

## COLLEGE ALGEBRA BOOT CAMP: A FLIPPED CLASSROOM APPROACH

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### **Abstract**

Corequisite remediation has become a growing trend when dealing with students who enroll in college with insufficient background for their gateway math course as a stand-alone course. These students simultaneously enroll in the college-level math class as well as a learning support course designed to help them to have success in the college level course. For students with certain majors (STEM, business, nursing, etc.) the required grades and test scores are even higher preventing them from enrolling in the correct math course (College Algebra) for their degree even with the added support class.

We created the College Algebra Boot Camp to aid these students in gaining the prerequisite knowledge needed and give them the opportunity to test into a College Algebra and its corequisite paired course. The first College Algebra Boot Camp occurred in the fall of 2020 using a flipped classroom approach. The results looked promising despite the overwhelming presence of a global pandemic.

### **Introduction**

In Fall 2018 the University System of Georgia mandated that all remediation in Georgia public universities occur in a corequisite format. This required students to take the learning support course simultaneously with their gateway course. There are two math pathways: the STEM math pathway that starts with College Algebra and the non-STEM pathway, which on our campus is Quantitative Skills and Reasoning (QR). Students placed into these courses based on test scores and/or high school GPA with College Algebra requiring higher entrance scores.

The new mandate created a situation where some students desire a STEM major but they have insufficient test scores or GPA to enroll in College Algebra even with corequisite support. Such students were forced to take QR instead. The Boot Camp was designed to give these students an opportunity to bridge any gaps in their knowledge and then re-test

into the proper mathematics course for their major, College Algebra. The first College Algebra Boot Camp took place on the Oconee campus during the first three weeks of the Fall 2020 semester. The Boot Camp engaged students in developing both algebra skills and non-cognitive skills designed to help students adjust to college and succeed. We developed and produced a video series for the students to watch in a flipped classroom environment on their own time. Class time was devoted to deepening students' understanding of algebraic content through discussion, guided practice, and analysis of common student errors.

### **Preparation and Planning**

Preparation for the Boot Camp started well in advance of any hint of a pandemic, and we desired the flipped-classroom model from the beginning. The authors applied for and received a Presidential Incentive Award (Davidson-Rossier, 2020) at our institution to fund the Boot Camp. The award funded the time to create the videos and roll out the Boot Camp. The first step in creating the videos was to select the topics that we wanted students to review and determine the technology that was required for the media production. We used Smart Notebook along with a USB writing tablet so that we could annotate on the screen. We used Camtasia as the screen-capturing software. (The same company has a smaller, lighter version called SnagIt if budget is an issue.) We edited an intro and outro on each video. These entailed a short welcome with a simple music jingle and an introduction from one of us clearly identifying the objectives for the associated topic demonstrated in the video.

Because we desired higher-quality audio, we used audio interfaces rather than the standard webcam microphone. Excellent audio is required for instructional videos. It is best to avoid using a webcam. Other helpful options exist as well that can dramatically improve audio. After recording and editing the videos, we used our institution's subscription to Kaltura to provide initial closed captions. The integration made it easy to upload our videos and Kaltura provided automatic caption. Because Kaltura is not completely accurate with captions, some minor caption editing occurred after uploading the videos. We created the 22 videos in the summer of 2020. The average length of each video was 20 minutes. In addition, we created templates for the videos along with associated note-taking guides (NTGs). The NTGs encouraged more active student engagement with the instructional video. The production time for each video can easily take four hours or more from start to finish for one video. In addition, correcting the closed captioning may take extra time. This process may seem overwhelming, but it is important to start somewhere. Kitchings and Hartfield (2020) provide a more thorough treatment of the topic of creating mathematics instructional videos.

For the Boot Camp itself, we created homework assignments in MyLab Math (MLM) and each video directed students to MLM practice assignments. Students could move straight from the video into MLM and practice concepts from the video. All students were initially enrolled in Math 1001/0999 Quantitative Skills with co-requisite support and paid for

MLM through Inclusive Access (IA) through that course. Students were then given access codes (provided by Pearson) to use in the Boot Camp (and College Algebra) MLM course.

### **Implementation**

In Fall 2020, 15 freshmen students in STEM majors who lacked sufficient entry requirements for enrollment in College Algebra voluntarily agreed to attend the Boot Camp for the first three weeks of school. Students took a pretest on the first day and then at the end of the third week, students took an exit exam to determine whether they could enroll in the College Algebra/Learning Support (Math 1111/0999) pair beginning on the fourth week of the semester. This schedule amounted to a delayed semester start for Math 1111/0999 with the same amount of contact hours as a full semester. Students who did not pass the exit exam were able to move into a similarly delayed start Math 1001/0997 course taught by a different instructor. Both courses officially started during the 4<sup>th</sup> week of classes. All students were originally enrolled in QR with the corresponding learning support class.

The Boot Camp students were supposed to complete assignments each night and attend Boot Camp for two hours each day four days a week. Due to the Covid-19 pandemic, the students had to be divided into two groups in order to maintain social distancing requirements. As a result, students could only attend 50 minutes each day. The Boot Camp operated as a flipped classroom (with no in-class lectures). During these three weeks the students engaged with one or two videos along with small tasks assigned prior to each class meeting. Students then practiced targeted skills and concepts the following day on campus. They worked and discussed problems on worksheets or visited the computer lab. Instructional time also included discussions of study skills and growth mindset. Students watched several such videos embedded in MLM. Students also took practice quizzes in order to get ready for the exit exam scheduled at the end of the third week. Original plans were modified to adjust for the fewer hours of face-to-face contact. In addition, while some bonding between students did take place, the social distancing and face coverings affected some of the group work plans.

### **Observations and Findings**

We began with 15 freshmen in the Boot camp. Six successfully completed the exit exam and continued into Math 1111/0999 meeting on an intensive 2-hour schedule Monday through Thursday for the remainder of the semester. One student stopped attending and was withdrawn for nonattendance during roll verification. Three students were required to quarantine for two weeks. (The quarantined students continued studying on their own but none were able to pass the exam upon returning to campus.) Five students completed Boot Camp but did not pass the exit exam. (One of these students chose not to take the exit exam.) Several students failed to engage with any of the assigned homework problems. Fifty-four percent of the 11 students who completed the entire Boot Camp passed the exit exam. The better-than-half pass rate of those who completed the Boot Camp was

encouraging. Success in the Boot Camp was not a reflection of their high-school GPA and seemed to be a result of each student's intrinsic motivation.

Figure 1 shows the scores from the pretest and the exit exam. The exit exam scores show improvement and achievement compared to the initial pretest. (Note that pretest scores were never revealed to the students.)

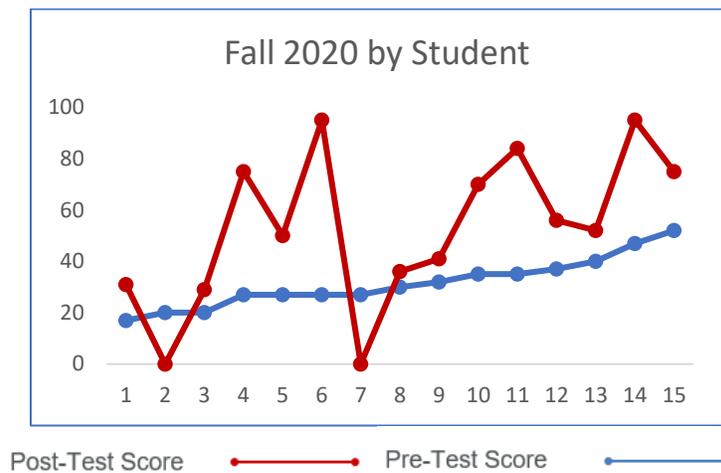


Figure 1

No one scored above 50% on the pretest. Students took advantage of the instruction over the three-week period and demonstrated improvement. All students' scores improved other than the two students who did not attempt the exit exam. No students' scores decreased and several students' scores improved significantly. Of particular note, two students who initially scored a 28% on the pretest improved to 75% and 95%. The passing score for the Fall 2020 Boot Camp exit exam was arbitrarily set at 70%. The passing score may be refined for future iterations of Boot Camp after additional reflection and analysis.

The six students who successfully completed the program improved not only their understanding of mathematics, but also their attitude toward mathematics. These students seem to be very motivated to do well and are willing to work hard to achieve their goals. Their success is evidenced by their results in the subsequent College Algebra course at the end of the fall semester. Five of the six students passed Math 1111 College Algebra with a B. Unfortunately, one student did not pass due to some difficult situations unrelated to the course. These five students who were initially required to take Quantitative Skills and Reasoning completed their first fall semester with credit in College Algebra and were able to continue more efficiently in their STEM major.

## Conclusions

The Fall 2020 Boot Camp experience demonstrated that this boot camp model can assist some students who did not initially place into the appropriate math course. It demonstrated how a Boot Camp in an intensive seminar setting can provide students with the

prerequisites they need in order to be successful in their required mathematics course. Most students who passed gained the mathematics skills necessary to succeed in College Algebra. They also gained time because they did not have to take the non-STEM math course when their major required the STEM math course. In addition, they developed increased confidence in their math ability.

The following questions remain to be considered for future Boot Camp experiences at our institution:

- 1) Our institution is comprised of five, very distinct campuses. How can we implement the Boot Camp model on the other four campuses (and should we do so)?
- 2) Which semester (fall, summer, or spring) offers the maximal potential impact for students on each of our campuses?
- 3) How does Boot Camp operate in a “typical” non-pandemic semester?
- 4) What technologies might improve and enhance student experiences in future Boot Camps?

### **References**

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