

# Developing Compressed Beginning and Intermediate Algebra Courses

By Sylvia E. Walker



The high number of students needing remediation presents many challenges to postsecondary institutions and the students they serve. Students in developmental classes are often overwhelmed by failure, increased debt, and no credit for these courses on their transcript, which often leads to a downward spiral of giving up. Many students struggle to pass their mathematics courses; therefore it is necessary for institution to do all they can to help students be successful in their mathematics coursework.

Research consistently shows that many students (approximately 50-75%) enrolling in postsecondary two-year institutions have deficits in mathematics. Nowhere in the community college curriculum is this failure rate of more serious concern than in developmental mathematics courses (Merseth, 2011). Beginning algebra has become notorious because of its high failure and withdrawal rates. Developmental courses that were once looked upon as the golden ticket for entrance to further educational opportunities are now considered major hurdles for many students; an unacceptable number of students are unsuccessful in passing their developmental mathematics courses.

Based on the annual report presented to the New Mexico Legislative Education Study Committee (Winograd, Dasenbrock, & Garcia, 2010), approximately 40% to 48% of high school graduates attended New Mexico public colleges and institutions, equaling a total number of 9,713 students in 2008-2009. Of this number, approximately 37% took remedial classes in math. Of the students who entered college in the fall of 2003 and needed no remedial courses, 46% of those students obtained a degree or certificate within 6 years. The percentage of students who entered college at the same

time but needed one or more remedial courses who obtained a degree or certificate within 6 years was 25%. The report also showed that the more remedial courses students needed to take, the lower the percentage of those obtaining degrees or certificates (see Figure 1). Over the past 5 years at New Mexico State University-Alamogordo (2013; NMSU-A), the pass rates in Algebra Skills have increased, and the pass rates in Intermediate Algebra have decreased.

## Purpose

The purpose of this project was two-fold. First, it would provide an opportunity for students to complete the developmental math course sequence more quickly, thereby enabling students to proceed to a college-level mathematics course sooner. To accomplish this, the classroom was designed with computer-assisted homework courses that blended beginning and intermediate algebra into two, 8-week piloted courses. Second, by using a combined beginning and intermediate algebra book, the students repetition of previously learned material was reduced, thereby enabling more class time for the new material in Intermediate Algebra.

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*An unacceptable number of students are unsuccessful in passing their developmental mathematics courses.*

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## Method

### Demographics

NMSU-A is a two-year community college campus dedicated to meeting the needs of a diverse community. Although some students continue to value the long established core courses, others seek alternatives to the traditional liberal arts education. In 2011, the seat count in the college's mathematics courses was approximately 2,400, and, of these, a little over 1,000 were in developmental mathematics courses.

### Procedure

From a population of approximately 130 students who would have been eligible to take the compressed Algebra Skills and Intermediate Algebra courses, only seven students enrolled. The advantage of a small class was more one-on-one help could be given, and the disadvantage of such a small class was the small  $n$  for the data collection represented a small percentage of the total number of students. These classes met four days a week, which provided daily reinforcement and did not reduce the time students were in class as compared to the 16-week classes meeting twice a week.

## Objectives and Results

The project's objectives covered multiple levels. They covered the administrative and curricular aspects of setting up and implementing the program. To evaluate its impact, parallel assessments were created and student performance compared.

**Objective #1.** To work closely with advising to determine which students would benefit from compressed Algebra Skills and Intermediate Algebra courses.

**Results for Objective #1.** The meeting with the advisors during the fall semester was well received with enthusiasm for the compressed courses. Advisors asked many questions about the courses and were excited that students would be ready for college-level algebra after a single semester. Unfortunately, the fall semester brought illness and advisor turn-over to their department, so the support and student placement in the compressed courses was not as strong as originally anticipated. The main source of informing and encouraging students to enroll in the compressed Algebra Skills and Intermediate Algebra courses was the current Pre-Algebra instructors. Twelve

common final was not as straightforward. To develop a common Intermediate Algebra final exam, all instructors, while keeping the course objectives in mind, chose 15 to 20 questions from their previous chapter exams. Out of these questions, they selected 25 questions for the common final exam.

**Objective #4.** To compare final exam scores of the compressed classes to the semester-long Algebra Skills and Intermediate Algebra classes to determine the relative proficiency of these two groups of students.

**Results for Objective #4.** The pass rate on the Algebra Skills final exam for the compressed class was 85.8% as compared to 79.8% for the 16-week course. The overall course pass rate in the compressed Algebra Skills class was 85.8% as compared to 76.5% in the 16-week class. The pass rate on the Intermediate Algebra final exam for the compressed class was 66.7% as compared to 59.1% in the 16-week class. The overall pass rate in the compressed Intermediate Algebra class was 83.3% as compared to 73.5% in the 16-week class.

## Discussion of Benefits

There were several potential benefits to this study that came to fruition throughout the course of the semester. The most obvious benefit was that the

compressed courses reduced the time needed in developmental math courses and allowed students to take college-level mathematics courses much sooner without jeopardizing learning the necessary subject material. Another benefit of the compressed Algebra Skills and Intermediate Algebra courses was that by moving immediately into the next class a more efficient transition was created for the students. Because the compressed class used a combined beginning and intermediate algebra book, there was no repetition and it was possible to pace the compressed class at one section per day; the 16-week classes had to cover at least two sections per day because of the amount of repetition in the book. Repetition consisted of solving equations, graphing equations, and solving systems of equations.

A third benefit to this study has been that by using a combined algebra book, a pedagogy of spiral curriculum is easily put into practice. A key feature of spiral curriculum, based on Jerome Bruner's work (Johnston, 2012), is that as students revisit a topic, their complexity of understanding of the topic increases. The information is reinforced and the logical progression from simpler concepts to more complex concepts has a smoother transition.

Last, but definitely not least, a fourth benefit of the compressed course is the abbreviated time investment. By reducing the time needed to complete necessary courses in the developmental math sequence, overall retention of students may improve and lead to earning a college certificate or degree sooner. Previous research has supported this contention. Results from Bragg, Baker, and Puryear (2010) suggest that a compressed curriculum can facilitate progression through the developmental curriculum at a pace that allows between 40% and 65% of students to demonstrate success on college success measures such as retention, transfer, and graduation. Sheldon and Durdella (2010) report that students were more successful and less likely to withdraw from classes in compressed versus regular-length courses.

## Recommendations

Brothen and Wambach (2012) state that developmental education is one of the most difficult teaching challenges and needs to be rescued from its second-class status. Opponents of developmental education argue that these courses are ineffective and a waste of resources, yet those who teach developmental education have experienced success. Developmental education is a good investment and educators need to continue efforts to improve it and demonstrate the value and importance of developmental education.

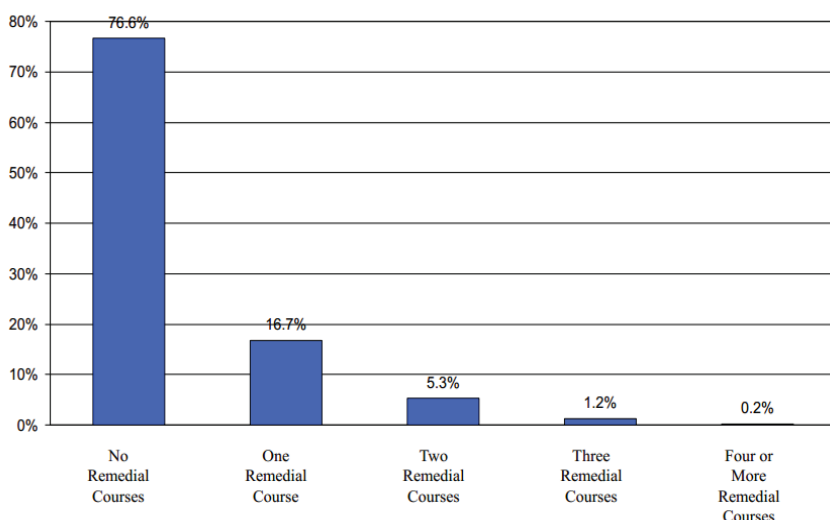


Figure 1. Percentage of students who entered college in Fall 2003 and who earned a Bachelor's Degree within 6 years by number of remedial courses taken during their freshman fall (2003) semester ( $N = 2,155$ ). Reprinted from *Ready for college 2010: An annual report on New Mexico High School graduates who take remedial classes in New Mexico colleges and universities*, by P. Winograd, R. Dasenbrock, & V. Garcia, 2010.

students had enrolled in the two compressed courses, but the beginning of the spring semester began with only seven students in the class. Of these seven students, all remained in the course throughout the 8 weeks.

**Objective #2.** To work with math faculty to develop the curriculum, syllabus, and course for compressed Beginning and Intermediate Algebra courses.

**Results for Objective #2.** The math faculty was excited and was willing to help develop the curriculum and syllabus for the beginning and intermediate compressed courses so that they would parallel the same topics covered in the 16-week courses. Since different books were used for the compressed courses than for the semester-long courses, the focus was on aligning the topics to ensure all of the course objectives would be met. The main difference was the course schedule: which sections were covered during each class, and when quizzes and exams were given.

**Objective #3.** To give the same final exam as the semester-long Algebra Skills and Intermediate Algebra classes.

**Results for Objective #3.** Because the compressed Algebra Skills and the 16-week Algebra Skills classes used books by the same authors, it was a simple process to use the same chapter exams as well as the same final exam. Intermediate Algebra classes' books were by different authors, so achieving a

My first recommendation is to stress with college administration the importance and necessity for faculty training and professional development in the field of developmental education. As educators, it is our responsibility to learn different approaches to redesigning curriculum in order to benefit students. Nolting has stated that developmental students need a multimodality instructional approach (Boylan, 2011), which means integrating the lecture with manipulatives, math study skills, and group work; learning math vocabulary words; using web-based support; tutoring students based on their learning style; and giving frequent quizzes and practice tests. Educators need to be willing to move out of their 'comfort zone' and find out what works best for students.

My second recommendation would be to continue offering the compressed Algebra Skills and Intermediate Algebra courses. The students in the practicum study classes were excited to end the semester ready for College Algebra. In addition, exam scores and course pass rates for students in the compressed courses exceeded those of students in 16-week courses. Compressed classes are not for all students, but many could definitely benefit from them.

An unknown writer defined ignorance as doing the same thing over and over and expecting a different outcome. My third recommendation is for the math department to continue to be an innovator and never be satisfied with the status quo – always be willing to change and work toward improving results. What is best for our students is best for us.

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*It is [developmental educators'] responsibility to learn different approaches to redesigning curriculum in order to better serve students.*

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## Conclusion

I agree with Bryk and Treisman (2010) when they state that math should be a gateway, not a gatekeeper, to a successful college education, and students must come to see math as an essential aspect of their everyday lives, no matter what their field of study. The general consensus appears to be that the sooner students finish the developmental math sequence and move into college-level mathematics courses, the more successful they will be. This needs to be done in such a way as to help students succeed and not set them up for failure. My compressed Algebra Skills and Intermediate Algebra practicum project shows promise as a path to improve student success.

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## Appendix B Best Practices Interview Protocols

### Background questions

1. How long has your institution had a developmental education program?
2. What developmental courses do you offer?
3. What's your role?
  - How long have you been at the institution?
  - How long have you been in your current role?

### Structure

1. Is developmental education a priority at your institution? If it is, how is this communicated (i.e., is there consistency between institutional goals and the goals of developmental education? Is developmental education featured prominently in the college catalog? Is developmental education considered an institution-wide responsibility? Do members of the campus community who aren't involved with developmental education still consider it to be important? Is developmental education part of the institution's long range planning?)
2. Is there a clearly defined mission statement for developmental education at your institution?
3. Is your developmental education program centralized in one department or are the courses housed in their respective disciplines?
  - If it's not centralized, is there any type of overall coordination for developmental education (e.g., all developmental faculty/instructors meet regularly; there are common goals and objectives for all developmental courses and services; etc.)?
  - Is there a developmental education coordinator or administrator?
4. Does your developmental education program employ adjunct faculty?
  - Who teaches the majority of your developmental classes (adjuncts or full-time faculty)?
  - How much are adjunct instructors paid at this institution? (*Costs*)
5. What support services (both academic and personal intervention) are offered to students in your developmental education program?
6. How are support services organized and/or integrated within the developmental ed program?
  - How are they staffed and funded?
  - If there's a central developmental education department, are support services part of this department?
7. Do developmental education faculty & instructors regularly collaborate with each other?
  - Do they collaborate with those who teach subsequent courses?
  - Do they collaborate with support services personnel?
8. Are developmental courses aligned?
  - Do they align with college-level courses?
9. How do you evaluate your developmental education program?
  - Is evaluation ongoing?
10. How involved are adjuncts in developing courses and assessing the program?
  - How integrated are adjuncts in the program and the college community as a whole?
11. What type of training is offered to new developmental ed faculty?
12. What opportunities and resources are available for professional development for existing faculty?
  - Are these opportunities and resources available for adjuncts, too?
13. Do you offer accelerated options for students to complete developmental coursework?
14. What role does technology play in the overall structure of your developmental education program?

### Assessment & Placement

1. Describe your institution's policy on assessing students for placement in developmental courses. For example:
  - How are students identified for assessment?
  - What methods do you use to assess students?
  - Is assessment mandatory?
2. How do you notify students about your assessment methods?
  - If you use a placement exam, do you advise students to prepare for the exam?
  - If so, do you provide material or other help for them to prepare?
  - Do students seem to understand the significance of the placement exam?
3. Does your placement exam test competencies identified in developmental coursework?
4. What are your guidelines for placing students in developmental courses?
  - Is placement mandatory?
5. Are students notified of their scores and of whether they are close to the cutoff?
  - Is any support (such as tutoring or a co-requisite learning support class) offered for students who are close to the placement score cutoff and want to enroll in the higher course?

### Costs

1. How is developmental education funded at your institution?
  - Have you ever sought and/or received grant funding for your program?
  - If so, do you regularly pursue grant funding?
2. Has your institution made any efforts to reduce costs associated with developmental education?
  - If yes, what have you done?
  - Were the efforts successful?
3. Has your institution made any investments in resources specifically for developmental education (i.e., designated computer labs, tutoring, other student services, etc.)?
4. Do you know the average cost per student for developmental education at your institution?
  - If yes, what is it?
  - If no, how many students are in your developmental education program?
  - How much is your total annual budget for developmental education?
5. What is the maximum number of students assigned to developmental courses?

## Appendix C

### Framework for Assessing Best Practices in Developmental Education

	Likert Scale Rating
<b>Specific best practices identified for each phase</b>	
Costs are between 1 and 3% of total budget	
Cost per FTE is lower than cost per FTE for other academic programs	
Monitor and track cost per FTE against peer and regional institutions	
Program does not operate at a loss	
Cost reduction efforts in place (including computerized instruction and partnerships with local high schools)	
Use of grant funding to offset costs	
Stated institutional commitment & clearly defined mission statement	
Centralized or highly coordinated program	
Collaboration among faculty & between support services personnel & instructors	
Alignment between & among developmental & non-developmental courses	
Ongoing, systematic program evaluation	
Adjunct faculty integrated within the program & college community	
Professional development & other training offered to faculty	
Comprehensive support services provided	
Students offered accelerated options for completing developmental coursework	
Multiple measures (test scores and non-cognitive questions) used to determine course placement	
Placement exam questions match coursework competencies	
Materials emphasizing importance of placement and suggesting test prep sent to students from the College	
Offer co-requisite learning support courses for students near the cut-off score	
Assessment for placement is mandatory	

Scale: 1- No evidence of this practice; 2- Minimal evidence of this practice; 3- Some evidence of this practice; 4- Satisfactory evidence of this practice; 5- Consistent and exemplary evidence of this practice



## The Profession and Practice of Learning Assistance and Developmental Education:

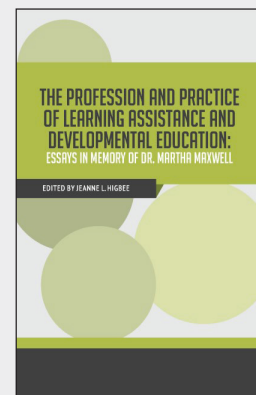
Essays in Memory of Dr. Martha Maxwell

Edited by Jeanne L. Higbee

*Chapters are authored by Fellows of the Council of Learning Assistance and Developmental Education and organized into three parts:*

- Martha Maxwell & the CLADEA fellows
- Viewpoints of the profession
- Best practices

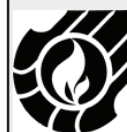
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# NADE News: President's Goals for NADE

By Robin Ozz President, National Association for Developmental Education

As I begin the last year of my tenure as President of NADE, there are three goals I have for NADE and what it will offer its members. I want you to feel...

## Connected.

Through the newsletters and the Board's increased attendance at chapter meetings, we have begun to work on this goal, but our work on making our members feel connected to the national organization and to each other will continue. We do not underestimate the value of having someone who understands the often humbling and lonely road developmental educators sometimes have to walk. We want our members to know your Executive Board, your Chapter leaders, and your colleagues are here for you.

To that end, we are focusing on holding regional conferences in addition to the annual conference so more people can meet, network, and learn. We are also going to focus more on our listserv which you can join at [nade-discussion-forum@thenade.org](mailto:nade-discussion-forum@thenade.org) and encourage you to join our Facebook page. Search for @nade.DevEd to find us.

## Protected.

By protected, I mean that you do not have to stand alone when you are questioned about your curriculum, programs, or developmental education as a field. Sometimes when people are peppering you with questions asking you to justify your position, it is hard to come up with ready answers. That is when we can come in. Your Executive Board can refer you to research and resources, and, if you wish, we can conference with you or write to legislators or administrators. We are here to help you and protect you. Call on us.

## Respected.

Above all, please know that we as your board, and I as your president, respect you for all that you are and all that you do. Most of your working days you may go unnoticed, feeling as if you are working in a thankless job often for little pay and recognition. But always remember you are working for the outcomes, not the income; you are the one your students will remember in the future as having made a difference in their lives. In this accelerated world it is easy to skip appreciation and fail to express gratitude; let me take this time to tell you how much you are appreciated now and every day!

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