

# Chapter 15

## Expanding Bloom's Two-Sigma Tutoring Theory Using Intelligent Agents: Application to Management Education

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### ABSTRACT

*This article describes how management education is engaged in significant programmatic reforms in response to the business community's call for web-savvy, problem-solving graduates. Web-based intelligent tutors provide a readily accessible vehicle for enhancing business students' learning performance as well as prepare them for the rigors of the global marketplace. A primary goal of these AI-based systems is to approach Bloom's two-sigma learning performance standard. Bloom found that average students tutored one-to-one with mastery learning techniques performed two standard deviations better than students who learned via conventional teaching methods. Intelligent tutors can also be used to identify students at risk, to formulate appropriate intervention plans, and to support team learning. The purpose of this article is to highlight the growing potential for using intelligent tutors to enhance student and team learning opportunities and outcomes and to outline strategies for implementing this revolutionary process throughout the management education community of practice.*

### INTRODUCTION

Business leaders, accrediting bodies, and management educators alike are calling for a paradigm shift in the content and delivery of management education because of globalization, unprecedented economic uncertainty, changing demographics, and new learning technologies (Buil, 2016; Hall, 2013; Rubin, 2013; Thomas, 2012). Business schools are beginning to recognize that digital technology can play an important role in improving both the learning process and learning outcomes (Bowen, 2014; Mohapatra, 2015; Spada, 2014). Specifically, the rapid growth in Web 2.0+ technologies has ushered in a new era

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for management education including: virtual learning environments, intelligent tutors, web-based collaborative learning groups, and crowdsourcing. Additionally, the ubiquitous availability of mobile devices has encouraged educators to utilize this technology as a vehicle for accessing context-based materials, without the constraints or limitations of time, location and pace (Aljohani, 2012). The increased use of learning technologies can help narrow the gap between a graduates' skill set and the ever-changing requirements of business. For example, an MBA Roundtable survey found that many business schools do not emphasize the skills desired by most hiring managers (Hanover, 2013). These included evidence-based decision-making, ethics, and a focus on results and quality.

*A number of the concerns such as the lack of integration and too little emphasis on problem finding, international dimensions, entrepreneurship, and practical experience have seemingly not been widely addressed. Nor have many of the other competencies considered important by employers, e.g., motivation and commitment to the firm, creativity, quality focus, customer focus, ethics–integrity, teamwork, flexibility, and interpersonal skills (Herrington, 2013).*

With globalization under increased scrutiny and an unpredictable economy, the business community is increasingly focusing on adaptive and sustainable positioning strategies (Waddock, 2013). The business community is looking for web-savvy graduates that are both problem-solving and entrepreneurial oriented. This is the ongoing challenge faced by the management education community. Even the business accrediting organizations have gotten into the act of critiquing business education. A report from the Association to Advance Collegiate Schools of Business (AACSB, 2016) found:

- A larger share of degree-based education will be delivered in flexible formats (modular, part-time) across providers, with students having more control over their curriculum
- Business schools will struggle to align the pace of curriculum development with the pace of evolution in business practice
- A shift toward more experiential learning and business engagement
- Business schools will be increasingly called on to serve the common good

Digital technology provides a vehicle that can be used for addressing these trends. More specifically, providing customized learning opportunities can enhance both student learning outcomes and preparation for the transition to the business community. The mastery of management education material lies at the heart of this proposition. In a 1984 study, Benjamin Bloom found that the average student tutored one-to-one using mastery learning techniques performed two standard deviations better than students who learn via conventional instructional methods (Bloom, 1984). The task at hand is to find technological-based methods of instruction that are scalable, which is not the case with the traditional Bloom model, and that approach the effectiveness of one-to-one human tutoring. Intelligent tutors represent one promising possibility (Anastassakis, 2014; Niu, 2012; Yeh, 2013). These systems, which consist of a combination of hardware devices and software programs, are designed to provide learners with both customized content and instructional feedback at a performance-driven pace. Intelligent tutors can be used to replicate the role of a one-to-one tutor on a massive scale and thus move toward the goal of approaching Bloom's Two-Sigma standard. To be effective, an intelligent tutoring system requires a pedagogical framework that is based on the latest learning constructs and that can justify its choice of activities, presentation

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