

# Early Integration of Tutorial Support in Beginning Algebra

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One factor affecting student success in developmental education is a gap in prerequisite skills. Nationally, the current trend is to offer services and acceleration opportunities to higher placing students, but lower placing students, and the issues they face, are not sufficiently addressed. At Grand Rapids Community College (GRCC), students who place into Beginning Algebra often have trouble, not because of current content but as a result of dependence on the calculator and the disconnect between expectations at local high schools and this community college. Mathematics students at GRCC who place in the bottom 25% of all mathematics students on the ACCUPLACER<sup>®</sup> placement exam are traditionally the most likely to drop out or not complete their course successfully.

Anecdotal observations reveal that most students with strong arithmetic skills will succeed in the Beginning Algebra course even if they have no previous experience with algebra. In trying to quantify this with an initial teacher-created survey of arithmetic skills, it was observed, for three consecutive semesters, that students who scored in the upper 60% usually passed the class with acceptable grades, whereas students in the lower 40% did not. The goal of this project was to address existing gaps in student knowledge for the lowest scoring students, thus increasing the likelihood of successful completion of their first mathematics course, as well as persistence to further classes. The research shows the success of these types of programs could be of “life changing importance for our students” (Adams, Gearhart, Miller, & Roberts, 2009, p. 67). The purpose of this project was to determine if early intervention in a Beginning Algebra class leads to greater student success.

## Theoretical Underpinnings

A primary aspect of successful developmental education programs usually includes the integration of support services with classroom instruction, with tutoring being one of the oldest forms of developmental education intervention (Boylan, 2002). The success of any collaborative learning approach involving multiple parties, however, relies on positive relationships between the people involved (Boyd, 2004). The relationship between instructor, tutor, and student is key. Unfortunately, it may take several months for motivational aspects of relationships between students and faculty to appear (Wlodkowski, Mauldin, & Gahn, 2001).

Traditionally, tutoring was considered a one-to-one practice between tutor and student with the instructor minimally involved, if at all. Recently,

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academic support has evolved to include supplemental instruction programs like SLA (SLA Program Office, n.d.) and acceleration programs like ALP (Adams et al., 2009). Additionally, Hodara and Smith Jaggar (2014) seem to be pointing to models like supplemental instruction or ALP when they assert that education reform should “integrate basic skills instruction into college-level coursework while providing supplemental academic and nonacademic supports so that students can immediately access college coursework and, at the same time, develop their quantitative and academic literacy skills” (p. 271). It is imperative that teachers carefully design activities promoting student involvement which may also lead to student success. Boylan (2002) defines integration as “characterized by the way in which they [classroom activities and tutoring laboratories] are coordinated with each other” (p. 65). He then offers a list of characteristics which indicate the presence of this coordinated integration, including: instructors consulting tutoring personnel, coordination of laboratory materials to course objectives, requirement of tutoring activities as part of course assignments or part of students’ grades, and “reasonably close” physical proximity of the laboratory and courses they support (p. 65).

There is sufficient research on the success of acceleration and supplemental instruction as separate semester-long models. However, there is inadequate research on shorter-term models that combine these methods. Integrated Tutorial Support (ITS) at GRCC is presented as a combination of supplemental instruction to address the lack of prerequisite knowledge in an accelerated format within the first month of class.

## Methods

GRCC has a long history of working to improve success and retention rates for students requiring remediation. Located in the Midwest, GRCC offers both credit courses and certification programs. There are approximately 15,000

students currently enrolled in credit-bearing courses. Of these, 30.3% attend full-time and 69.7% part-time (GRCC Institutional Research and Planning, 2015). Improving success rates of students in developmental education courses has been a continued focus of both the administration and faculty at GRCC. The college's decentralized developmental education program offers coursework in reading, English, mathematics, basic computer operation, and college success. Developmental math courses are offered through multiple formats. Students have the option of taking courses in either a traditional lecture format or by utilizing a web-based adaptive software. Specifically, GRCC uses the ALEKS program (McGraw Hill, 2016).

At GRCC, students placing in the upper 25% of developmental education courses (ACCUPLACER) are offered the opportunity to accelerate learning through a 3-week program. In contrast, the Integrated Tutorial Support (ITS) project was developed to provide early intervention for students placing in the lowest third in a Beginning Algebra class. This ongoing ITS program has been conducted since Fall 2014 in sections of Beginning Algebra taught by a single instructor. Data for this study was collected over 4 semesters (Fall 2014–Spring 2016); during this timeframe a total of 39 students participated in the ITS project. A comparison to the general campus population (see Table 1) shows minorities were slightly overrepresented. This is consistent with larger trends in developmental education.

**Table 1**  
**Demographics**

Population	Caucasian	African American, Asian, Hispanic, or Others	Male	Female
GRCC General*	70.20%	29.80%	48.40%	51.60%
ITS Sample	60.90%	39.10%	39.50%	60.50%

Note: \*Data from GRCC Institutional Research and Planning.

### Goals

This project had four main goals. They were developed not only to encourage success within the current semester but also to give students skills which would be transferable across disciplines and time. The goals of this project were:

1. To help students in a Beginning Algebra course acquire prerequisite skills and knowledge.
2. To establish ongoing tutorial support within the first week of class.
3. To foster collaboration and encourage social connections.
4. To better use existing underutilized services at no additional expense to the college or students.

### Procedure

On the first day of class, students from selected Beginning Algebra classes were given the initial survey. It included four problems covering long division, fractions, and signed numbers. An analysis of the reliability determined that a positive correlation existed between initial survey score and final course grade. This critical piece was used to quickly identify students needing the most help. The lowest 40% were invited to participate in the ITS project under the following conditions:

1. Attendance would be mandatory.
2. Students participated fully, completing the worksheets and taking the Final Quiz within 3 to 4 weeks of the beginning of the course.
3. Students made room in their schedule to fit the tutor's availability.
4. Students were exempt from two of the projects assigned as coursework to the rest of the class. Their Final Quiz grade would replace these grades.

5. Passing the Final Quiz was required at 80%, consistent with other developmental math courses at this college.

All ITS sections have been taught by the same instructor using select experienced tutors to provide the support services for the ITS groups. Although initially the location of tutoring services was near the classroom, logistics have required a relocation. Effects of this change are currently under investigation.

After the initial survey, each of the invited students signed up for two tutorial sessions per week, which fit both their schedule and the tutor's. Every effort was made to group students together, up to three per group, to foster social connections and community building. Students were to begin attending sessions the first week of class and continue through the following 4 weeks. In order to improve study strategies and increase the effect of collaboration, students were also given the option to continue meeting with the tutoring group after the intervention was complete.

During the tutoring sessions, ALEKS generated worksheets covering addition; subtraction; multiplication; division; and order of operations of whole numbers, fractions, decimals, and signed numbers were used to guide students through the learning of their deficit topics. The tutor tailored instruction to students' individual needs and provided study skill support and encouragement. The tutor also encouraged the formation of study groups outside of the scheduled tutoring times, as well as use of the Mathematics Tutorial Lab. Upon successful completion of the month-long ITS instruction, students were given the Final Quiz. Those who did not achieve a minimum score of 80% were allowed to retake the quiz after sufficient time was applied to reviewing and practicing deficit topics, usually within a 1-week time frame.

### Results

The primary goal of this study was to determine if early intervention would help students in a Beginning Algebra course acquire prerequisite skills that would enable them to successfully complete the course. During this 4-semester study, a total of 179 students were enrolled in sections taught by this instructor. Of these, 52 students were invited to join ITS, with 46 accepting and 39 completing the program.

Data was collected and analyzed regarding the percentage of ITS students passing in comparison to a control group of non-ITS students. Success was defined as a final grade of C- or better, the prerequisite grade for the next course in the sequence. To date, the data show an average course grade for participants who completed the program of 2.18 on a 4.0 scale ( $M = 2.18$ ,  $SD = 1.388$ ,  $N = 39$ ). Pass rates among participants who did not withdraw is 65.6%. This is notable when compared to the pass rates of all students in Beginning Algebra (56.6%; GRCC Analytics, 2016) and, particularly, to students from the control group (22.2%).

### Discussion

Although the sample size is still small, results indicate that this program is meeting its established goals and should begin scaling up. The reasons for this include not just positive quantitative results, but also qualitative anecdotal observations. Most students (95.3%) who participated in the program continued with tutorial support throughout the semester. More importantly, however, was the noticeable positive change in attitude regarding the learning process, even among those students who did not pass the course. This may be due to the development of social networks and self-actualization.

Expansion must be completed slowly, so adjustments may be made to respond to changing needs or improve the process. Careful instructor and tutor selection will be considered to ensure the goals of the program are being met. Instructors and tutors must maintain frequent contact as communication is key. Technology has been used to improve communication when face-to-face interaction is not possible.

CONTINUED ON PAGE 34

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50

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CONTINUED FROM PAGE 33

Knowing the majority of developmental education students are either unprepared or underprepared for the rigors of Beginning Algebra, this study focused on identification of student deficits in critical prerequisite skills. Upon identification, a tutorial intervention was implemented to accelerate learning of these targeted students and increase skills to proficiency by the first exam. Based on the initial encouraging results, and the fact that this program has been implemented without additional cost to the college, scaling-up is set to begin Fall 2016. We will continue to collect and analyze data to establish the effectiveness of this program.

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## NADE News: Winds of Change

By Robin Ozz President, National Association for Developmental Education

"Like the Okie winds that go *sweeping down the plains*, change blows in and around developmental education in wisps and gusts." –NADE17 Conference Team

What a perfect sentiment to consider as we prepare to meet in Oklahoma City (OKC) for our 41<sup>st</sup> year of networking, supporting each other, learning, laughing, and celebrating the incredible field that is developmental education.

This year's conference takes place at the Cox Convention Center (which should bode well for internet), which is connected to the Renaissance Convention Center Hotel, and a quick walk from all of the other conference hotels. They are also a short distance from the amazing Bricktown. The area now called Bricktown was OKC's first warehouse district founded in the late 19<sup>th</sup> century, but, as with most cities, it began to decline in the 60s and 70s when people and businesses moved out to the suburbs. With the help of a major projects initiative in the 1990s, Bricktown gained a baseball stadium, a canal with a water taxi, river improvements, and a concert and sports arena.

Fast forward to today. I was just there, and I can attest it is now a hopping entertainment district with more than 45 restaurants; almost as many bars, clubs, and retail shops; along with family-friendly attractions, museums, and galleries. Live music spills out of almost every door, and the canal walk is entertaining in and of itself. The area is teeming with activity, and if you want to go out after a hard day of learning, everything is a short walk away.

We were fortunate enough to have over 300 proposals from which to choose plus a plethora of pre- and postconference session proposals. So far,

our speaker lineup includes Major Ed Pulido, U.S. Army (Ret.) and the Sr. VP of the Folds of Honor Foundation, a Veteran's charity which provides the spouses and children of the fallen and wounded educational scholarships. Injured in battle in 2004, he was honored greatly, but along with these honors came a dark depression, PTSD, and suicidal ideation that would cripple him. His road to recovery would be the building block for his understanding the inner wounds of war and making sure that mental health is a focus of the Department of Defense and the VA.

Another scheduled speaker is Jose Ferreira. Jose is a thought leader in education and his previous talks have covered such topics as "the Internet of Things," "A Lord, A Liberal, Two Geniuses, and Sir Knewton Walk into a..." Jose earned his MBA from Harvard. He was formerly an executive at Kaplan, a strategist for John Kerry's 2004 presidential campaign, and most recently a partner at New Atlantic Ventures (formerly Draper Atlantic). He currently serves on the World Economic Forum Global Agenda Council on Education & Skills, as well as the advisory boards for Laureate International Universities, Cambridge University Press, and the ASU/GSV Education Innovation Summit. He is the founder and CEO of Knewton, named one of the World's Top 10 Most Innovative Companies in Education by Fast Company in 2016.

All in all, the conference team has a universe of pleasure planned for you March 1-4 in OKC. Make plans to join us!

*NADE: Helping underprepared students prepare, prepared students advance, and advanced students excel!*

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