Acceleration and Compression in Developmental Mathematics: Faculty Viewpoints

By Brian Cafarella

ABSTRACT: Community colleges are facing increased pressure to accelerate students through their developmental mathematics sequence. However, many individuals feel that some state legislatures and college leaders are frequently bypassing developmental math faculty expertise when implementing acceleration and compression initiatives. This qualitative study focuses on faculty viewpoints with regard to acceleration and compression in developmental math. Guiding this study was the research question: Based on faculty experience, what is the best fit for the practices of acceleration and compression in developmental mathematics? Data has been gathered using a structured interview format for six developmental math instructors, two at each of three community colleges. Findings from this study suggested that the practices of acceleration and compression are a proper fit for students who are comfortable with computer software. Incoming skill level and individual student learning style are also imperative when considering acceleration and compression for developmental math students. Individual instructor comfort level is another significant detail for consideration with regard to the aforementioned practices.

Compression specifically refers to the condensing of mathematical content.

The practices of acceleration and compression in developmental mathematics have been of great interest in recent years. According to Edgecombe (2011) compressed courses allow students to complete multiple courses in one academic term. In a traditional developmental mathematics course sequence, students may be required to complete stand-alone arithmetic and multiple algebra classes. A compressed course allows students to study arithmetic and algebra in one class and complete their developmental mathematics requirements sooner. Edgecombe clarified that acceleration involves the reorganization of instruction and curricula in ways that expedite the completion of coursework or credentials. Both acceleration and compression strive for the same goal, which is to allow students to complete their required coursework at a quicker pace than a traditional course sequence. However, classes that are self-paced and held in computer lab settings are generally referred to as "accelerated." Also, in accelerated courses, as long as students complete the course requirements, they may finish the course in less than one academic term. Compression specifically refers to the condensing of mathematical content which results in less course work. As evidenced in this study, it is also possible to employ elements of both acceleration and compression into a developmental math course or sequence.

The practices of acceleration and compression have been thrust forward by state legislators and college leaders to ensure that students progress through their developmental course sequence at a quicker pace. Mangan (2014) reported that, as state legislators have become increasingly frustrated and anxious with the number of students who test into developmental math and do not complete their college requirements, they are considering faculty input less. Some feel that faculty viewpoints regarding the implementation of the practices of acceleration and compression in developmental math have been bypassed.

Literature Review

The Pressure to Improve Developmental Mathematics

As the 21st century has progressed, the practices of acceleration and compression within developmental mathematics courses have increased. This has largely been due to state legislators placing pressure on public institutions of higher education to demonstrate better completion rates (Bailey, Jeong, & Cho, 2010). Weisbrod, Ballou, and Asch (2008) reported that many states have begun to impose funding formulas on public institutions of higher education. Specifically, schools need to show higher success and retention rates to receive additional funding. Furthermore, both state legislators and higher education boards are making institutions more accountable for successful remediation of students (Arendale, 2003).

Overall, state legislators have become increasingly frustrated with the large number of students who place into developmental math courses and their retention rates. Bahr (2008) found that 81.5%

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of students who attempted a developmental mathematics course did not complete a degree or transfer to another school. In 2008, Fike and Fike confirmed that students who are not successful in their first developmental mathematics course are very likely to withdraw from college within 1 year. Boylan (2008) warned that governors and state legislators are running out of patience and are putting pressure on institutions to raise student success rates. Success rates generally refer to the percentage of students who successfully complete a course.

Cost Debate and Developmental Math Sequence Length

There has been a heightened debate regarding the cost of developmental education in general; variance among cost estimates and processes used to calculate them have led to calls for transparency to support accurate estimates at local and national levels (Pretlow & Wathington, 2012). In 2010, the cost for developmental education was reported as high as 3 billion (State Higher Education Executive Officers, 2010). Statistics such as these are used to support the argument that the cost of developmental education is too high and the current number of required developmental math courses in most institutions is unsustainable. The State Higher Education Executive Officers also reported that government spending on higher education was roughly 140 million dollars. Therefore, Goudas and Boylan (2012) articulated that the cost of developmental education is rather low as it accounts for roughly two percent of the overall budget.

Edgecombe (2011) employed statistics to suggest that the traditional sequence of developmental mathematics courses hinders community college students from entering college-level courses. This evidence is based on Bailey et al.'s (2010) findings that only 33% of students who place into developmental mathematics courses complete their required course work within 3 years. Only 17% of students who place into developmental math successfully complete a developmental mathematics course sequence of three courses or more. This study included a sample of over 250,000 students from 57 different community colleges in seven states. In summation, this has all led to more and more community colleges employing practices of acceleration and/or compression into their developmental math programs.

Impact of Compression and Acceleration

Some research results have favored the use of compressed courses for developmental mathematics. Sheldon and Durdella (2010) have noted an advantage to offering developmental mathematics courses in a compressed format as opposed to a traditional design. They further articulated that "developmental students are quite capable of assimilating course material in a shorter time when the material is presented in a more intense and compressed format" (p. 52). Based on their quantitative study, which utilized a group comparison design between a group of students in a compressed course and a group of students in a traditional course, Woodard and Burkett (2010) also recommended that developmental mathematics courses should be offered in a compressed form and added that compressed courses not only increase student success but also reduce the chance of burnout for many students.

Various institutions have also reported success with compressed formats. Bergen Community College in New Jersey has begun to offer a compressed arithmetic and algebra course for students who score on the high end of the placement test. This allows students to complete their developmental mathematics requirements in 1 semester. Students who score on the low to mid-range of the placement test can opt to take the traditional course sequence. As a result, the success rates in developmental mathematics at Bergen Community College have increased by fifteen percentage points (Redden, 2010). In 2008, several community colleges in New York City implemented the Start Program (Winerip, 2011). Instead of a multiple course sequence consisting of arithmetic and algebra concepts, Start combines several concepts of arithmetic and algebra into one course that meets 5 hours a day and 5 days a week. Almost three times more students have completed this course and have moved on to college-level work.

The traditional sequence of developmental mathematics courses hinders community college students from entering college-level courses (Edgecombe, 2011).

Many institutions have noticed increased success rates by offering accelerated instruction. Squires, Faulkner, and Hite (2009) noted that Cleveland State Community College (CSCC) in Cleveland, Tennessee, through a grant from the Tennessee Board of Regents, segmented all of the content in their mathematics courses into modules. For each module, students completed online homework assignments, quizzes, and exams using the Pearson software program, MyMathLab (MML). Students work in a lab setting and focus solely on the math content in which they have difficulty. A lead faculty member and professional tutors could provide them with individualized instruction. As a result, students were able to finish multiple courses in 1 semester. Since the start of this redesign, success rates in developmental mathematics have risen 18 % (Squires et al., 2009).

The Community College of Denver (CCD) has also witnessed increased student success rates using an accelerated program entitled FastStart (Epper & Baker, 2009). Similar to the program at CSCC, FastStart utilizes MML. In FastStart, many students are completing in 1 term what was previously 2 terms of developmental mathematics. Moreover, CCD has seen a significant increase in the number of developmental mathematics students who are now passing college-level mathematics.

Other developmental mathematics programs have had success with modalities that employ elements of both acceleration and compression. Redden (2010) reported that institutions, such as South Texas College, have witnessed increased success rates by compressing a traditional three-course sequence into two courses covering the same material and allowing students to work at their own pace using mathematics software in the computer lab.

The Gates Foundation has also become involved in the redesign of developmental education and has become a driving force in the practices of acceleration and compression. Melinda Gates, cochairman of the Bill and Melinda Gates Foundation, has pledged $110 million to improve developmental education. This money was allotted to develop groundbreaking models for developmental education that employed practices of acceleration and/or compression of developmental courses (Ashburn, 2007). The Gates Foundation also helped start Complete College America (CCA). CCA is a nonprofit advocacy group that has urged state law makers to reduce or eliminate remedial courses so that students can progress into their college-level courses at a quicker rate (Mangan, 2013).

Faculty Perspective

Some educators and experts have expressed mixed and opposing opinions for the practice of acceleration in developmental math. Boylan (2002) asserted that students should be carefully screened before being placed into accelerated courses. Mangan (2013) reported that some academic experts are concerned that if certain students are accelerated too rapidly into their college-level courses, they will flounder. Mangan (2013) provided an example of a math professor questioning how students could successfully perform operations with polynomials without a solid comprehension of basic numbers. Furthermore, these academic experts believe that professors in college-level courses will be overburdened with too many low skill students due to the acceleration process in developmental education. This, in turn, will hinder all students.

The practices of acceleration and compression within developmental math have raised some additional concerns. According to Mangan (2014), many academic experts are asking "What will happen to students who place into the lowest levels of remedial math, some of whom might test at third-grade levels? (p. 3). This question has led such experts to further question the responsibility of community colleges when it comes to accommodating incoming students who are extremely deficient in mathematics. How can community colleges structure developmental courses to assist these students when the emphasis is on accelerating all students into college-level classes?

Some faculty who teach developmental courses have simply objected to the idea that the practices of acceleration and compression have stemmed from external entities such as the Gates Foundation and state legislators. Mangan (2013) articulated that these individuals "contend that the strategy bypasses colleges themselves and imposes top-down solutions" (p. 3). Mangan (2014) added that experts within developmental education believe that state legislators, the Gates Foundation, and Complete College America are pushing the practice of acceleration as a simplistic solution for a complex problem.

Researchers have conducted quantitative studies that have focused on the practices of acceleration and compression in various institutions. There has been some research, which contains minor qualitative elements, that investigates, faculty viewpoints regarding acceleration and compression in developmental mathematics; however, this topic has not been explored in depth. Accordingly, this qualitative study explored developmental math faculty viewpoints regarding the aforementioned practices in developmental mathematics. Therefore, I employed the following research question to drive this study: Based on faculty experience, what is the best fit for the practices of acceleration and compression in developmental mathematics?

Method

This was a basic interpretive, qualitative study. Merriam (2002) has articulated that in a basic interpretive qualitative study, "the researcher is interested in understanding how participants make meaning of a situation or phenomena" (p. 6). Merriam further asserted that the strategy is inductive and the process is descriptive. My goal was to understand the viewpoints of a group of developmental math instructors regarding the practices of acceleration and compression.

Participant Selection

For this study, I utilized purposive sampling. According to Krathwohl (2009), "Purposive sampling is most often used in qualitative research to select those individuals or behaviors that will better inform the researcher regarding the current focus of the investigation" (p. 172). My goal was to study community colleges in the midwest section of the United States that have been employing practices of acceleration and/or compression in developmental math. Since this study would require traveling to the sites for face-to-face interviews, I set a 250 mile radius from my residence as a maximum limit for travel. I studied school websites and spoke with various representatives to determine which schools were using practices of acceleration and compression in developmental mathematics, and I decided on four schools. To obtain as broad a perspective as possible, I ensured that two institutions consisted of an urban population and the other two consisted of a rural population. I excluded four-year institutions from this study as many four-year schools and universities have greatly decreased their offerings of developmental education (Jacobs, 2012). After designing my study and creating my interview questions, I sought Institutional Review Board Approval (IRB) for each school. I received IRB approval for three of the four schools.

> *Many academic experts are asking "What will happen to students who place into the lowest levels of remedial math, some of whom might test at third-grade level?"*

In further employment of purposive sampling, I focused on identifying faculty participants who have taught developmental math courses in an accelerated and/or compressed modality. My goal was to obtain a participant size of five to eight. This number was suitable enough for a small qualitative study that sought thick, rich data. With the assistance of the IRB personnel and the department chairs, I identified the faculty members who were teaching developmental math courses in an accelerated or compressed modality. I then emailed these faculty members to explain the purpose of my study, and I invited them to participate. Two faculty members in each of the three community colleges accepted the offer to participate.

Informed consent and confidentiality are two factors that must be addressed when conducting a study with human participants. According to Kvale and Brinkmann (2009), "Informed consent entails informing the research participants about the overall purpose of the investigation and the main features of the design, as well as of any possible risks and benefits from participation in the research project" (p. 70). I ensured my participants that only the professional transcribers and I would have access to the actual interview recordings and transcripts. I explained that the final report, which included raw data from the interviews, would be available to the public. Accordingly, I assigned all participants and each institution a pseudonym to protect their identities and address confidentiality. This pseudonym was used on all paper documentation (faculty demographics form) and during the interviews so that even the professional transcriber was not aware of the participant's true identity.

Study Settings and Participants

I studied three community colleges in the Midwest. Joe and Alicia were participants from Mallory Community College, a large community college in an urban setting. Joe and Alicia both hold master's degrees in mathematics. Alicia has taught developmental math as well as college-level mathematics for 12 years. Joe has taught developmental and college-level math for 5 years. Audrey and Lori were from Stafford Community College, another large institution in an urban setting. Audrey holds a master's degree in mathematics education and has taught developmental math at the community college level for 7 years. Lori holds a master's degree in mathematics and has taught developmental math at the community college level for 5 years. Lastly, Steve and Chrissy were from Davis Community College, a midsize community college in an area that is considered rural. Both Steve and Chrissy hold master's degrees in education; however, their bachelor's degrees are in mathematics. Steve has 4 years of experience teaching at the community college level whereas Chrissy has 5 years.

Mallory Community College (MCC) has been employing a practice since 2012 that contains elements of both acceleration and compression. Five, semester-long courses have been compressed into one course in a laboratory setting. This course covers content from prealgebra topics such as the laws of signed numbers to intermediate algebra topics such as solving compound inequalities. This course employs the software program, Math XL. The structure is self-paced, which allows for acceleration, but students must complete certain sections of the course to receive a grade of "satisfactory." Students may complete the material outside of class; however, there are 6 hours of mandatory contact hours each week in the laboratory. The design has become commonly known as a stacked format, which means there are students who are at multiple levels in the same laboratory, and the instructor circulates throughout and assists them one-on-one. In the stacked format, it is quite common for a student to be completing an assignment on signed numbers sitting next to a peer who is factoring trinomials. MCC offers students the choice of enrolling in this stacked course or registering in the courses that are lecture-based, and students are informed by their advisors that there are two different modalities and they can register for the one that they feel meets their needs.

Since 2012, Stafford Community College (SCC) has offered an accelerated format that consists of three self-paced developmental math classes exclusively in a laboratory setting using the software program MyMathLab (MML). Students work at their own pace while an instructor circulates to answer questions and provide assistance. The first course begins with operations of whole numbers and the exit course concludes with factoring trinomials. Like MCC, SCC offers these courses in a stacked format. Students must complete the requirements for one course before moving on to the next, and they must complete at least one course in a semester to earn a passing grade. However, if students complete a course early, they may begin the next one. SCC does not offer developmental math courses in a lecture-based format.

Davis Community College (DCC) offers a developmental math course exclusively in a compressed format. In early 2013, DCC compressed three, semester-long developmental math courses into a one semester course. This course covers content from operations with whole numbers to solving linear equations and is offered solely in a lecture-based format. DCC's approach is similar to the Start Program, employed in New York City, and the compressed courses offered at Bergen Community College. However, contrary to Bergen, DCC does not offer the alternative for students to enroll in a traditional developmental math sequence. The compressed developmental math course is the only option.

A major advantage of the standardized open-ended interview is that… the participants' time is used efficiently.

Data Collection Procedure

Prior to the face-to-face interview, I emailed a form to participants and asked them to answer background questions regarding their collegiate major and years of teaching experience overall and at their institution. Patton (2002) referred to these as background/demographic questions. My rationale for these questions was to garner information from which to create a profile of participants.

Face-to-face interviews were the primary data collection method. I utilized a standardized, open-ended interview. Patton (2002) articulated that standardized, open-ended questions are carefully worded and are very specific. Each participant received the same lead question in the same order. Patton has also referred to this as a structured interview. He argued that a major advantage of the standardized open-ended interview is that because the interview is highly focused, the participants' time is used efficiently. Each participant was asked a total of five lead questions and various follow-up questions and probes. My probes, however, varied based on the responses from participants. To ensure accuracy and allow verbatim transcription, each interview was audio recorded; however, I did take field notes during the interview process.

Method of Data Analysis

Upon completion of the interviews, recordings were professionally transcribed to ensure accuracy. I then began to read and reread the written information from the interview transcripts and, more importantly, to code the data. The overall method that I utilized to analyze the raw data was constant comparison. According to Merriam (2002), constant comparison is used to compare units of data that the researcher believes to be meaningful in order to generate tentative categories. I accomplished this

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by rereading both the transcripts, notes, and other insights while hand writing in the margins of the documents and on a blank page next to each page of interviews. My first reading was simply aimed at developing the coding categories or classification system. I then started the coding process in a more formal way and transitioned to sorting, searching for common threads and ideas across the memos and notes. This in turn allowed me to generate tentative categories with the common ideas that emerged across the data. I continued to engage in constant comparison until I reached a point at which no new insights and interpretations emerged from further coding. These tentative categories matured into the final categories, which are listed in the Findings section of this article.

Strategies to Ensure Trustworthiness

During the data collection and data analysis stages of this study, I employed various strategies to add to the credibility of the study such as reflexivity. "Reflexivity has entered the qualitative lexicon as a way of emphasizing the importance of self-awareness, political/cultural consciousness, and ownership of one's perspective" (Patton, 2002, p. 64). Ridenour and Newman (2008) suggested that researchers can engage in reflexivity by keeping a daily journal; therefore, I maintained a daily journal in which I reflected on my thoughts and feelings after each interview.

Member checking was another salient trustworthiness strategy that I utilized. Krathwohl (2009) specified that member checking involves asking the "study participants to read the researcher's report to determine whether it has portrayed them accurately" (p. 346). Therefore, after I constructed tentative findings, I contacted my participants via email, and I asked them if they felt that my conclusions were grounded in their responses. If any of my participants had not agreed that my conclusions were grounded in their responses, I would have re-examined my results and compared those findings again with my raw data. However, my participants concurred with my conclusions; therefore, I proceeded with reporting the results of my study.

After analyzing and interpreting the data, I engaged in peer debriefing. According to Merriam (2002), peer debriefing involves "asking a colleague to scan some of the raw data and assess whether the conclusions are plausible based on the data" (p. 26). I asked two colleagues to review my interview transcripts as well as my tentative findings. My peer debriefers did not have a background in developmental mathematics; however, they have completed qualitative studies that used interviews as the primary data collection method. The peer debriefers reported that the conclusions were indeed grounded in the data. They did, however, suggest that I remove some extraneous information.

Ridenour and Newman (2008) stressed the importance of transferability in a qualitative study. Transferability refers to the likelihood that the results of the study will hold up in another setting or situation. The reader must be able to judge this and come to a conclusion. I allowed my readers to do this by providing a thick, rich description of the setting and my findings. Merriam (2002) posited that providing a thick, rich description should allow readers to determine how closely situations match and whether findings could be transferred. Also, Krathwohl (2009) maintained that a researcher can provide a thick, rich description by including excerpts of raw data into the findings. In this study, I was able to provide a thick, rich description by using participants' voices to convey some of the findings.

In summary, a researcher must utilize various strategies to ensure overall trustworthiness in a study. Trustworthiness refers to the "truth value" of a study (Ridenour & Newman, 2008). In other words, the reader should be able to conclude that the results of a study are believable.

> *The faculty is split in opinions with regard to this teaching modality.*

Findings

Implementation Decisions

Implementing the courses that employ both compression and acceleration at Mallory Community College (MCC) was a faculty driven initiative. Joe elaborated "We had five semester courses and there was too much overlap. We had to do something for students who could get through the material quicker. The administration supported us, but it was definitely the faculty who wanted it." Both Joe and Alicia mentioned that the faculty who spearheaded this initiative became aware of it through attending regional conferences. Joe stated that that the faculty is split in opinions with regard to this teaching modality. However, the faculty who do not believe in the accelerated course in a laboratory setting do not teach it.

Audrey and Lori reported that the accelerated format at Stafford Community College (SCC) was driven from the administration. Lori explained. "We used to have face-to-face offerings for our developmental math classes. Then in 2010, our dean told us we had to implement this lab-based format." For 2 years, SCC offered developmental math courses in the traditional setting and in the lab setting. The transition did not go well. "It was terrible. Students didn't know they were signing up for a computer math class and were freaking out. They weren't learning anything. Our success rates were never that good, but they got worse with that class," said Audrey.

Both respondents from SCC asserted that their administration made a bad situation worse. "My dean and chair told us that in the fall of 2012, we couldn't offer face-to-face instruction anymore for our dev [developmental] math classes" explained Lori. She added, "We tried to tell them that this wasn't working and computer-based instruction does not work for everyone." Audrey provided her thoughts. "It was like talking to a brick wall. My dean kept saying 'the state wants us to accelerate students more, and you have to make it work'. He also kept saying other schools were doing it [providing accelerated learning] and it was working, so it should work for us."

Similar to SCC, Steve and Chrissy reported that the compressed format at DCC for their developmental math course was an administrative driven initiative. Chrissy explained, "It was early in the 2012-2013 academic year; our provost and dean told us our developmental math course sequence was too long and we had to shorten it to one course, and we had to start offering this course the next year." Steve added, "We tried to talk them out of it. Our students were having a hard enough time learning the content when it was spread over three semesters. How were they gonna learn it if it was all crammed into one?" Both participants mentioned that their administrators reported that the rational for this change was that other schools had witnessed increased overall completion rates by compressing their developmental math course sequences.

Best Fit for Acceleration and Compression

Student comfort with computers. All of the participants, who teach in a computer setting, agreed that for an accelerated class that employs computer software, prior comfort with computers is imperative. Lori (SCC) provided her thoughts. "This can work for the students who are comfortable using the computer. If they have strong Internet skills, there is a less of a learning curve with the mathematical software." Joe (MCC) elaborated "If just the notion of a computer freaks you out, this is not the course for you. But my gut feeling is that in 2014 most students are comfortable with the computer." Audrey's (SCC) experiences, however, have contrasted with Joe's.

> We get students who have been out of school for over 30 years and they are scared to death to take a math class. The first thing they see is a computer, and they go into full blown panic. I've had students that can't even use

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> a mouse, much less register for the math software, much less do math on the computer.

Incoming skill level. The participants concurred that incoming skills level plays a pivotal role as to whether a student is a proper fit for an accelerated or compressed model. Joe commented on the compression of the course at MCC. "For some students, they learn the material better because it's in a shorter amount of time. It's not as drawn out and they can concentrate more. I would say these are the stronger math students." Steve (DCC) explained: "There are a small number of students who had a bad day on the placement test or maybe just have some gaps, and that's how they got into a dev math course." Steve noted the progress of these students. "These students were generally bored when we had three dev courses, and they do pretty well now with one course. It's more challenging to them, and they're happy to get through it faster." Alicia (MCC) agreed." For whatever reason, some students placed poorly, maybe because they were out of math for a long time, but they were always good at math, and then they fly through the material."

Other participants noted the challenges when students lack basic math skills. "I have students who can't even add or subtract, and in 15 weeks, I'm supposed to get them to understand solving linear equations" explained Chrissy (DCC). Both Chrissy and Steve noted that there is a great deal of attrition in the compressed course at DCC from some of the weaker students because they simply can't keep up with the material. Steve elaborated. "I have a student who can't do long division sitting next to a student who is trying to brush up on linear equations. How am I supposed to teach with that big of a mix?"

Learning style. A few of the participants noted that individual student learning style plays a pivotal role in determining whether or not students are a fit for an accelerated or compressed model. This is especially true when comparing a traditional lecture course with a self-paced course—delivered in a computer laboratory—which allows for acceleration. Audrey (SCC) commented. "Some students, who are on the high end with their math ability, do really well. They have a good understanding of the basics so they can take off and work on their own." Audrey added: "They still need help; so they appreciate us working with them one on one, but they get it quickly. Then, they can just do practice problems on the computer. They just work well independently." Joe (MCC) gave his thoughts: "Some students simply like to work quietly on math rather than sit in a classroom and follow a lecture. The lecture would be boring for them and they might drop out." Lori (SCC) provided an insight to students on the other end of the spectrum.

> Learning math in a lab just isn't for everyone. When we first started offering these classes, we would get students who wanted to go into a traditional lecture class. They either had weaker skills or just needed a live person explaining the material. It's not always the weaker students. I've had strong math students who simply learn better in a traditional classroom. Now that we don't offer lecture classes anymore, we're not being fair to all of our students. We're not accommodating all learning styles.

Audrey (SCC) provided more thoughts.

> Some students benefit from sitting in class and taking detailed notes while the instructor explains everything step by step to develop a solid foundation. Most of all, they need structure. In the lab, I sometimes feel like I'm running around giving these fast explanations on problems; they really aren't learning it.

"I've had strong math students who simply learn better in a traditional classroom."

MCC offers students the choice of taking lecture-based classes that are spread out over 5 semesters or a compressed course in a laboratory format that allows students to accelerate through their developmental math sequence. Both Joe and Alicia feel that schools should offer students these choices. Alicia elaborated. "I don't think this [lab-based courses] is gonna go away, but I think students should still be given the choice of a traditional class. Some students learn math better in a lecture format, and that's fine." Joe added: "All students learn differently, and we have to accommodate that."

Instructor comfort level. Several of the participants remarked on the importance of instructor comfort level in relation to the successful implementation of acceleration and compressed learning modalities. Alicia (MCC) commented on teaching in a computer laboratory. "It's very much like a facilitator role. As the teacher, you're going around having conversations with the students and helping them. I happen to enjoy that." Joe (MCC) agreed. "You have to like interacting with students all the time. I like it because I can be more personal with the student, but some people consider it too chaotic because it doesn't have the structure of a traditional classroom." Alicia added "I think some instructors shy away from teaching in this format because it's foreign to them." Lori (SCC) provided her thoughts:

> My strength as a teacher has always been as a lecturer in the classroom. I've always given really good notes, and it's more than that. I always liked to bring different activities and even some math games into the classroom to help them learn. Students used to comment on that in my evaluations. That is who am I am as a teacher. I can't do that in a lab. I just walk around and answer questions. It's a shame.

Audrey (SCC) added. "It's like the administration doesn't care about us being good teachers. Other schools are doing this type of thing, so we have to do it."

Future Impact of Acceleration and/or Compression

I asked each of the participants to comment on whether they believed that the practices of acceleration and compression helped or hindered student success in higher level mathematics. Alicia (MCC) gave her thoughts. "I would say the students who made it through the accelerated course do just as well if not better. They learned how to work independently and they got lots of practice." None of the other participants teach courses beyond developmental mathematics, and all reported that at DCC and SCC, data have not been gathered to assess whether students are more successful in college-level mathematics since the implementation of the compressed and accelerated modalities.

Overall Thoughts

Toward the end of the interview, I asked the participants to provide some collective thoughts regarding the practices of acceleration and compression in developmental mathematics. Most of all, I asked the respondents to comment as to whether they felt these practices should continue in the field. All of the participants asserted that these were valid practices but had limitations. Chrissy (DCC) explained. "This [the compressed format] works really well for some students, but it's totally unfair to so many other students." Steve (DCC) added.

> We have some students that simply have gaps in their math knowledge, and they don't need as much instruction, but we also have so many low level students, and it's not fair to push them this far. We also have students who need to spend more time on certain topics. We could do that over three semesters; we can't now, and it's not fair. People have to understand that math is linear. If you don't know how to add or subtract, you can't do order of operations and word problems. If you

don't understand signed numbers, you can't evaluate expressions or solve linear equations.

Other participants provided some final comments on the accelerated format modality in the laboratory. "I don't think we'll ever go back to just lecture. There are a lot of students moving through quicker, but I think we need to give students a choicem," commented Alicia (MCC). Joe (MCC) agreed. "I, personally, think most students at my school are better in the accelerated format, but I still wouldn't say it's for everyone." Lori (SCC) provided her thoughts.

> The funny thing is that the purpose of the computer lab was to accelerate students. Our data show that students aren't really moving through their dev math courses any quicker than when we offered lecture classes. I mean there are a few who finish early, and that's good. So why can't we go back to the lecture classes and only offer the accelerated model for those who are deemed a good fit?

Both Lori and Audrey (SCC) expressed concern that the structure of the computer lab can hinder basic organizational skills. Lori elaborated. "Dev math students come in with terrible organizational skills. When it comes to simplifying order of operations or solving linear equations, you have to have a structured step by step process and they don't have that." She added. "That's often why they fail. It's not that they don't get it; they just don't work the problem in an organized way, and then they shoot themselves in the foot."

Discussion

The Proper Fit for Students

This study's findings indicate that the practices of acceleration and compression may be a best practice for some students. According to the participants in this investigation, students who most often succeed in an accelerated course in a laboratory setting demonstrate a high comfort level for computer software. These students also work very well independently and seem to be highly motivated. The practices of acceleration and compression may also be a better match for the higher-end developmental math student. These students may already have an understanding of some of the required material but contain small gaps in their basic math knowledge base. Such students also have strong number sense. Specifically for the compression of developmental math courses or sequences, the results from this study mildly coincide with those of Sheldon and Durdella (2010) and Woodard and Burkett (2010) in that some students benefit from a compressed course. However, for both acceleration and compression, the participants in this study noted that these were developmental math students who work independently, are motivated, and have a more highly developed skill set.

"Our data show that students aren't really moving through their dev math courses any quicker than when we offered lecture classes."

It is also apparent from this study's findings that acceleration and compression are not a universal best practice for all developmental math students. These practices are not ideal fits for weaker developmental math students. Furthermore, these conclusions align with the concerns reported by Mangan (2014) that the increased practice of acceleration and compression marginalizes the needs of weaker developmental math students. The results from this study also indicate that traditional lecture-based instruction should not be omitted. There are developmental math students who may prefer and who have more positive learning experiences in this modality. The traditional

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lecture-based class also allows instructors the freedom to employ a wide variety of best practices such as collaborative learning and other mathematical activities that enhance student learning.

Implications

When contemplating the practices of acceleration and compression, college leaders and developmental math faculty members should consider employing a cultural audit (Whitt, 1993). Specifically, a cultural audit studies both the espoused and underlying beliefs and values within an organization. A cultural audit can give a better indication as to whether a suggested practice is a proper fit for a group of developmental math instructors and their students. Oftentimes college leaders and developmental math faculty learn about novel ideas and practices from studying the various ways that acceleration and compression are being employed in other institutions. Before implementing any new practices, however, they should employ the cultural audit.

There are several ways to conduct a cultural audit. College administrators and developmental faculty can conduct interviews with students and faculty to gain perspective as to whether a proposed practice is a suitable fit. Administrators and faculty could also administer written needs assessment surveys to students and faculty to determine whether a proposed practice fits a specific need. The question that college leaders and faculty must ask is: Which practice(s) is the best fit for our specific group of students? After extensive research, with a massive amount of faculty input, schools can then begin to pilot some of these practices on a small scale. This will help determine if such practices are a suitable fit for the specific institution and if changes are needed.

As institutions prepare to implement practices of acceleration and compression, college leaders and faculty should examine the student characteristics that best fit each practice or modality. For example, if a school is preparing to implement an accelerated modality in a computer lab, one that is similar to the practices at Mallory Community College (MCC) and Stafford Community College (SCC), college leaders and faculty must ask: What kind of student best fits this practice? Each school must determine the specific student characteristics that fit each modality. Faculty should then work with the school's academic advisors and counselors to ensure that students are placed properly. Students should be completely cognizant of the various types of learning modalities of developmental math courses when registering. In summation, the findings from this study align with Boylan's (2002) suggestion that students should be properly screened before being placed into an accelerated or compressed modality.

Respecting Faculty Input and the Placement of Pedagogy over Politics

This study's findings have indicated that in some institutions, administrators are clearly not respecting faculty input and expertise. These findings align with Mangan's (2014) report that the overall input of developmental math instructors is being bypassed. The participants from both SCC and DCC articulated to their administrators that the accelerated and compressed formats were not suitable for all students and were hindering student learning in some cases. At SCC, the dean instructed the instructors to continue to employ these practices due to pressure from the state, and administrators from both SCC and DCC stressed that it was important to keep pace with other schools that were employing acceleration and compression. The responses from the participants suggested that these school's administrators prioritized the possibility of obtaining more state funding and the overall image of the institution over the academic needs of students. In summation, the findings from this study suggest that the administrators at SCC and DCC placed politics over sound pedagogy. Hanson (2003) defined politics as the competition for resources. More specifically, if a person is acting in the interest of politics, he or she is doing what is necessary to obtain various resources (i.e., funding).

> *Students should be completely cognizant of the various types of learning modalities …when registering.*

It was also evident that that when the new initiatives of acceleration and compression were faculty-driven, as opposed to being imposed by the administration, the implementation process was more seamless and morale was higher. More specifically, at MCC, it was the faculty who decided to implement the accelerated and compressed course, and the feedback from faculty, with regard to student success, was largely positive.

As Mangan (2014) reported, legislators are becoming increasingly anxious about the number of developmental math courses incoming students must take. This study's findings suggest that bypassing faculty input is not beneficial to student success. Instructors have the most interaction with students and are experts in their respective fields. Therefore, developmental math instructors should have final say in decisions that relate to developmental math practices. In conclusion, institutions must place sound pedagogy over politics and offer the modalities that best fit the learning needs of their specific group of students.

Ideas for Future Research

The practices of acceleration and compression in developmental mathematics should be studied further. Mangan (2013) mentioned that some individuals are concerned that if developmental math students are accelerated through their coursework too quickly, they will falter. In this study, the participants from MCC reported that developmental math students who were accelerated are performing well in their college-level math courses. These findings align with those reported by Epper and Baker (2009). It is noteworthy that students from MCC enroll in an accelerated course by choice and therefore, may be the stronger math students. However, no information has been gathered for the students in college-level math who participated in accelerated and compressed models at SCC and DCC where developmental math students are not given a choice. Therefore, more information should be gathered regarding the progress of students in college-level mathematics courses who successfully completed accelerated and compressed developmental math sequences and also which students withdraw or fail. Researchers could conduct quantitative studies that employ a group comparison method. The success rates of students in college-level mathematics courses could be compared to those who successfully completed an accelerated or compressed sequence and those who successfully completed a traditional sequence in developmental math. The purpose of this study would be to determine if acceleration and compression in developmental math helps or hinders students in college-level math.

Institutions that offer a choice between the acceleration/ compression model and a traditional course sequence should consider piloting a screening process and collecting data on the outcomes. Students could be placed into a specific modality based on specific characteristics. More specifically, institutions should conduct internal research to determine the characteristics of a student who is a candidate for a specific accelerated or compressed course. The purpose of this study would be to establish if placement based on specific characteristics into an accelerated/compressed course or a traditional course impacts student success rates.

Conclusion

There have been statistics that suggest that lengthy developmental math sequences can negatively impact college completion rates. However, these reports and conclusions only paint part of the picture. The findings from this study indicate that some students may be a proper fit for acceleration and compression. Conversely, there is a significant subset of students whose needs may not fit these delivery models. These students profit from a traditional lecture-based class. The bottom line is that the discipline of developmental math consists of an extremely heterogeneous student population. Although acceleration and compression may be best practices for some students, neither modality is a universal best practice. Therefore, institutions should consider offering a wide variety of modalities for students, and, more importantly, students should be properly screened before placement in order to facilitate their success. This must be done to retain a greater number of students and to assist these students successfully complete developmental mathematics and ultimately achieve their college goal while concomitantly addressing concerns of administrators and legislators (Mangan, 2014).

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