project at a mid-western university’s Information Systems Department entitled The Impact of Adaptive Personalized Learning on Student Outcome will be analyzed. In addition, detailed information about the new trends of adaptive learning technologies in education such as, MindTap, CourseMate, and SAM Cenage System, will be reviewed. As a starting point, during the Spring semester of 2016, five faculty members were assigned to teach a course titled Principles of Management Systems in the Information Systems department. Two out of the five faculty members decided to experiment with Intelligent Systems -- more specifically, using the concept of Adaptive Personalized Learning. At the end of this paper, some preliminary results of this study will be discussed.

LITERATURE REVIEW

Recently, in 2007, the program Changing the Equation (CTE), designed by The National Center for Academic Transformation (NCAT) and supported by the Bill and Melinda Gates Foundation, was created to specifically address the attrition of community college students in introductory algebra and other math courses. This program redesigned remedial and developmental math sequence courses using instructional software such as MyMathLab or MyLabPlus which requires lab attendance, participation, deadlines, monitoring of student progress, and intervention for those lagging behind.

Today, online learning courses are popular with students whose schedules no longer fit the traditional norms. With the increased enrollment in online learning, the field of learning analytics (LA) aims to optimize learning through examination of dynamic processes, which occur within the student context (i.e., measurement, collection, analysis, and reporting). For example, they analyze systematic mapping on learning analytics using the MOOCs context and present perspectives and challenges (Moissa, Gasparini, & Kemczinski, 2015).

Personalized Learning and Learning Analytics

While Feldstein, Hill, & Cavanagh (2015) note that the definition of personalized learning is not agreed upon, it matters when addressing how personalized learning can help students. Even though the term personalized learning is inadequate, it has enhanced student learning when used in tandem with properly implemented educational practices. The field of LA provides key information that educators
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