

Demystifying Success in a Summer Bridge Program: Investigating Students' Intrinsic Motivation and Mastery Goals in the Context of a Learning Analytics Intervention

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Abstract: This study investigated students' academic motivation orientations in a summer bridge program and how a learning analytics-based intervention supported the activities of the academic advisors. Students' mastery orientation decreased over the course of the term and our results showed how certain learning analytics features and use cases were associated with this change. The findings indicate that student motivations need to be carefully considered in the design of learning analytics-based interventions since the resulting tools can affect how students make sense of and engage with their courses.

Introduction

Postsecondary institutions need viable and successful models to increase retention, particularly for those groups of students with historically lower graduation rates. As learning analytics (LA) tools have been utilized to address retention concerns, students' pre-entry attributes and their formal institutional outcomes (i.e., grades) have dominated the predictive models that drive these interventions. Students' intrinsic motivation to achieve their stated goals and their capacity to plan and utilize available resources are fundamentally linked to retention in higher education, yet these measures are difficult to include in large-scale LA tools. This study investigated students' motivational orientations and how a LA-based intervention supported the activities of the academic advisors by asking the following research questions:

- RQ1: How do students' motivational orientations change during a summer bridge program?
- RQ2: What factors are associated with changes in motivation during a summer bridge program?
- RQ 3: What is the relationship between when advisors' use an early warning system and their students' academic performance during a summer bridge program?

Theoretical Framework

Existing theory has shown how students' motivation within the context of competence-relevant activities can be defined as achievement goals, converging in mastery and performance goals. "Mastery goals focus on the development of competence and task mastery, whereas performance goals focus on the demonstration of competence relative to others" (Rawsthorne & Elliot, 1999, p. 326). Performance goals may be further delineated into performance-avoid and performance-approach orientations (Elliot & McGregor, 2001). Achievement Goal Theory posits that students engage with learning environments differently based on these orientations (Dweck, 1986).

Methodology

Our research agenda is organized around principles of design-based research. We collaborated closely with the leaders and staff of a summer bridge program to design and implement teaching methodologies, student surveys, and a learning analytics-powered early warning system intended for academic advisors.

Setting, Participants, and Data Sources

This study focuses on the seven-week Summer Bridge Program ("Bridge") that is situated within a large four-year, more selective, lower transfer-in, and primarily residential university with very high research activity (<http://classifications.carnegiefoundation.org>) located in the Midwestern United States. Two hundred and sixteen Bridge students completed three courses in the Summer 2013 term. Most participants were female (62.5%) and identified as members of an underrepresented minority group (69.4%). One-fifth (21.8%) were first-generation college students and one-sixth (14.8%) were athletes. Students' high school GPAs ranged from 2.1 to 4.0 ($M=3.45$) and composite ACT scores ranged from 14 to 30 ($M=22.54$).

Two online motivational surveys were distributed, one at the start-of-term (12 items) and one at the end-of-term (22 items). To measure students' motivational orientations, selected items from the Patterns of Adaptive Learning Scales (PALS) instrument were employed in both surveys. While the surveys represent the main data sources, the overall project was focused primarily on how academic advisors in Bridge used an early warning system (EWS), Student Explorer, which was designed to provide advisors information about their students' performance to facilitate timely interventions (see Krumm, Waddington, Lonn & Teasley, in press).

Results

Paired-samples *t*-tests assessed whether students' goal-orientations changed during Bridge (RQ1). There were no significant differences between pre-bridge and post-bridge performance-approach scores or performance-avoid scores. There was a statistically significant decrease in students' pre-bridge mastery scores ($M = 4.7$, $SD = .55$, $\alpha = .89$) and post-bridge pre-bridge mastery scores ($M = 4.3$, $SD = .84$, $\alpha = .93$); ($t(208) = 6.53$, $p < .001$).

To better understand what might contribute to this decrease in mastery orientations (RQ2), we specified a multiple regression model of students' change in mastery. We controlled for relevant demographic characteristics, previous academic expectations and support, incoming mastery, as well as previous achievement. Students' incoming mastery was positively associated with their outgoing mastery, $\beta = .34$, $t(12) = 3.1$, $p < .01$. Surprisingly, students' self-reports of how often their advisors showed them their EWS data were *negatively* associated with changes in mastery $\beta = -.11$, $t(12) = -2.247$, $p < .05$, ($R^2 = .30$, $F(12) = 6.12$, $p < .01$).

Since Bridge programs are meant to ensure that students are prepared for college-level coursework, we wanted to understand which factors were associated with student's final grades. Using multiple regression models, we controlled for demographic characteristics, academic achievement measures, high school preparation, and encouragement by family and friends. Athletic status was negatively associated with English course grades, $\beta = -.67$, $t(15) = 2.52$, $p < .05$, while students' reports of excellent high school teachers were positively associated with English course grades, $\beta = .12$, $t(15) = 2.04$, $p < .05$, $R^2 = .31$, $F(15) = 2.83$, $p < .01$. For students in the remedial Math course (A), mastery orientation was *negatively* associated with course grade, $\beta = -.67$, $t(16) = 2.52$, $p < .05$, and the Bridge advisors EWS views *after* meeting with students was also negatively associated with students' Math A course grades, $\beta = -13.4$, $t(16) = -2.952$, $p < .05$, $F(16) = 11.11$, $p < .001$. For students in the college-level Math course (B), perceived family encouragement was negatively associated with course outcomes $\beta = -15.6$, $t(17) = -2.15$, $p < .05$, $F(15) = 5.18$, $p < .001$. Finally, students' self-reports of how often their advisors showed them EWS data were not associated with any course grade.

Discussion and Conclusion

While Achievement Goal Theory research has shown that high mastery orientation is adaptive for students in academic settings (Rawsthorne & Elliot, 1999), our results show that some features of the Bridge program may moderately decrease students' mastery goal orientations (RQ1). We were surprised to learn that showing students their own data within the context of an early warning system (EWS) might have contributed to this decrease (RQ2). Yet, we do not know *which* features of EWSs contribute to this decrease. Moreover, our findings support the idea that any student-facing LA intervention will need to be developed and deployed with care, because such tools affect how students make sense of and engage with their courses.

Understanding the relationship between when advisors used the EWS and students' academic performance as measured by course grades (RQ3) is a nuanced endeavor with mixed results. After controlling for pre-entry demographics, students' perceptions about encouragement from family and friends, and formative course performance, the extent to which Bridge advisors viewed students' data via Student Explorer *after* meeting with students was negatively associated with students' Math A course grades. One of the limitations of our study is that, by design, EWSs encourage deeper investigation of students who are struggling academically than students who are thriving, thus skewing the statistics gathered from EWS user actions. A student with a lower grade is therefore more likely to have their advisor log EWS use than a student with a higher grade, potentially explaining the trends witnessed in our analyses.

LA interventions are designed to foster optimization of learning and learning environments that could ultimately improve student performance and retention. Our results indicate that even guided presentations of student performance data can have significant effects on students' academic achievement and their motivational orientation. Therefore, designers of LA interventions should consider how best to collect and present such data sources. Furthermore, the next generation of LA interventions must resolve the tension between ease of scalability in current data sources (e.g., grades) and the richness of measures such as students' intentionality, goals, and motivations that have proven utility in tailoring learning environments to learners' needs, but are more difficult to collect at scale and integrate into current LA tools and processes.

References

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