

NADE Members Respond:

Improving Accelerated Developmental Mathematics Courses

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The acceleration of developmental mathematics instruction is a current trend in the field of developmental education. This report on a survey of practitioners reveals the challenges in teaching accelerated models of developmental mathematics courses and garners recommendations for improving the practice. Responses were elicited from faculty teaching developmental mathematics in two- and four-year colleges. Survey results offer input from those already involved in the practice and are intended to benefit practitioners and administrators engaging in reform applying to accelerated course delivery models.

Purpose of the Study

More than a decade ago, Boylan (2004) made a case for accelerating the developmental education process. He described a model of improved student placement and integrated support interventions that would move students to college-level courses more quickly. More recently, there has been a substantial push to accelerate the instruction and delivery of developmental mathematics courses. Jaggar, Edgcombe, and Stacey (2014) described some benefits of accelerated course models. The shorter structure reduces the potential student withdrawal points from a sequence of developmental education courses and speeds up the pace at which college skills are developed. However, these interventions require careful thought, design, and implementation. The faculty that are teaching these types of courses would likely offer important insight in these areas.

The purpose of this research was to gather feedback from instructors in order to learn from their experiences with accelerated mathematics instructional reform. Cafarella (2016) described a negligence with regard to considering faculty input when reforming and accelerating the delivery of mathematics instruction. This work should, in a small way, address that particular gap. The participants were surveyed as part of their involvement in professional development activities with the National Association for Developmental Education (NADE). The results may offer benefits to college faculty, researchers, and reform advocates as they work to improve the delivery and performance of developmental mathematics courses.

Review of the Literature

Venezia and Hughes (2013) have described the reasoning and a few methods for accelerating developmental education courses. The goal is to reduce the amount of time students spend in skills preparation courses and move them more quickly to courses that count toward earning credentials. Sequences of multiple developmental education courses are described as problematic due to high withdrawal rates. Research shows that failure to enroll, failure to pass, and high withdrawal rates all contribute to a majority of students never completing a multilevel sequence of developmental education courses (Bailey, Jeong, & Cho, 2009).

Accelerated Course Structures

Accelerated mathematics course structures differ across institutions. Some common structures are modularized, contextualized, compressed, and corequisite models. Modularized courses have content that is broken into discrete learning units that focus on particular skills (Venezia & Hughes, 2013). These models are reliant on accurate and precise diagnostic skills assessment

in order to identify the specific competencies of individual students. Challenges of this model include a curriculum that may appear “disjointed” (Venezia & Hughes, 2013, p. 41) and a self-pacing component that may be problematic for students lacking effective time-management skills.

Contextualized courses are learning experiences designed with career-related content (Arnold, 2010). In developmental mathematics,

this type of content is combined with the instruction of basic academic skills. The goal is to make learning relevant to life and to model the application of skills in workplace scenarios.

Compressed courses shorten the length of time for skills development by reducing redundant content in a curriculum. This can be further supported by aligning a course with a specific field of study and/or combining and pairing courses (Venezia & Hughes, 2013). The time commitment for compressed courses is shorter than the traditional semester format.

Corequisite course models are structured to allow students to enroll in a college gateway math course while simultaneously providing remedial-level academic support. Belfield, Jenkins, and Lahr (2016) describe this model as one that enhances student motivation as students are more rapidly engaged with college-level content, as opposed to beginning math skills development within a sequence of remedial courses. The structure may also promote more effective alignment of targeted academic support services with the content of the course.

Accelerated Mathematics Studies

Cafarella (2016) characterized the state of scholarly opinion on the practice of accelerating developmental mathematics as one of “mixed and opposing opinions” (p. 13). He noted literature that described challenges with regard to appropriate student placement, place in accelerated courses that moves too quickly for students, and outcomes that lead to a wide variation in student preparation for college gateway courses. Cafarella’s (2016) qualitative study focused on faculty views of accelerated developmental mathematics courses. The faculty offered mixed opinions of accelerated models but supported the view that reform should be faculty driven rather than mandated from the administration. A primary consideration asserted was that students be assessed for their preparedness to proceed in learning math skills at a faster pace. These models also rely heavily on technology-based instruction. It

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was therefore recommended that students be assessed for familiarity using computer technology and, if needed, appropriately acclimated in doing so.

Guy, Cornick, Holt, and Russell (2015) described the redesign of a mathematics skills course at a large urban community college. The intent was to reduce the length of the course from a semester to 4 weeks and to change the classroom focus to problem solving rather than instructor lecture. They reported student achievement gains in this accelerated model; however, longer term gains in persistence and preparation for next-level remedial courses were not attained.

Method

Population and Sample

Participants of this study were developmental mathematics faculty recruited through two venues: the NADE 2016 Math Summit and the NADE Mathematics Special Interest Network (SPIN). The NADE administration provided mailing lists for both groups. Researchers compared the two lists to be sure that an individual was not counted twice in the overall population because of being a member of both the NADE 2016 Math Summit and the SPIN.

An online survey aimed to identify challenges encountered and to garner recommendations for improving student outcomes when teaching accelerated developmental mathematics courses.

The survey was sent to a 523 individuals. The first question required participants to indicate whether they were teaching accelerated developmental mathematics or not at the time of the survey. This ensured that analyzable input was only collected from those who were currently teaching. Of 137 responses received at the closing of the data collection window (26.2% response rate), 77 participants indicated that they taught accelerated developmental mathematics, representing 14.7% of the targeted population. Those who indicated that they did not teach accelerated developmental mathematics did not get access to the full survey ($n = 42$, 8% of total targeted population). There were 18 incomplete responses. These respondents had completed only questions related to faculty characteristics. Only the completed responses from the 77 participants teaching accelerated developmental mathematics at the time of the survey were analyzed. The final sample was comprised of 71 full-time and 6 part-time faculty teaching at two-year ($n = 61$) and four-year ($n = 16$) colleges in the United States. The majority was female (83%).

Instrument

An 11-item online survey instrument focused on faculty characteristics and various aspects of accelerated mathematics implementation was developed by the researchers. The survey was pilot tested and minor modifications were done before sending it to potential participants. For example, in the original survey, the term “redesigned mathematics” was used, but after receiving feedback from field practitioners, “redesigned” was changed to “accelerated” to avoid misunderstanding.

Two survey items were the focus of this report. Participants were asked to list: (a) up to three challenges they had encountered in their accelerated math courses, and (b) up to three recommendations for improving student outcomes in accelerated developmental mathematics. Both questions were open-ended and generated qualitative data.

Data Analysis

Qualitative responses from the online database were transferred to Microsoft Excel for data analysis. For both questions in the study, participants were asked to provide at least one, and up to three answers. Responses to the

challenges encountered in accelerated mathematics courses generated 179 data points and 158 data points were obtained from responses to the recommendations for improving student outcomes in accelerated mathematics courses. Constant comparison analysis (Glaser & Strauss, 1967) was used to analyze and code the data. As a result, 14 themes emerged for challenges encountered in accelerated mathematics courses, and 9 themes emerged for recommendations for improving student outcomes in accelerated mathematics courses. Themes were sorted by frequency to identify the top three recurring themes for each item.

Results and Discussion

Participants noted that various modes of accelerated mathematics courses were offered at their institutions. The compressed model was the most commonly offered type of accelerated mathematics (36%), followed by modularized (25%), corequisite (18%), and contextualized (9%). Nine faculty members (12%) indicated that more than one mode of accelerated mathematics was offered at their institutions.

Top Three Challenges Cited by Instructors

Attendance. The top ranking challenge noted by participants was student attendance. Respondents elaborated with the following statements:

- Poor attendance kills grades when there is only 8 weeks to a course.
- Students who miss a couple weeks miss 25% of the course and fail.
- Students who either have the credit-bearing course with another professor or who are not doing well do not attend the support class.
- Mandatory attendance would help with solidifying math knowledge.

Higbee, Schultz, and Goff (2006) reported disagreement among faculty about attendance policies in developmental education. However, Higbee and Fayon (2006) have reported that student absenteeism is substantially higher in developmental courses with no attendance policy. Boylan (2002) advocated for making classroom and program expectations clear to students. At a minimum, it seems that students enrolling in accelerated mathematics courses need to be keenly aware of the importance of attending class.

Pace. The second highest ranking challenge cited by participants was the pace at which accelerated courses proceed. Respondents offered the following details:

- The pace is too fast for some students.
- Students are sometimes unable to keep up with homework since it is assigned daily.
- The session goes quickly and students who take a while to adjust to school get a slow start and have trouble finishing the course.
- The faster pace tends to put students on the defense.
- Working at an individual pace, students often fall behind causing a struggle to catch up with the material.

These findings are in line with a recent study on modularization in developmental mathematics in Virginia and North Carolina, where pace has been cited as a challenge by both instructors and students (Bickerstaff, Fay, & Trimble, 2016). Because there are different delivery formats for accelerated developmental mathematics (e.g., teacher-centered, computer-aided, etc.), Bickerstaff et al. (2016) have recommended to “match students to the

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optimum delivery format” (p. 35). Some students might do well in computer-mediated environments. Others lacking time management skills may need more guidance from teachers in order to make sufficient progress and not fall behind.

Student Learning. The third highest ranking challenge was a concern about the efficacy of courses as they relate to student learning. The commentary consisted of the following:

- Students do not have time to really digest material sufficiently for mastery.
- Students have a difficult time juggling the workload for the two courses and in keeping up with the rules, assignments, and expectations for each.
- The retention of knowledge for students in these courses can be very short.
- Students who take the course a second time do not seem to have remembered anything from the first time. They have to work through the same units again which is frustrating.

Several of the accelerated math instructional models appear to be steeped in Bloom’s (1968) Learning for Mastery. Regarding the time variation for mastery of content, Kulik and Kulik (1991) interpreted Bloom’s notions to mean that weaker students need more time to reach proficiency during early stages of course delivery. However, once they experience success, and subsequently develop confidence, they will not need as much time to advance further. Therefore, it seems the initial placement and early stages of accelerated courses are key. If students are not allowed adequate time early on to achieve mastery and build confidence, it may hinder their progression to achievement in later stages of the course.

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Top Three Recommendations Offered by Instructors

Instructional considerations. The top recommendation was broadly categorized as instructional considerations. Participants offered several concrete ideas. The more popular items were:

- Less lecture and more problem solving time (and not just on the computer) is needed.
- Ensure that the content is necessary. Some math concepts are de rigueur, but not tied to next level courses. These can be eliminated to reduce the overwhelming content load.
- More than one section from the typical text needs to be taught per day to accelerate. This can overwhelm students. Rewrite lessons into one worksheet per day so students do not realize they are doing so much work.
- Apply frequent formative assessment.
- Apply cooperative learning and make time for small group work.
- Set hard due dates, create well-structured classes, and make expectations clear.
- Do not “dumb down” the material for the sake of speed.

These are of course, anecdotal, but many are consistent with principles of effective teaching documented in the literature. For example, Hudesman et al. (2013) reported positive outcomes for students who were enrolled in developmental mathematics courses that incorporated a formative assessment program with a self-regulated learning component. Based on quantitative and qualitative data analysis on accelerated modularized mathematics courses, Bickerstaff et al. (2016) suggested the use of strict deadlines and clear instructions, especially for computer-mediated accelerated courses. The recommendations also align with Boylan’s (2002) suggestions regarding

the application of varied modes of instruction and a decreased emphasis on lecture.

Advising. The second highest noted recommendation affirmed the importance of advising as it relates to placing and supporting students in accelerated classes. Respondents offered the following advice:

- Mentor students in helping to plan their accelerated class work schedule.
- Make sure students are properly advised as to the pace and class expectations.
- Advise students of the need to devote more time to a compressed course.
- Offer orientation with a realistic portrayal of the time and effort needed to succeed.

The importance of advising with regard to placing students in appropriate developmental education interventions has been noted by Saxon and Morante (2014) and Boylan (2009). Furthermore, advising lower-skilled students about connecting to the college community and support services is important to their success (Arnold, 2010). This study shows that faculty believe advising plays a central role in speeding up the development of student math skills. Advisors can be helpful in communicating the expectations of accelerated courses and in connecting students with academic support opportunities.

Accurate Placement. The third ranked recommendation was to ensure appropriate placement of students into accelerated courses. Respondents elaborated with the following commentary:

- Appropriate placement—acceleration is good for some students, but not all.
- Check student readiness via placement test, transcripts, and/or other placement criteria.
- Placement decisions based on motivation to succeed in accelerated courses.
- Encourage students to study before the placement test so they place as high as possible.

Saxon and Morante (2014) have described the components and principles of a quality student assessment and placement system. Such a system is necessary to support academic standards and student success. The option of accelerated courses and the intense pace at which they proceed calls for an even greater need for meticulous student placement into appropriate interventions.

Conclusions

Though accelerated courses show promise for some groups of students, it is unlikely that they are a panacea. Respondents have made this point when opining on the speed at which accelerated courses typically proceed. The finding regarding appropriate student placement into accelerated courses affirms this notion as well. It is also apparent that faculty believe in the importance of strict attendance policies in accelerated math courses. The importance of advising to the effectiveness of these course structures is also revealed.

As noted, this study garnered the opinions of practitioners charged with the delivery of accelerated mathematics courses. Generally, no particular trend in seeking faculty input regarding the reform and practice of developmental education has been revealed. As a matter of fact, quite an opposite trend has occurred. A *Chronicle of Higher Education* reporter noted that with regard to legislatures, underprepared students, and college completion goals: “... many are no longer content to defer to faculty members on academic matters”

(Mangan, 2014, p. 1). With regard to developmental education reform and underprepared students, educators should be careful not to hold a myopic focus on acceleration for the purpose of college completion. Student learning is the goal. Periodic measures such as persistence, retention, and graduation will provide outcome data related to that goal.

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