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# Predicting and Improving Academic Success and Student Retention: An Action Research

*Research-in-Progress*

*Extended Abstract*

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## Abstract

*This participatory action research aims to demonstrate how information systems scholars, practitioners, and administrators of higher education collaborate to develop, implement, and evaluate effective predictive models and in turn create and adopt policies and procedures that improve student academic success and retention in a business college. This research takes a novel perspective by focusing on predicting student success and retention, informed by activity theory as the fundamental theoretical framework to understand the interactions among various stakeholders in the communities.*

**Keywords:** participatory action research, activity theory, predictive model, retention

## Introduction

Driven by the business values of data analytics, higher education institutions have started to investigate, develop, implement, and evaluate their strategies for academic data analytics (Elbadrawy et al. 2016; Van Barneveld et al. 2012; Wolff et al. 2013). Leaders in higher education are often challenged by strengthening academic performance and improving retention while protecting the best interests of students. Predictive models are favored by many academic institutions to help gain insights and improve practices in administrative and academic areas, largely due to the maturing capabilities of analytics and big data tools for delivering timely results (Davenport & Kim 2013). Scholars believe that predictive models can help institutions identify gaps and opportunities to help students achieve better academic performance as well as identify areas for improvement so institutions can retain students over their course of study. This study aims to address how information systems (IS) scholars, practitioners, and administrators of higher education collaborate to develop and implement effective predictive models and in turn create and adopt policies and procedures that improve student academic success and retention.

## Theoretical Development

This research draws its theoretical foundation from predictive modelling and activity theory. A qualitative research methodology, participatory action research serves as the guiding philosophy and principle for planning, conducting, and evaluating the research.

Predictive modeling is a common approach widely used in the business domain. Predictive modeling depicts the processes involved to identify the target variable(s) and predictors, understand the relationship among the variables, define and apply specific techniques such as regression, decision tree, and neural network to model the data, interpret the results, and evaluate the model (Davenport & Kim 2013). In higher education, predictive models are favored by many to improve teaching and learning and help better use educational resources (Van Barneveld et al. 2012). Many higher education institutions implement predictive models to improve student enrollment and retention. For instance, Washington State University identified seven predictors of increased risk of early withdrawal from transferring students between 2004 and 2014; these factors related to prior academic performance, transfer credits, demographics, and student finances (Cohen 2015). Fiorini et al. (2014) reported a study where student

success was predicted using data collected from 16,630 students in the National Survey of Student Success 2006-2012 and student engagement was found to be a significant predictor of student success. Furthermore, factors such as pre-college variables (Sperry 2015), first-year academic performance, financial aid status and balance (Djulovic & Li 2013), online classroom engagement (UMUC 2016), library use (Soria et al. 2013), supportive staffs, focusing on individual needs, and positive modeling by faculty (Mbuva 2011) can have significant impact on student retention as well.

Activity theory is a popular theoretical and research framework that “is applied around the world in various disciplines and domains of practice” including health and social sciences, education, and human-computer interaction (Engeström 2016, pp. vii). The central argument of activity theory is that people, organizations, and communities learn, adapt, and change in the natural and complex social environment (Engeström 1993, 2001). Thus, activity theory is favored by many scholars to study multifaceted social and cultural systems such as developmental transformation and collaborative learning (Gedera & Williams 2016). Activity theory is a transformative theory and provides some important lenses to informing many different phases of research project and especially mixed methods research (Creswell 2015). It is particularly suitable for community-based participatory research such as action research. Stakeholders of the community, in the case of higher education, include students, faculty, and administrators, who are active participants in many phases and stages of the research. In this research, one activity system is represented by the design, development, and implementation of the analytics predictive model and the other activity system is represented by the college enrollment management. Improving student academic success and retention is the common object (goal) shared by the two activity systems.

Participatory action research is a type of community-based action research. It is especially effective in generating scholarship knowledge and driving actions and changes through inquiry-in-action (Avison et al. 1999; Davison et al. 2012; Levin and Greenwood 2008). Collaboration takes place between the study participants (practitioners) and the researcher in all steps of the study including determining the problem and the research methods to use, analyzing the data, and applying the study results. The word participatory refers to the active role played by the users, thus also called user-centered. The participants and the scholars are co-researchers throughout the entire research study. Scholars believe that the best value of participation action research is not only knowledge discovery but also action and conscious raising - it seeks to empower participants through constructing and using knowledge (Stringer 2014). Communities welcome participatory action research because it engages the community and involves them in the decision-making process including designing and implementing the interventions. There are many different frameworks depicting the stages of action research and almost all of them feature a cyclical structure, i.e. the stages of action research repeat certain steps to continue the action and improvement (Hasan et al. 2016). In a brief description, stages of action research include observe and diagnose, think and analyze, plan and take action, evaluate, reflect, and modify future actions.

## **Design and Methodology**

This research project takes place in the business college at a large, public research university in a metropolitan area in mid-western US. Enrollment of the college is about 2,000 in a typical fall semester. The university enrollment has remained almost flat since 2014 with a change rate about 1.5%. The college enrollment, on the other hand, has been increasing and had a 9% surge between fall 2015 and fall 2016. Following the guidelines of participatory action research, seven key participants were identified in July 2016 to initiate the research. Participants represent IS scholars of data analytics, administrators, and technical and business intelligence practitioners in the college and university, all collaborating throughout the research in multiple cycles of action research. Specifically, the participants include the Dean and two Associate Deans of the business college, the IT Director and Enrollment Director in the college, the Executive Director of Strategic Information & Business Intelligence of the university, and the researcher, who is an Information Systems faculty with analytics expertise in the business college. Lead by the Dean of the college, the team was formed and first met in July 2016 with the charge to develop and implement a predictive model for academic success and student retention.

This research involves two different types of research data – data for predictive modeling and research data for conducting the participatory action research. The first type of data is collected and used for the purpose of predictive modeling and focuses on two primary target variables as well as a number of

predictors. The process will follow the guideline and suggested steps in (Shmueli & Koppius 2011). There are two main target variables of interest in this study. One is student academic success, which is defined as the academic performance a student has in any term of study. This includes and is not limited to the GPA or various types of GPA gained at the institution. The other target variable is student retention, i.e. whether or not the student remains in the academic programs in the college from one term to the other (course registrations and major). This, however, does not include the summer term as those who attend summer school do not represent the majority of students in the academic programs. A wide range of academic data is considered for potential predictors to be included in the analytics model. The research team, in the beginning of the research project, collaborated with Institutional Research on campus to discuss and obtain data for student-focused analytics. Data being considered include student demographic data, prior academic performance such as high school test scores, academic progression, GPA, placement testing information, major and minor information, interaction with academic advisors, community engagement and participation, course registration, etc. There are in total over 100 variables identified for the predictive model. SAS Enterprise Miner will be used to build the predictive model. Specifically, a cluster of models will be developed using decision tree, neural network, and regression models. The best performing model(s) will be adopted for future implementation. The second type of research data will satisfy the need for conducting, analyzing, and interpreting this participatory action research. Data being collected and to be collected include meeting notes and minutes, observation and documentation throughout the entire span of the research study. In addition, interviews will be conducted with all research participants identified above, with one or more interviews with each participant. A typical interview will likely last 45 minutes to an hour. Interviews will be transcribed and coded following the guidelines of qualitative research and analysis.

## Conclusion

The research is expected to be completed and results reported in early 2018. This research will contribute to both practices and theoretical advancement. It will provide a practical analytics tool for student retention and additionally shed light on the advance and role of activity theory in participatory action research. The practical findings of this research will contribute to higher education institutions in three ways. First, we gain deeper insights of students and their educational experiences by identifying the key influential factors unveiled from the analytics predictive model. In addition, we will be able to make fact-based decisions and design, implement and evaluate actions (or interventions) supported by the findings from the predictive models to improve the experiences and academic achievement of our students. Last but not the least, results of the interventions will help nurture an appropriate culture for administrators, practitioners, and faculty to collaborate and engage students who have the best potential to perform well and stay with the college to complete their degrees.

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