

THE BAYESIAN TRACING MODEL IN COURSE SOFTWARE

EDUCATIONAL SOFTWARE OVERCOMING BARRIERS FOR STUDENTS

An Undergraduate Thesis Portfolio
Presented to the Faculty of the
School of Engineering and Applied Science
In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Computer Science

By

Carrington Murphy

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SOCIOTECHNICAL SYNTHESIS

College students, specifically those enrolled in large lecture style classes, may often have a negative experience with their instructors. Bernard and Kuhn (2008) found a remarkably negative correlation between class size and student evaluations of instructor effectiveness. Many other studies have been conducted suggesting that students in large classes typically view their professors and classes as less instructive (Monks & Schmidt, 2010). This study hypothesizes that some negative results are at least partially due to a lack of individualized learning. One of the more common techniques for individualizing and modernizing learning has been the introduction of learning analytics, often paired with online instruction. In order to better explain the effects of learning analytics technology on higher education classrooms, this study encompasses a technical paper discussing the parameters used in implementing one widely adopted learning model and an STS research paper which examines the social system of the classroom.

The technical project has focused on one possible solution proposed by a professor at the University of Virginia. Professor Mark Floryan is designing and building a piece of software called the Student Performance Tracker. In this software, Floryan will provide students with learning analytics data and live feedback with the hope that it will allow professors to be more effective and encourage students to master more of the course material. The technical paper focuses on the models built into the software which automatically calculate and update students' grades, displaying them in real time. These models, in addition to accurately fitting the student performance data to represent how much they have learned, should closely align with the teacher's grading philosophy.

In the technical paper, the parameter space of the Bayesian Knowledge Tracing model is analyzed. Because the model must be adapted to a variety of factors specific to its use and

implementation, it is beneficial to provide an overview of the effects of each parameter, and how those parameters may align with certain teacher preferences. An overview of recommended ranges for each parameter is presented alongside some possible scenarios when those ranges would be recommended. The results of this study will allow the model, and by extension, the Student Performance Tracker software, to better achieve its goals of providing feedback and increasing instructor effectiveness.

In the STS research paper, analysis is focused on understanding the social relationships in the classroom. Through the use of two major frameworks, the study sought to answer the question: what does educational software need to do to accommodate for students faced with inequality barriers? Through the social analysis, and through understanding some common criticisms of learning analytics, the paper was able to reveal some key design principles that should be followed in designing technology for classroom use.

Reviewing the conclusions made reveals a crucial underlying principle: understanding students as individuals. Just like learning analytics seeks to provide students and professors with specific guidelines and feedback, the software system should reflect a design process which distinguishes among all users and their potential use cases. In order to best support this design, software should provide a both a high level of customizability to the professor, and a high level of accessibility assistance.

Over the course of both projects, it becomes clear that education can become more effective and efficient through the introduction of learning analytics technologies. However, those technologies must always be designed and evaluated for a better understanding of their social impact on the individuals they serve.

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Technical advisor: Mark Floryan, Department of Computer Science

EDUCATIONAL SOFTWARE OVERCOMING BARRIERS FOR STUDENTS

STS advisor: Catherine D. Baritaud, Department of Engineering, and Society

PROSPECTUS

Technical advisor: Mark Floryan, Department of Computer Science

STS advisor: Catherine D. Baritaud, Department of Engineering, and Society