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The NADE Digest publishes articles of interest for developmental education professionals including administrators, faculty, learning assistance personnel, academic counselors, and tutors who are interested in the discussion of practical issues in post-secondary developmental education. The Digest is published electronically twice each academic year. Articles in the Digest are indexed in ERIC.

NADE Digest Submissions

Articles should relate to issues that inform and broaden our understanding and practice of teaching and learning in developmental education. The subject of the article may emphasize innovative approaches, best practices, how meaningful research affects teaching and learning, or techniques to enhance student performance. Review the "Call for Manuscripts" at www.thenade.org for more information.

IN THIS ISSUE

MISSION

NADE seeks to improve the theory and practice of developmental education at all levels of the educational spectrum, the professional capabilities of developmental educators, and the design of programs to prepare developmental educators.

The "Perfect Storm" of Policy Issues and Its Impact on Developmental Education

Hunter R. Boylan, Patti Levine Brown, and S. Wes Anthony
Appalachian State University

In the past decade, a variety of political and economic issues have contributed to changing the landscape of American higher education. Among these issues is a shortfall of college educated laborers for the workforce, the increasing costs of college attendance, and the subsequent expansion of student debt. State politicians and decision makers have responded to these issues with mandates affecting the design, delivery, and evaluation of remedial courses. Unfortunately, developmental educators have had little input into discussions of these mandates while being held accountable for their success. Although many of the reforms discussed do contribute to improved college completion, it remains to be seen how far they will "move the needle."

It is relatively rare for a sequence of trends to result in a "perfect storm" of policy making and reform. In the past decade, however, the confluence of several issues in higher education has led to a perfect storm of higher education policies, many of the policies having direct and indirect implications for developmental education. Although the products of this policy storm have had major and often negative effects on developmental education, the issues surrounding these policies have had very little to do with developmental education. Instead, they have had a great deal to do with a variety of economic factors that have shaped the policy storm in higher education.

Three components comprise this perfect storm of policy. The first is the shortfall in the production of college and university educated graduates prepared to fill positions in the U.S. work force. It is estimated that by 2018 the U.S. labor force will face a shortage of millions of college educated workers (Carnevale, Smith, & Strohl, 2010). For obvious reasons, this is an issue concerning not only public policy makers but also those involved in business and industry.

The second component is the continuing increase in the cost of higher education. Although their divestiture of higher education contributes to rising costs, state legislators have been concerned with these costs for nearly a decade. This issue is also of substantial concern to parents of college students and the students themselves.

The third component is the growth of student indebtedness as a result of increased costs. As of 2015, the average debt of the U.S. college graduate was $30,100 (Institute for College Access and Success, 2016). This issue concerns public policy makers at the local and national level as well as parents and students. These issues and concerns, along with a misunderstanding of what developmental education is, have coalesced into legislation at all levels having serious implications for developmental education in many states.

Work Force Shortfalls

The Georgetown Center on Education and the Workforce reported in 2011 (Carnevale & Rose) that between 1990 and 2010 the demand for college educated workers increased by 2.0% per year whereas the production of graduates by higher education institutions increased only 1.5% per year. This not only contributed to a shortfall of college educated workers but it also contributed to wage inequality. The authors also proposed that U.S. higher education would need to produce 15 million more baccalaureate degree holders, 4 million more postsecondary certificate holders, and 1 million more associate degree holders by 2025 in order to meet workforce needs.

An earlier report by Carnevale, Smith, and Strohl (2010), pointed out that by 2018 the U.S. will experience a shortfall of at least 3 million workers at the associate-degree level and above. Furthermore, there will be an additional shortfall of 4.7 million workers with postsecondary certificates. The authors suggest that U.S. colleges and

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Naomi L. Ludman, Editor
National Association for Developmental Education (NADE)
PO Box 963, Northport, AL 35476
office@thenade.org | www.thenade.org
Tel: 205.331.5997 | Fax: 866.519.1331
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universities would have to produce 10% more graduates each year between 2008 and 2018 in order to meet this shortfall.

These figures have encouraged a variety of organizations to set goals for increasing the number of college graduates in the U.S. In 2009, the Bill and Melinda Gates Foundation set the goal of doubling the number of college degrees and certificates among low-income students (Bill and Melinda Gates Foundation, 2009). Most recently, in 2013, the Lumina Foundation established the goal of having 60% of Americans attain a quality degree, certificate, or other postsecondary credential by 2025 (Lumina Foundation, 2013). All of this goal setting and projected shortfalls of college graduates have focused policy makers on the issue of college completion.

The Cost of College

According to the National Center for Education Statistics (2016), the average cost of attending a public university in 1984 was $3,433 in 2014 dollars. By 2014, that cost had risen to $18,110. Community college costs had risen from $2,854 in 2014 dollars to $9,888 (National Center for Education Statistics, 2016). The College Board recently reported that inflation adjusted tuition increases at public universities had increased by 3.5% per year between 2006 and 2016 (2016).

Meanwhile, many state legislatures have followed a course of disinvestment in higher education over the past decade. According to the American Council on Education, state funding for higher education had declined by 40.2% between 1980 and 2011 (Mortenson, 2012). The Council projected that if state funding for higher education continued to decline at the current rate, there would be no state funding at all for public colleges and universities by 2050. Admittedly, in recent years some state legislatures have begun to increase funding for higher education, but these increases are small and remain at risk to the vicissitudes of politics and the economy (Harnisch & Lebioda, 2016). This combination of increased college costs and declining state support for higher education has placed a substantial financial burden on college students and their parents, and policy makers are looking for ways to stabilize rising college costs and make education more affordable to more Americans.

Student Indebtedness

The amount of debt owed by students when they graduate from college has become a major issue for policy makers. As the cost of higher education increases, so has the indebtedness of college students. In 1993 less than half of those who graduated from four-year public institutions had any college debt. By 2015, this number had increased to 68% and the percent of students graduating from for-profit colleges was 88% (Institute for College Access and Success, 2016). Even at community colleges, 38% of students graduated with debt in 2012 (Denhart, 2013).

The total amount of debt owed by college students has also increased. Forbes Magazine reported in August of 2013 that the total debt owed by college students had exceeded 1 trillion dollars (Denhart, 2013). A report from the Institute for College Access and Success claims that the average 4-year undergraduate borrower left college in 2015 with over $30,000 in debt, an increase of 4% from 2014 (2016).

The situation is even worse for minority and low income students. According to Huelsman (2015)

- 81% of African-American students attending public colleges and universities graduate with a debt load,
- 58% of African-American students graduating with associate degrees are in debt, 14% more than white students, and
- 66% of African American and Latino borrowers drop out of for-profit colleges with debt loads.

In a study of over 5,500 low-income households with student debt, Despard, Perantie, Taylor, Grinstein-Weiss, Friedline, & Raghaven (2016) found these households to have much higher incidence of material and health-care hardship than low-income households without student debt. These incidences of hardship were worse for those who continued to pay their debt than those who did not pay. Dongbin (2007), found that the greater the first-year debt of low-income students, the lower their chances of graduating. The debt load of college students has increased measurably over the past two decades and it has particularly increased for low income and minority students.

Completion as a Solution

These three trends—a shortage of college educated workers, the increased costs of college, and the increase in student indebtedness—have captured the attention of policy makers in the past decade. One of the most common responses to these trends has been to implement legislation designed to get more students to complete college and to do so more rapidly. Complete College America has reported that the average time students take to complete an associate degree is 3.6 years, and the average time taken to complete a baccalaureate degree at non-flagship universities is 4.9 years (Complete College America, 2014). Legislators have seized upon these figures and decided that the major contributor to all three trends is what they consider to be the excessive time spent completing college. They

have concluded that if students spent less time completing college, we would add skilled workers to the economy at a higher rate, the cost of college would decline, and students would incur less debt.

It has, therefore, become an article of faith that increasing the number of students who complete college and decreasing the amount of time it takes them to do so is the universal solution to a variety of economic problems faced by state legislators. It is no doubt true that increasing student completion and reducing the time to graduation should address the triple threat of trained worker shortages, increased college costs, and expanding student debt to some degree. But, as Mark Twain pointed out "the Devil is in the details." There are probably many ways to increase student completion and reduce time to graduation but, thus far, legislators have concentrated on picking what they consider to be the "low hanging fruit," in this case, remedial courses and developmental education.

The Assault on Remediation

Until about 2012, there was no particular legislative attention being paid to remedial courses. There were, however, some reports suggesting that remedial courses were not working well (Bailey, Jeong, and Cho, 2011; Calcagno and Long, 2008; Martorell and McFarlin, 2007). Even more influential, however, was a report by Complete College America entitled, "Remediation: Higher Education's Bridge to Nowhere" (2012). This report claimed that remedial courses were a dead-end because few students passed them and even those who did rarely passed the college-level course in that subject. Armed with substantial funding from the Bill and Melinda Gates Foundation and others, Complete College America was able to send its representatives across the country to visit legislators, display their findings, and urge the elimination of remediation. Their argument was that students wasted their time in non-credit remedial courses that led nowhere and contributed little to retention or completion. It was largely due to their efforts that legislators began to see ending remediation as a quick and easy way to increase graduation rates and reduce the amount of time necessary for degree completion.

Legislative Actions

Legislative action regulating the "how and why" of developmental education has become the norm in several states including Florida, North Carolina, Texas, Virginia, Colorado, Tennessee, and Maryland. However, with the passage of Senate Bill 1720 in 2013, Florida College System institutions were faced with some of the most restrictive mandates to date regarding the offering of developmental education courses as well as the design and implementation of these courses. Similarly, with the implementation of North Carolina's Senate Bill 561, the majority of the developmental education courses in the state are likely to be pushed back into the high schools. A review of legislative actions in these two states may provide an opportunity to better understand what may begin to take place in other states.

Legislation in Florida

Senate Bill 720 (2013) is a massive piece of legislation that brought about a number of changes in Florida's K-12 system as well as major changes in the Florida College System that administers remedial education, also referred to by the bill as remedial college preparatory instruction (Hu, et al., 2015). One of the more significant parts of this legislation included the creation of the Office of K–20 Articulation in the Department of Education that assists with the transition of students from secondary education to colleges and universities. The bill also required the 28 Florida College System institutions to design remedial courses to meet the needs of students who lacked the reading, writing, and mathematics skills needed to be successful in college-level classes. Although the bill did not do away with noncredit stand-alone courses, it did require colleges to offer remedial course options that students could pursue while also enrolled in college credit classes. It also provided the option for students who were not required to test for or enroll in remedial courses to request that they be assessed and allowed to enroll in these classes if they so desired. The bill further required Florida College System institutions to advise students whose test scores indicated a need for remediation of the options offered by the institution in which they were enrolled.

Designing tailored courses was not a new process for faculty teaching remedial courses; however, the design of remedial education options was now mandated by law. The mandate included various research-based models for designing options that emphasized accelerated and compressed co-requisite models, embedded, individualized instruction that incorporated technology, software, modularization of content, and self-pacing. All Florida College System institutions were mandated to offer at least two different models for their underprepared students.

The most dramatic change impacting the number of students required to take remedial courses across the state was that the bill specified two groups of students that must not be required to take the common placement test or to enroll in remedial courses. These two groups included students who entered the 9th grade in a Florida public school in 2003-2004 or later and earned a standard Florida high school diploma, and students serving as active-duty members of the United States Armed Forces. This allowed

large numbers of students to enter college without a skill assessment. It also allowed large numbers of students to opt out of remedial courses.

Legislation in North Carolina

North Carolina Senate Bill 561 was approved in the fall of 2015 (College and Career Ready Graduates, 2015). This bill created the Career and College Readiness Committee of the North Carolina Community College System (NCCCS). The committee was formed to consider ways of moving the majority of remedial classes to high schools in North Carolina. This legislation allowed a number of underprepared students, mainly those who had been out of high school for a certain period of time, to take classes at the state's community colleges. The remainder, however, would be enabled to take any required remediation while still enrolled in high school.

Remedial courses across the NCCCS were required to undergo a course redesign initiative in 2013. This redesign covered all remedial mathematics courses and called for the integration of remedial reading and English courses. The reform also required changing the name of the remedial mathematics course to Developmental Mathematics (DMA) and integrated reading and English courses to Developmental Reading/English (DRE).

The redesign initiative changed the course offerings on all 58 NCCCS campuses from a total of four courses (two reading courses and two English courses) to three integrated reading and English courses. All of these courses were to be taught using an accelerated model, face-to-face courses in 8 weeks and online courses in 7 weeks. In mathematics, there also had been a four-course sequence: Basic Math, Pre-Algebra, Introductory Algebra, and Intermediate Algebra. After the redesign initiative, many community colleges followed the recommendations of the NCCS and moved the basic math course to the colleges' Adult Basic Education Programs. The remaining three courses were replaced with eight, four-week modules ranging from pre-algebra to intermediate algebra. Another mandate from the NCCCS was what was referred to as the use of "multiple measures." Every member institution of the NCCCS was required to exempt from remedial courses any North Carolina high-school graduate with a GPA of 2.6 (North Carolina Community College System, 2015). This had the effect of reducing the enrollment in both the mathematics and the integrated reading and English courses.

The Misunderstanding of Developmental Education

One of the ironies of the assault on remediation is that it has been damaging to developmental education because of the ignorance of most of those who conduct research or make policy regarding remediation. Remediation is and always has referred to the teaching of stand-alone courses teaching pre-college material. Developmental education, on the other hand, is known by professionals in the field as the integration of courses and services governed by the principles of adult learning and development (Boylan, 1999, Boylan & Bonham, 2014, Saddlemire, 1976,).

Unfortunately, news reporters, policy makers, legislators, bloggers, and researchers have almost all misunderstood this distinction and confused remediation with developmental education. For instance, a 2009 study of print media reporting on developmental education found that all reports assumed that remediation and developmental education were synonymous. One writer even referred to developmental education as "a code word for remediation" (Boylan, Carringer, Saxon, & Shiles, 2009).

Because of this ignorance, policy makers have attempted to reduce not just remediation but also developmental education. In their quest to eliminate remediation, they have eliminated many successful developmental education programs. In the process, the entire reform movement has ignored two important developmental education concepts. One is that the best way to serve students is to integrate support services into courses. The other is that the most effective instruction is based on theories of adult learning and development. This misunderstanding is unfortunate and it will, no doubt, hamper the college completion movement for years to come (Boylan, Calderwood, and Bonham, 2017).

Conclusion

Since 2012 legislators and higher education policy makers have attempted to address the very real challenges of shortfalls in college-educated workers, increased costs of college, and expanding debt loads of college students. There is no doubt that these issues need to be addressed, and many legislative and policy solutions are available to address them. But it is not entirely the fault of remediation or developmental education that these problems exist.

The belief that remediation causes attrition has led policy makers, researchers, and postsecondary education leaders to focus their reform efforts almost exclusively on reforming remedial courses, gateway courses, teaching models, or curricula. It is almost as if policy makers and leaders believed that, if remediation is eliminated or reformed, the barriers to college completion would be

removed. Furthermore, they have confused remediation with developmental education, and implemented policies to eliminate or reduce developmental education as well as remediation. As a result, some strong developmental programs that have contributed to student success and completion have been eliminated because of the perception that remediation and developmental education are synonymous. Having done so, policy makers in several states have targeted remediation for reform, mistakenly called it developmental education, and then claimed to have addressed the problem of college non-completion. In fact, they have only addressed the problem of high non-completion rates in remediation or high failure rates in gateway courses. This is consistent with their narrow view of what affects student success and completion. Ignoring a host of situational (health and family), demographic (income and ethnicity), background (time elapsed since high-school graduation or quality of elementary and secondary preparation), and affective (values and attitudes) factors only exacerbates the problem.

Meanwhile, developmental educators have been caught up in the completion agenda and subsequent reform movement, frequently having to completely change what they do, often without having any input into the change. All too frequently the people who will have to implement changes are the ones who have the least opportunity to influence the changes. The resulting change is sometimes for the better. Sometimes, it is for the worse. There are certainly better ways to do remediation than the traditional stand-alone course model, and many of the reforms being mandated represent an improvement. This improvement, however, is unlikely to completely solve the problems that legislators and policy makers are trying to address.

In these circumstances, it is important for developmental educators to understand that they are caught up in a much larger set of concerns. They did not create the shortage of college educated workers, the high costs of college, or the increase in student debt. But they are being expected to make major contributions to solving these problems. As Uri Treisman has pointed out "Developmental educators have been charged with solving problems they did not create using methods they do not support" (2016). The reform movement has definitely changed the state of the art in developmental education. It remains to be seen whether or not it will contribute to reducing the worker shortage, lowering college costs, or reducing student debt.

Dr. Hunter R. Boylan is professor and director of the National Center for Developmental Education at Appalachian State University in Boone, North Carolina. Dr. Patti Levine Brown is assistant professor of Higher Education, also at Appalachian State University. Dr. S. Wes Anthony is director of the Kellogg Institute at Appalachian State University.

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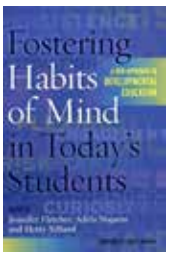

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Using Social Media Tools for Academic Support and Enrichment in the Classroom

David R. Arendale
University of Minnesota

For over a decade at the University of Minnesota, I have used social media tools in my introductory global history course to improve engagement and final grades. Students and I work as partners in using the tools to engage them more in the class, prepare for exams, and develop these skills for other courses. Our approach is guided by principles of Universal Design for Learning. We remove barriers so all students can access exam preparation resources, and they have options to validate their knowledge gained in addition to traditional exams. Students report satisfaction with usefulness of the resources, and evaluation studies document effectiveness in raising final course grades. This article shares practical steps on how to use no-cost and low-cost social media applications to accomplish these purposes.

Introduction

Many first-year students find the transition to postsecondary education difficult. Several academic and social factors contribute to this difficulty which can lead to students withdrawing from college: (a) unable to meet academic rigor, (b) lack of integration into academic and social dimensions of college, and (c) failing to make connections between what they know with new material encountered in the classroom (Tinto, 1993). Fong, Davis, and Kim (2016) identified motivation, self-regulation, and anxiety as lowering persistence to graduation. They found student engagement was a positive factor for higher academic achievement and persistence. Research indicates some students are reluctant to form study groups: first-generation college, students not living in campus residence halls, students of color, recent immigrants, and others (Pascarella & Terenzini, 2005). In conversation with my history students at the University of Minnesota (UMN), the question is not whether they work a part-time job; rather, it is how many part-time jobs they hold to pay for tuition and textbooks. This places even more pressure on the students to allocate their time among school, work, and personal life.

In addition to the time pressures outside the classroom, many students face learning barriers within the class because of pedagogical choices made by instructors. In the past decade, evaluation studies support two pedagogical approaches to increase academic achievement: (a) Digital instructional strategies enable improved teaching and learning (McNight, *et al*., 2016), and (b) *Universal Learning Design* (UDL) removes barriers from the environment so all can access course content and have multiple ways to reveal mastery of course learning objectives (Ross & Meyer, 2002).

Based on these findings and my personal experiences as a college history instructor, I re-designed my first-year course to make it more accessible, engaging, and supportive for student academic achievement. Over the past decade, I have gradually introduced the practices described in this article. I embedded learning assistance into my introductory global history course (4 credit hours) rather than relying on students to navigate the campus to locate tutorial help. I could not rely on all students forming study groups on their own to help prepare for exams. Neither would my holding supplemental tutoring appointments serve students with work or other conflicting time obligations. I knew from conversations with my students that they had little discretionary time. However, most of them displayed ease with social media and technology.

Each of my two history courses varied from 30 to 90 students. The maximum number of students during an academic term did not exceed 200. I was assigned undergraduate teaching assistants that could have been assigned to provide traditional tutoring and small study group review sessions. Instead, I directed them to help me with research projects and some of the grade entry. I experimented to see if I could embed academic support for my students without outside help. As a former community college instructor, I know what it is like to have no additional help when teaching five large classes. I thought use of technology could help scale-up academic support for classes with larger enrollment without a significant increase in my time. I did not have extra discretionary time for the students since the other 60% of my work assignment was research and public service projects. End-of-term student evaluations reported high satisfaction ratings with the class experience, and research studies found that students using the social media and technology earned higher grades.

This article contains a sample of no-cost and low-cost options to embed learning assistance in the course and make the class experience more engaging and barrier-free. An overview of my approach is available at my website (http://www.arendale.org/history-course/) and an article written with my colleague (Arendale & Ghere, 2008). More information about UDL is available at http://www.arendale.org/udl-links/. Some of my technology tools are available at http://www.arendale.org/learning-technologies-links/.

Creating Online Exam Review Resources

As stated earlier, I was concerned with providing equal access to exam preparation resources. Early in my career at UMN, I held on-campus exam review sessions at various times of the day or night. Content for the meetings focused on key vocabulary terms and essay questions that might appear on the exams. However, when these sessions were scheduled in a campus classroom, student participation averaged 25%. Of those students who attended, most lived in the campus residence halls. This taught me that online access was needed when and where students wanted to access it. The following are sample course activities that led to increased academic support and engagement: (a) online study guide, (b) audio recordings, (c) online exam review sessions, and (d) crowd-sourced assigned readings. Through periodic formal evaluations, the study guide, audio recordings, and online review sessions contributed to higher course grades for participants (Kenney & Arendale, 2017). (We are preparing additional publications.)

I knew online tools presented an opportunity to enable students to create their own study review materials and share with each other. UMN embraced the *Google App Suite* (Gmail, Drive, Sites, and other apps) and provided them for all staff and students. *Google Sites* enabled them to create an online study guide. The students and I created audio recordings which provided an auditory option so they could listen through a website or access through mobile device apps. While I would help structure these resources, students provided most of the content. This approach is consistent with best practices of UDL that ensured course information is available through a variety of formats. I continued to be available before and after class and through office hours on multiple days at different times. In addition, students could contact me at those times using *Google Video Chat* (now *Hangouts*) in lieu of coming to my office.

Creation of these exam preparation materials was a graded activity. I surveyed students at beginning of the term for their preference of an activity with one course unit. There were eight choices for them to rank order. After sorting through the surveys, I assigned most to their first or second choice. Strict deadlines were established for submission of the assigned task which they completed only once during the academic term.

Online Study Guide. An online study guide was created through a *Google Sites* website (http://myworldhistory.org). To make it easier for students to remember the location, the website address was rented for $10 annually from a web hosting service. I also provided links to it through the online Moodle course management system (CMS). I structured the website with separate web pages for each unit covered by the exam. My role was providing a list of potential exam vocabulary words, long-response essay questions, and space for a multi-paragraph overview of the unit. This pattern was repeated for each unit. Major exams included material from three or four units. Students were uncertain which items would appear on the exam since I selected from the large number of vocabulary words and essay questions contained on the website. Except for unit one in the course which served as an example of the assignment expectation, the rest of the website was erased before the academic term began.

Learning how to post items and edit the website was difficult for most students. Therefore, I took this responsibility which required a few minutes of my time to review their Word format document submitted through the CMS and then post to the website. I was responsible for quality control. My role was to correct minor errors while submissions with major errors were returned to the student to revise and resubmit within 48 hours. A matrix of the assignments with their due dates was posted through the CMS, and late submissions earned a zero grade. Few students failed to complete their task on-time. In addition to impacting their individual grade, peer pressure in the class helped maintain high standards and timeliness. The students counted on each other to create the guide.

Audio Recordings. The human voice provides another modality to communicate information other than a website or handout. Short audio recordings of 20 minutes provide opportunity for students to teach one another about critical course content. It gives me as the course instructor a place to explain course material or strategies for exams and clarify the nuances and complexity of the potential essay questions. Students could listen to the audio recordings when they wanted. The easiest way to create these recordings is to record student and instructor messages through a digital audio recorder or a laptop computer. Those files can be exported for use elsewhere such as uploading to the CMS.

However, I chose a more complicated approach to provide these audio recordings for my students. As the following paragraphs show, my approach required ex-

tensive collaboration with the students. Some students were sophisticated in their use of technologies and would welcome the opportunity to help either voluntarily or by receiving extra credit. I also turned to them when dealing with technical issues. It is much quicker to ask them rather than search the Internet or purchase more learning technology books.

Some students talked with me before or after class and fewer met me during office hours. However, many arranged their classes in consecutive order with a quick departure to work or home. With a large campus like UMN, students quickly move between classrooms across campus or arrive just as class begins. My solution was to create an *audio podcast*. The benefits of this approach is that recordings can be listened to through mobile devices. They can be automatically downloaded when waiting for a bus, driving, working out at the gym, or walking on campus. Students report that podcasts of five to fifteen minutes are most likely to be used. More general information about podcasting is available on my website, http://z.umn.edu/podcasting .

The podcast the students and I created is called *Then and Now*. Previous episodes (240+) are available at the podcast website (http://thenandnow.org) or can be subscribed to through an app for Apple or Android mobile devices (http://www.arendale.org/david-arendale-my-podcasts/) or downloaded for free at *iTunes* software for laptops and desktop computers (http://itunes.com). Over the past decade, our podcast has included the following basic parts: a student provides a short overview of the unit, and I talk about the potential essay questions and provide insight into what I am looking for in the responses without providing a summary of the desired answer. Some years I also included the following parts contributed by students: study tips they found useful, tips for use of technology used by students, and selecting music from a copyright-free website and creating a short introduction. For music selected, it could be any type as long as the lyrics did not disparage individuals or groups and contained no swear words. In addition, the copyright-free music must come from a website that permits use on podcasts.

Recording Online Exam Review Sessions. I previously conducted in-person exam review sessions. While participating students reported satisfaction with the experience, a small percentage of students attended because of other time commitments. As a result, I began using the school-provided web conferencing software (WebEx). Free and low-cost options are *Vokle* (www.crunchbase.com/organization/vokle), *Uvlog* (http://uvlog.com), and *Livestream* (http://livestream.com). After I provided a short overview for each unit, students could interact with me by asking questions posted to the WebEx text chat box. These sessions were recorded and links to them placed on the CMS; I also sent an email to all students with a direct web link. The CMS web logs revealed high utilization.

Crowd-sourced Course Readings. Years ago, I abandoned a traditional history textbook. In its place, I selected articles from online journals through our UMN library related to each course unit. In addition, I included articles written by prior students in the class. This provided additional motivation to the students since they are not only writing short papers for me, but they are also writing potential readings for future students in the course. This writing assignment is a short research paper of seven-pages double-spaced on a history topic students select. After grading, I obtain permission from students to select the best for posting to the *Historpedia* website (http://historpedia.org). This is our version of *Wikipedia*. The website is constructed and hosted through the *Google Sites* account provided to me as described earlier. I set the viewing authorization so anyone on the Internet can read the articles. I know others are reading them since I receive notifications from the *Turnitin* plagiarism online database that a few students at other colleges copy and paste sections from these papers. In the future, I will edit the best ones and combine them into a free eBook distributed through Amazon, iBook, and similar places.

Supplemental Learning Opportunities through Digital Storytelling

As described earlier, one of the principles of UDL is to provide alternative means for students to demonstrate mastery of course learning objectives other than traditional pencil-and-paper exams. In addition, many of the students have already acquired competency with learning technologies through secondary (or primary) school or personal experience. Course engagement is much higher when students create their own learning experiences. As a result, I incorporate digital storytelling. Students can select to create special audio shows rather than one of the previously described online study guide activities. They also can complete an extra-credit project creating a history music video. While not used for digital storytelling, I use Twitter to provide supplemental readings for students.

Audio Shows. Earlier in this article, I illustrated use of audio files to prepare for exams. Rather than that option, students could instead create a cultural music or interview show. Students are free to create the music show themed around one of the countries or topics in the course. In addition to selecting four to six songs, students also introduce the music by explaining how the selections reflect the culture of the country or the history topic of their choice. (There are several free online sources for music autho-

rized to use with podcasts: *Free Music Archive*, *Creative Commons*, *CCmixter*, and *Royaltyfreemusic.com*.) The interview shows consisted of a ten-minute question-and-answer with someone in the community or on campus of the student's choice. Students made their recordings through their smartphone or with an inexpensive audio recorder they could borrow from me. Past topics included interviews of an immigrant's journey to the U.S., a Muslim cleric, and leader of a cultural center in the city. The music and interviews shows are interwoven into the course *Then and Now* podcast.

History Music Videos. The online *Animoto* digital software (http://animoto.com) permits mixing of images, text, and short video clips, with their vast music library to create music videos lasting the length of the selected song. Educators can obtain a license for their students to obtain a free account. My students were welcome to select any event or person for the video, and they could work by themselves or with two other classmates. Students reported the average time to create the videos is two hours or less. To reduce the anxiety of students, I made this an extra-credit activity. My students and I found a variety of ways to use these history music videos, and some of them reported using the technology for assignments in other classes. I requested permission from a few to play their videos to begin or end an appropriate course unit. I also created my own *Animoto* videos to preview new course units in the CMS and use as another resource for exam preparation. The following link provides samples of the work my students and I created for these purposes: http://www.arendale.org/animoto-class-links/.

Twitter. Many students are interested in world news but feel overwhelmed by how to identify meaningful articles from the flood of social media and news sources of varying quality. I created a Twitter account for the course: http://twitter.com/ThenNow_History. About 25% of the students voluntarily follow the account. I post a link to one good world news article each week. Most come from *The New York Times* or the *BBC*. I focus on significant news from outside the U.S. such as immigration into Europe or conflict in countries.

Recommendations for Implementing These Activities

It took me many years to learn how to implement these activities. I spent a semester or longer learning how to use the technology before bringing it to the classroom. Having an informal technology support team of campus tech-savvy staff, students, and faculty is key. Even though reading technology books, viewing *YouTube* tutorials, and attending workshops can be helpful, I find that students are my best support. I ask their assistance, and they enthusiastically work to create class activities, teach me about the technology, and help others in the class. My students are not only my partners, they are also my best teachers. I learn much from the course surveys, individual student interviews, and periodic formal evaluations: what to revise, what to discard because the activities were not meaningful for students, and what to keep because the activities are contributing to students' meeting or exceeding course objectives. I learned long ago to keep a good sense of humor and humility when using technology and introducing new learning activities in the classroom. Despite careful planning, surprises occur. Most students are tolerant of the occasional mishaps as long as they understand the desired learning outcome and know that it is not just an excuse to try out the latest technology.

Conclusion

Meaningful use of social media and free or low-cost technology has been a productive partnership between the students and me. Student engagement has increased through their co-production of exam review media (audio podcast episodes and websites) and academic enrichment media (audio podcast episodes, history readings, and history music videos). These media and the online exam review sessions provided 24x7 access to everyone in the class where and when they wanted to listen and learn. Learning barriers were reduced and academic engagement was increased. This approach provides a way for academic content faculty members to support the success of all their students which has historically been the goal of developmental education: "helping underprepared students succeed, prepared students advance, and advanced students excel" (https://thenade.org/Mission-Vision-and-Goals).

Dr. David R. Arendale is associate professor in the Department of Curriculum & Instruction, the College of Education and Human Development, at the University of Minnesota.

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Two LEAPS Forward, One LEAP Back: A Two-Year Pilot of a Developmental Mathematics and English Cohort Program

Katherine Oubre and Tanya Rivers
Western New Mexico University

Learning Expectations and Academic Preparation (LEAP) was a two-year pilot offering a cohort (20 students) of our lowest scoring English and mathematics developmental students an intensive cross-disciplinary semester to accelerate through their developmental courses. Blending learning community and summer bridge best practices, LEAP incorporated significant scaffolding to help students develop transferable cognitive, academic, and college skills. In both pilot semesters, we achieved early successes; however, our retention/success rates over time tended to match rather than substantially exceed that of traditional courses. While LEAP did not achieve long-term sustainability, we reflect in this article on our "take-aways" as individual instructors, developmental program coordinators, and faculty members promoting stronger academic and college skills on a university-wide level.

Developmental Education Challenges at Western New Mexico University

Western New Mexico University (WNMU) is an open enrollment, 4-year public institution serving approximately 3,000 students in rural southwestern New Mexico. Because the closest community college and university are two hours away, we fulfill the needs of both the 2- and the 4-year+ college, with a student population closely resembling community college demographics. Over half of our students (52%) are first-generation college students, nearly three quarters of our students (72%) have a low expected-family contribution, and nearly half (47%) meet both criteria, which is the basis for identifying "at-risk" students.

WNMU offers multiple levels of remediation for English and mathematics. Traditionally, the following English courses were offered in this standard sequence: Developmental Reading I (through Adult Basic Education), Developmental Reading II, Developmental Writing I, Developmental Writing II, and for 3 years, a pilot Developmental Writing II co-requisite with English 101.[1] In mathematics, developmental students place into developmental mathematics or developmental algebra, courses that utilize the ALEKS program, which allows students to progress at their own pace through the sequence in face-to-face, traditionally scheduled classes. Students are placed through mixed methods (Accuplacer with additional diagnostics) to ensure accurate placement. While there are opportunities for students to "accelerate" in both mathematics and English, students placing into the lowest levels of English and mathematics still have many "hoops to jump" before completing their college-level course.

Kate Oubre and Tanya Rivers were hired in 2013 as tenure-track assistant professors in their respective academic departments, with each serving a one-fourth course release (Kate as English composition coordinator and Tanya as developmental mathematics coordinator). As the Complete College America movement was gaining traction, New Mexico, like many other states, was threatening to cut funding to developmental courses and mainstream all students into college-level courses. Kate was warned that she would be "fighting" for continued funding, but both Kate and Tanya were granted autonomy to reshape their respective curricula as needed. Both developmental sequences had been developed in the 1990s but had not undergone major revisions except for the dissolution of the developmental studies program, which had housed English and mathematics together, prior to 2013. Full-time faculty who had taught developmental courses had moved into other positions or were nearing retirement, and since developmental courses are considered a necessary if neglected stepchild at our university, we were largely left to our own devices. Thus, except where indicated in this article, the pronoun "we" means Kate and Tanya; we have noted the few instances of collaboration where appropriate.

When we started teaching at WNMU four years ago, retention and success rates closely mirrored the national trends with traditional remediation programs. (Complete College America, 2017). In terms of retention challenges, we noticed that students concurrently enrolled in our English and mathematics classes would "disappear" from both classes--remaining on our rosters but no lon-

1 Beginning Fall 2016, Developmental Reading and Writing courses have been re-structured into two courses: English 097 (Introduction to College English) and English 099 (Rhetoric and Composition I Workshop), a co-requisite support course for English 101. The English gateway courses are English 101 and English 102. Beginning Fall 2017, Developmental Mathematics courses have been re-structured into Math 097 (Math Fundamentals) and Math 098 (Introductory Algebra). The mathematics gateway course is major dependent.

ger attending classes. We also observed that a majority of students placing into all three of the lowest level of developmental coursework were not taking these classes in their first semester. Additionally, after our first year, the mandatory student success course for all incoming first-year students was phased out. Thus, while we coordinated our efforts to retain individual students, we recognized the need for a more systematic approach to better serve students.

Our Shared Pedagogy and Vision

After several discussions with our department colleagues over a "Research Across the Curriculum" informal gathering, we determined shared principles about developmental education and assumptions about and experiences with teaching our students. This shared vision helped us determine our program vision and model.

1. Learning is based on three principles in line with Edwards and Beattie's reiteration (Winter 2016) of the National Research Council's *How People Learn*, that new knowledge must be built on a strong foundation of prior knowledge, that cognitive development occurs when the brain forms networks and connections, and that self-reflection and the development of metacognition help to reinforce learning and build those cognitive connections (p. 30).

2. Students become more engaged with one another and with their professors if they forge personal connections and create a sense of community, which is a common assumption and goal in the learning community model (Yale, n.d.).

3. Students scoring at the lowest levels in mathematics and English also face challenges in abstract as well as critical thinking.

4. Students in remediation face challenges outside of academic coursework that must be addressed for them to succeed. Current research shows that additional supports do have positive effects on developmental students' success, although the long-term results are mixed (Rutschow and Schneider, 2011, p. 52). Despite concerns about the long-term benefits, we felt strongly that with the elimination of our student success course in 2015, along with our at-risk student population needs, we needed to address external as well as curricular concerns.

5. Current models for accelerating students in a fast-track program would not benefit these students. While we are committed to providing motivated and higher-functioning students options for acceleration, we believed that concentrating and intensifying foundational skills should be the focal point of the program, a concept that is consistent with current models as reported by Hanover Research (2013, p. 13).

6. Transfer of skills within a discipline is very challenging for students, and transfer across disciplines requires even more of a cognitive leap. We wanted to incorporate opportunities for students to practice and reflect on transfer of knowledge and skills with interdisciplinary projects, a practice that is consistent with strong learning community models that achieve slightly better outcomes than those without cross curricular integration (Rutschow and Schneider, 2011, p. 41).

7. Students who demonstrate a need for developmental courses in mathematics, reading, and writing would benefit most by taking those foundational courses early in their academic careers.

After identifying our shared principles, we determined that the Western State Colorado University PRIME program would serve as an excellent model for our program. According to WSCU's Institutional Research, not only did they achieve a 98-99% (fall to spring) retention rate over a 5-year period, but they also graduated their first fifth-year class in 2015 with 50% of their original cohort. We had lofty ambitions to match WSCU PRIME's success and retention rate. To accomplish this, our practical goals were to assist the cohort in determining and building on foundational knowledge of mathematics and English to reach college level as efficiently as possible; to model and encourage transfer of skills across reading, writing, and mathematics; to embed college and student success components; to enhance student independence and knowledge of university resources; to create a learning community environment; and to promote opportunities already available for motivated students to streamline their individual developmental mathematics/English sequence to be college-ready within one year.

With funding from an Albert I. Pierce Foundation grant, we were able to travel to Gunnison, Colorado, for advice and guidance in constructing our program design that blended the learning community and the summer bridge program models.[2]

2 The authors wish to thank Albert I. Pierce Foundation and WNMU Collaboration Grants for their assistance in funding the development of LEAP as well as WSCU PRIME faculty members Edith Cranor-Buck (Mathematics) and Shelley Read (English).

The Learning Community Model and LEAP

The learning community model's general principles fit well for developmental students not only in acculturating them in the academic expectations of college but also in forging connections and utilizing support structures already in place at the university. In broad terms, the PRIME program models a common sense of purpose in insisting on students' reliance on one another as well as their two professors to succeed at the college level. Many learning communities focus on underprepared students and seek to help them advance to college-level work quickly by helping them forge connections that will provide lasting support.[3]

Following the learning cluster model, LEAP scheduled three "linked" classes for a cohort of 20 students: Developmental Reading II, Developmental Writing I, and Developmental Mathematics. These courses were offered during a common block of time five days a week, with both instructors attending all class meetings and sharing common office hours; these features were designed to add consistency and a standardized schedule that reinforced "school" time. Additionally, we worked with the university's student service specialists to develop a list of "developmental friendly" courses to fill out students' schedules. To assist in fostering community, we developed team-building strategies and opportunities to help students forge academic and social bonds. Further, we worked with our campus partners to ensure that we had a clear set of protocols for advising students and linking them to the proper university resources (including advising, financial aid, registrar's office, counseling, business office, etc), and in year two created 'just-in-time" mini-lessons during class on achieving academic success and navigating our college system. Throughout the semester, we asked students to reflect on their experiences in LEAP as well as the mathematics, reading, and writing strategies and skills they had acquired to help them become more self-aware about their learning. Finally, we made ourselves available in the spring for additional student support, including teaching the next course in the sequence.

In addition to our LEAP support structures, we included inter-disciplinary and cross-disciplinary projects into our academic coursework to help students practice conscious and methodical skill transfer. Kate incorporated mathematics activities and lessons in English with Malcolm Gladwell's *David and Goliath*, an 11th grade reading-level text that includes statistical analyses. In mathematics, Tanya incorporated lessons that helped students better understand language in relation to mathematics. Most importantly, based on Tanya's "Math in the Real World" writing assignment, we created a career exploration project, including a resume and mock interview, a research and field interview project, and a written report outlining the role of mathematics and English in a student's chosen major and/or career. With these assignments, we hoped to bridge the "silo effect" in students' thinking about academics, and help them find value in challenging academic skills by peering into their future profession.

The Summer Bridge Model and LEAP

WSCU's PRIME developers utilized the summer bridge model as a fall-semester program, providing students who fit the traditional at-risk demographic (often underrepresented racial minorities, low-income students, and/or first-generation college students), with support during the academic school year.[4] Part of their rationale, which also holds true for WNMU, is that their student population is not available to attend summer programs. By creating this as a fall experience in the academic year, these programs conform with The National Council for Postsecondary Research study recommendations to offer "more support and transitional experiences to help students reach and sustain attainment goals" (Barnett et al, Executive Summary 2012, p. 5).

LEAP borrowed from the best of learning community and summer bridge programs to provide students with opportunities to determine prior knowledge, build skills, reflect on their experiences as learners, begin to make connections across disciplines in order to synthesize and firmly embed that learning, and develop a social cohort and support system. By offering a "summer bridge" program in the fall semester, we worked to meet acceleration model goals of "just-in-time" learning and provide students with assistance in accessing university resources at the time when they most need it—in their first fall semester of classes. In our second pilot, we emphasized discussion and reflection around cognitive development and learning and reduced our very rigorous academic scaffolding a bit earlier in the program to help students begin that transition towards independence. Additionally, since all LEAP participants took these mandated courses concurrently, they were set up for greater academic success and acceleration over their peers by program design.[5]

3 Long Beach City College STAR program, TRIO (Yakima Valley Community College), Clark College, and the Kingsborough Community College system have used this model successfully. See National Resource Center for Learning Communities (n.d.) and Rutschow and Schneider (2011).

4 See U.S. Dept. of Education, 2015.

5 All Developmental Math students have an opportunity to complete early and begin (or even potentially complete) Developmental Algebra during the semester; thus, LEAP students also had options to accelerate even more quickly depending on their dedication, skill acquisition, and motivation.

Two Years of LEAP: What the Numbers Show

Our original vision was to achieve a nearly 100% retention and success rate as we stated in our proposal for the Albert I. Pierce Foundation grant that we received. Thus, our primary measurements were quantifiable:

- How many LEAP students achieve success (C or better) in their courses with us?
- How many LEAP students are retained from fall to spring?
- How many LEAP students are retained from fall to fall?

At the same time, we built in other assessment tools to measure individual as well as cohort learning and success, including student surveys, reflections, metacognitive and transfer exercises (or portions of academic assignments), and informal feedback.

Although we experienced short-term successes with individual LEAP students and the cohort as a whole, the data regarding longer-term success and retention, though difficult to assess directly, align with previous studies, making it a challenge to continue allocating (and budgeting) the intense resources required for this type of learning community cohort.

LEAP Success

The LEAP population over both semesters was quite small, with a course cap of 20 students and early attrition of one or two each semester. Despite changes we made to improve scaffolding techniques, group cohesion, and metacognition, our results across both pilot cohorts showed only a modest success, illustrated in Figure 1.

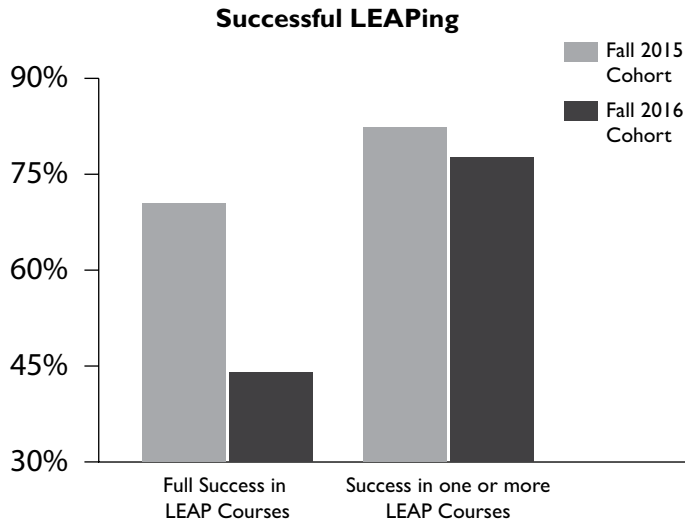

Figure 1. Course Success

In a mini-longitudinal study, Kate currently (Fall 2017) teaches four LEAP 2015 students who have completed their English composition sequence and are now enrolled in a 200-level literature course to meet general-education requirements. Although these students passed their gateway course, each one still faces very significant challenges in reading and writing that remain potential obstacles in attaining a bachelor's degree.

LEAP Retention[6]

Because of the small size of the university as well as the small number of students who refuse to take all three developmental courses concurrently, there is no clear control group by which to compare LEAP student retention. Thus, LEAP students could only be compared with students in another developmental mathematics section taught by the same instructor. The following charts compare the Fall 2015 cohort with that "control group." LEAP students follow the national trends, retaining at a slightly higher rate initially, but by their second spring, the retention of the LEAP students is virtually identical to the control group, as Figure 2 reflects.

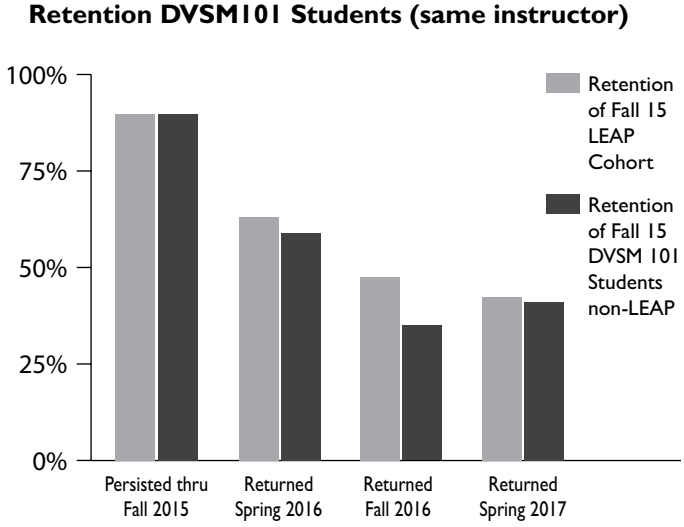

Figure 2. Comparative Retention DVSM 101 LEAP vs. "control"

As shown in Figure 3, although the retention rate decreases, the percentage of students returning each semester subsequent to LEAP increases for the LEAP Fall 2015 cohort, which is comparable to the control group. After the initial decrease in students returning in the Spring 2016, LEAP students continue to return at an increasing rate through the Spring of 2017.

6 Throughout this article, "retention" is used to designate continuing enrollment semester to semester (fall to spring, fall to fall).

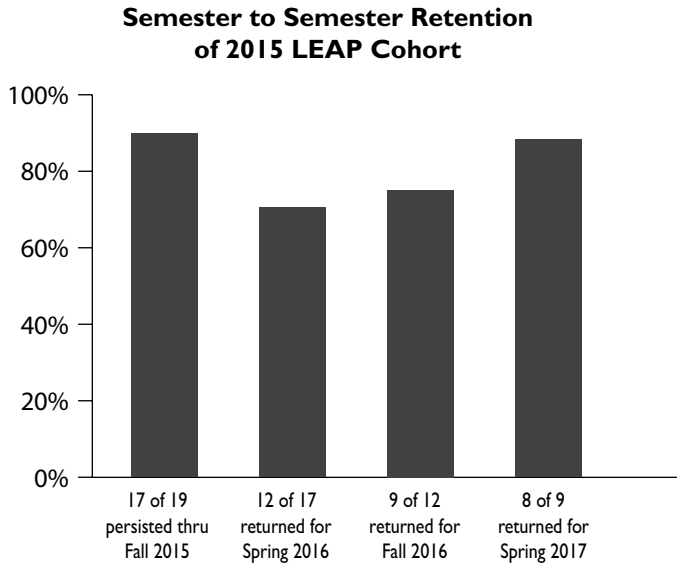

Figure 3. Semester-to-Semester Retention of 2015 LEAP Cohort

Since we have not polled students exiting, returning, or re-entering after a stop-out, it's difficult to know whether or not their LEAP experience had a direct influence on their decisions about college. However, we do sense from their behaviors when we meet that their experiences with the two of us have "mattered" to them in some way.

In an attempt to collect qualitative information about the students' experiences in LEAP, in the first semester we assigned tasks that very specifically asked students to reflect on the courses, specific components of the LEAP program, and their experience as learners in this modified college environment. What we found while reviewing these assignments as well as university-administered course evaluations is that students:

1. appreciated most having two instructors in the room for every class meeting,
2. sometimes identified skills and concepts in one subject that could be transferred to the other (mathematics to English or English to mathematics) but needed a lot of support to do so, and
3. appreciated the opportunity to make connections with classmates that carried over to other areas of student life.

As our intention for the program was to provide opportunities for students to build skills, connections, and a social cohort and support system, we consider the students responses to these directed questions a success of the program. It is evident that the students, without such clear and directed prompts, would not have commented on the various components of LEAP that made the program unique among college courses since most of these students had no prior college experience.

LEAP's Challenges

Although we are proud of individual students for their success and perseverance, the factors working against many of our cohort members forced us to recognize how challenging it would be to sustain the LEAP program. Additionally, we could only reach a maximum of 20 students a year with LEAP when our entire developmental and first-year student populations need many of the strategies we incorporated into our program.

Additionally, for LEAP students, concentrating the lowest level students into one group did not build community as we had planned, but instead created more intense pressures on us as instructors because the students lacked the skills to appropriately support one another. Throughout the semester, and continuing into subsequent semesters, we found that many LEAP students either a) became dependent on us to connect them to appropriate campus resources to troubleshoot their complicated lives or b) lacked the skills to even identify problems and seek resources independently. For these and other reasons, we found our efforts to build an independent, healthy, and helpful learning community challenging.

Finally, while WNMU provided institutional support to run the pilot, with New Mexico's consistently tightening budget constraints on higher education, we needed to implement more cost-effective measures to reach more students who can benefit from embedded college success strategies within their core coursework.

LEAP's Lasting Influence

Although we could not continue to justify the intensive resources required to run the LEAP program well, our experiences with LEAP have provided lasting benefits to us individually, programmatically (within our disciplines), and collectively in terms of what we can offer the university at large.

Kate's Reflections on Teaching English

On a personal level as an instructor, I gained a deeper understanding of my developmental English students' mathematics and "life" skills. Although Tanya and I frequently discussed our students' challenges, witnessing them first-hand in the concentrated and intensive LEAP environment had a significant impact on my teaching practice. For example, Tanya teaches percents in developmental mathematics, a concept that still challenges students at the end of the semester. In one lesson, Tanya asked students to solve basic percent word problems about shopping, and many students, including adults who shop every day for their families, could not calculate basic sales (10% or 20% off). I realized that such basic percentages as grades that

I mark on student assignments are meaningless to this population, so I have altered my practice to include more numeric grade explanations on student work.

The most significant programmatic English outcome of LEAP was a major change in the developmental English curriculum. In LEAP, I had the opportunity to simultaneously experiment with a 6-credit hour integrated reading and writing curriculum that also incorporated study/college skills. Based on our LEAP program data, the Humanities Department and WNMU's Curriculum and Instruction Committee approved English 097: Introduction to College English (6-credit hours of integrated reading and writing), which was implemented in fall 2016 to replace the traditional and separate "basic" developmental reading and writing courses.

Finally, in terms of student success, LEAP highlighted the vulnerabilities of students at this level; while I often imagine that I can reach everyone and prepare them for college-level work, it is not a reasonable goal. Despite the national trend towards co-requisite models to accelerate students' skill development in English, the Complete College America model is mainly designed to help "cuspers," not students at this level of remediation, a finding that developmental English faculty members on the New Mexico Developmental English Taskforce agreed upon unanimously in our report last year (2016).

Tanya's Reflections on Teaching Mathematics

Working with Kate in LEAP has had a profound effect on how the developmental mathematics courses that I teach are delivered, and since I am the coordinator of those courses, this has trickled into ALL developmental mathematics sections at WNMU. First, it was a true privilege to observe a colleague's teaching on a daily basis, something we rarely (if ever) get to experience in education. I have learned so much by watching Kate scaffold assignments, activities, and courses for students in need of such support. As such, I have redesigned the developmental mathematics courses, still using ALEKS as the main delivery mechanism, to provide students with a more cohesive course. The courses now offer instructors the space to improve scaffolding and support, encourage students and instructors to make connections between topics, and hopefully, will allow students to transfer knowledge between the two courses in our developmental mathematics sequence and beyond. I am also continuing development of instructor resources to model best practices in the developmental mathematics classroom. The resources include activities and projects that have been strongly influenced by my experiences with the LEAP program.

As LEAP was coming to a close, the developmental mathematics courses were venturing into online offerings. These online versions of the developmental mathematics courses are also strongly influenced by my experience with students in LEAP. First, witnessing the struggle with written language that these students have has prompted me to take more control over the course content in the online setting. While we still administer the course content using the ALEKS program, I have made many videos to instruct students, both in content and also in navigating the software that we use. While there are students who prefer written instruction in the online setting, I have had a majority of the online students comment on how helpful the videos are, even if the written versions are posted directly with the video. Second, I have embedded written activities in the online courses (which are making their way into the face-to-face courses as well). I have learned, in working with Kate, that having students write about their ideas and experiences with mathematics is a powerful way for students to connect to the mathematics they are learning. Students start on day one writing, via a timeline, about their mathematics history, and then they progress to writing detailed solution-manual type pages by midterm and writing about how the mathematics they are learning in these courses will be used in their "real life." The development of this last project began in my non-LEAP sections and was revised multiple times with the input and guidance of Kate (an invaluable experience and exemplary example of humanities and mathematics collaboration).

Finally, my experience with LEAP has changed my personal approach in working with developmental mathematics students. As an example, pre-LEAP, when talking to students (whether in lecture, small group, or individual mode) I would rarely ask if they understood the words that I was saying. Now, I ask, regularly, for students to rephrase what I've said or ask them to define a word that I've used. These are not mathematics terms. These are words that are part of the academic vocabulary that I use daily and forget that students new to college, new to even the idea of college and elective (vs. compulsory) education are not familiar with nor familiar with the context in which the vocabulary is used. (The words "comprehensive" and "assessment," for example, were in my syllabus for years before I realized that students had no idea what a comprehensive assessment was). I have also had the revelation that connecting mathematics to English models the concept of "transfer." I have used parts of speech and sentence structure vocabulary and ideas in mathematics class to emphasize mathematics concepts such as negative numbers in arithmetic and equations vs expressions.

Kate and Tanya's Ongoing Work at the University Level

As our reflections indicate, our experiences both with LEAP and non-LEAP developmental and even introductory college courses revealed that students on campus were not navigating the college "system" effectively. As we considered the "just-in-time" student success components that we had incorporated into LEAP, we believed that these components could benefit a much larger cohort of students.

In order to reach this larger audience, Tanya developed mini-modules (lessons, resources, and short quizzes) that she piloted in an online developmental mathematics course spring semester 2017. Additionally, we worked with mathematics, computer science, and English faculty members through a university collaboration grant to adapt Tanya's materials and create new components in our online learning management system (Canvas) that could be utilized by any faculty member who wished to participate:

- Navigating Canvas and Mustang Express
- Disenrollment
- Syllabus 101
- Traits of a Successful Student
- WNMU Tutoring
- Navigating Campus (a flowchart)
- Mid-Terms!
- Student Handbook
- FAFSA—Financial Aid
- Withdrawing—Financial Aid
- Calculating GPA—Student Aid
- Registration
- Preparing for Final Exams

As we completed the construction of this online course curriculum, the new Applied Liberal Arts curriculum planning committee, on which Kate served, unanimously voted to incorporate these modules into the new pilot course, Humanities 176, a learning community program required for all first-year students. By embedding and contextualizing these foundational aspects of university life across the spectrum, we hope to create a stronger, richer base of knowledge for students so they can help themselves and others successfully navigate their college experience. Since our Center for Student Success and Applied Liberal Arts and Sciences Committee are fully invested in this project, we will be closely monitoring and assessing our successes and challenges throughout the semester and year.

Dr. Katherine A. Oubre is associate professor of English at Western New Mexico University in Silver City, New Mexico. Tanya Rivers is associate professor of mathematics, also at Western New Mexico University.

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Commuting the Math Sentence: Accelerating Developmental Mathematics Using the Co-Requisite Model

Charlene Atkins and C.T. Beggs
University of Central Missouri

This study compares the results of a developmental co-requisite program with those of a traditional pre-requisite program in an attempt to determine whether the two models provide equivalent levels of effectiveness and efficiency.The research focused on gateway course completion scores and final exam scores for undergraduate students enrolled in a college-level quantitative reasoning course at a public four-year university in the mid-west. The results of this study suggest student success may be improved through the implementation of co-requisite pathways. A learner-centered approach to teaching, one offering just-in-time support, is recommended in this study.The co-requisite model coupled with evidence-based instructional methods demonstrates a promising practice in developmental education worthy of further inquiry.

Recent reform movements questioning the efficiency and outcomes of developmental mathematics education have influenced rapid modifications in course design and student placement (Belfield, Jenkins, & Lahr, 2016). In particular, the effectiveness of methods of assessment for placement have come under intense scrutiny. Questions have arisen as to how well ACT, or any other single standardized test score, reflects student ability and whether current placement policies effectively interpret these scores (Bettinger, Evans, & Pope, 2013). While many institutions use various assessment software programs, some either use proprietary means of placement or tie the placement results to institutional course pathways (Hughes & Scott-Clayton, 2011).

In this paradigm, developmental education courses could have several gradations bearing various levels of college credit. For instance, a student who lacks ACT scores but takes a placement exam at a college testing center, having not received mathematics instruction in recent years, may struggle to adequately demonstrate actual proficiency. This placement score often leads to a prescribed course pathway in developmental courses that may or may not bear credit toward earning a credential (Vandal, 2014). Further, many students do not complete the assigned developmental course sequence (Bailey, Jeong, and Cho, 2010; Parker, Bustillos, & Behringer, 2010; Parsad & Lewis, 2003; Williams, 2016). At best, placement test effectiveness is limited to specific subject areas and, devoid of multiple measures such as high-school grade point average, may fail to add value to developmental course placement (Belfield & Crosta, 2012).

Another concern regarding placement and developmental programs is that students with developmental needs are disproportionately represented by individuals from first-generation and low-income backgrounds (Bettinger, Boatman, & Long, 2013). Many of these students have academic risk factors that developmental courses can both alleviate and exacerbate. For instance, a developmental course may be paced or structured in such a manner that it meets a student's current proficiency level as indicated by the placement exam. Past paradigms dictate that a student is best served by this arrangement and, in this instance, some academic risk factors are alleviated. However, for each developmental course taken, an at-risk student is potentially exposed to a new set of risk factors that include, but are not limited to, additional time to degree during which chaotic external factors threaten student progress, increased likelihood of financial aid friction related to lack of satisfactory academic progress, setbacks in articulation agreements between institutions where credit does not transfer, or simple inability to successfully navigate the next course in the sequence (Super, 2016).

Against this backdrop of national issues, institutions have been under pressure to redesign placement practices as well as developmental coursework. This pressure led the researchers to investigate the co-requisite placement option prior to redesigning the university placement policies. While critics have noted that many initiatives lack rigorous evaluation (Mangan, 2015), the co-requisite pilot described in this study included an evaluation plan from the beginning. This study was conducted at a mid-size, moderately selective, public institution in the mid-west (MWU). Here, various realities encouraged a reassessment of developmental mathematics education. First, cyclical course reports, which showed how students in the developmental mathematics sequence failed to earn college-level mathematics credit, drove regular conversa-

tions about student progress. Secondly, mounting national reforms, including but not limited to Complete College America initiatives, provided a critical lens through which to evaluate student performance locally. Finally, political influence led, in part, by Complete College America's recommendations prompted institutional leaders and faculty to consider pre-emptive initiatives in a deliberately designed pilot process.

Co-requisite Model

Co-requisite courses represent an attempt to alleviate short- and long-term risk factors for students lacking academic preparation and proficiency. While shortening time to credential has inherent economic benefits in reduced cost, co-requisite courses may also help alleviate course misplacements that further contribute to debt burden (Jaggars, Hodara, Cho, & Xu, 2015). One difficulty is identifying whether co-requisites have limited application or whether their use can be scaled across learners of all levels of proficiency. Many states have adopted policies or incentivized institutions that promote the implementation of co-requisite courses (Venezia & Hughes, 2013). While many co-requisite courses have shown promise in a variety of contexts, questions remain as to whether this pathway has helped increase the progression rates, particularly for students demonstrating significant need for developmental support (Kosiewicz, Ngo & Fong, 2016).

Developmental education is structured differently among institutions of higher education. Some developmental programs are located in specific disciplines, others are provided by a student support center, and others are delivered through a unique centralized academic department. Depending on the structure, faculty perceptions can both promote and limit the advancement of co-requisite designs (Walker, 2015). Co-requisite courses require a concurrent learning experience providing just-in-time support to students who, under other circumstances, would not yet be enrolled in gateway courses. Gateway courses are required, college-level content courses that students must successfully negotiate before formally entering a program of study. Hence, these courses are "gateways."

Adopting a co-requisite course presented several challenges for the participating institution. Since co-requisite courses are, essentially, a result of reform, implementation required clear and consistent messaging with various MWU stakeholders. For example, academic advisors were crucial to the process, but some struggled to understand the concept or were reluctant to place developmental students in an accelerated path that was, at the time, untested. Since, at this institution, developmental mathematics and gateway mathematics are housed in distinct departments in separate colleges, creating a cooperative faculty linkage in the co-requisite pairing faced structural challenges.

Study Design

The purpose of this study was two-fold. First, the researchers wanted to determine whether the co-requisite and pre-requisite models provided equivalent levels of effectiveness in supporting student course completion and achievement on the common final exam. Second, the authors wanted to determine whether the co-requisite model could help alleviate risk factors common to students needing developmental education, specifically time devoted to the mathematics sequence and costs associated with the sequence.

The co-requisite model described in this study required interdepartmental collaboration between faculty in separate colleges at MWU. Full-time, tenure-track faculty in the College of Education instructed the developmental mathematics lab (DML), a 2 credit hour course. The developmental mathematics instructors focused on using learner-centered strategies and cooperative learning structures to assist students in developing social, emotional, and intellectual skills. Graduate assistants, instructors and full-time tenure faculty in the College of Health, Science and Technology instructed the gateway mathematics course (MATH 100). The curriculum for MATH 100, a 3 credit hour gateway course, included topics in set theory, geometry, probability and statistics. Each instructor of MATH 100 determined his or her own course evaluation system. Variations between the MATH 100 evaluation systems included the use of extra credit, weighted grading systems, and graded attendance. However, all instructors administered a common final assessment.

The sample for this study included (N=699) undergraduate students enrolled in MATH 100. Archived data from four semesters was collected and analyzed by the Office of Institutional Research. Data included student ACT mathematics sub-scores, final MATH 100 course grades, and scores on the MATH 100 common final examination.

For the purpose of this study, three groups were structured for inquiry. Group One contained 80 student participants enrolled in MATH 100 and the co-requisite DML concurrently. Students in this group were those with ACT mathematics sub-scores below 22 and who would have traditionally been placed into the developmental pre-requisite pathway, based on their ACT mathematics sub-scores. These participants received learner-centered, just-in-time academic support two days a week in the DML course while attending the traditional MATH 100 course three days a week. The treatment spanned one semester for the course and lab totaling 5 credit hours in course load.

Group Two was comprised of 224 students (ACT sub-scores of less than 22) who had previously completed the developmental algebra pre-requisite pathway. The pre-requisite algebra pathway required student enrollment in an emporium model. This model, first introduced at Virginia Tech, requires student interaction with modularized online tutorials (NCAT, 2013). Primarily self-directed, these students completed coursework independently with opportunities to seek assistance from graduate student course facilitators. Students in Group Two participated in the default pre-requisite course sequence that spanned two 16-week semesters in two unassociated 3-credit hour courses, for a total of 6-credit hours.

Finally, Group Three included 395 students who met the gateway enrollment criteria without developmental support. These students achieved an ACT math sub-score of 22 or higher and were identified as academically prepared for the gateway course. Each group completed the common final exam to determine mastery of the student learning outcomes at the end of the semester of enrollment.

Findings

Group One had a mean ACT mathematics score of 17.03 with a standard deviation of 1.62. Of these 80 students, 78.75% completed the gateway course with a 70% C or higher. Group Two had a mean ACT mathematics score of 17.17 with a standard deviation of 1.86. This ACT profile is quite similar to those of Group One. Of these 224 students, 75.00% completed the general education course with a 70% C or higher. One student had an ACT mathematics score above the required score of 22. Reasons for placement in this course are unknown. It is possible that the student elected to take a developmental course as a primer prior to enrolling in the gateway course. Group Three had a mean ACT mathematics score of 22.61 with a standard deviation of 3.71. One student had a score of 11, yet did not enroll in a developmental course at MWU. The reason for this is unknown. Of these 395 students, 90.13% completed the gateway course with a 70% C or higher. Descriptive statistics can be found in Table 1.

Table 1

ACT Mathematics Scores

	N	Mean ACT math sub-score	Standard Deviation	Minimum	Maximum	Completed MATH 100 with 70% or higher
Group 1	80	17.03	1.62	13	21	78.75%
Group 2	224	17.17	1.86	9	27	75.00%
Group 3	395	22.61	3.71	11	34	90.13%

In addition to examining course completion data, a one-way analysis of variance was computed comparing the final exam scores of 479 subjects. This sample did not include participants who withdrew from the course, were exempt from the exam by an instructor, or who completed the final exam at a time other than the scheduled testing date. This comprehensive exam consisted of 28 multiple choice questions. Students were given 120 minutes to complete the exam and were permitted the use of calculators. The grand mean of the post-assessment was 19.35 with a standard deviation of 4.33. A significant difference was found ($F(2, 477) = 71.41$, $p < .0001$) among the groups. A Duncan multiple range test ($p = .05$) was used to determine the nature of the differences between groups. This analysis revealed that students in Group Three scored significantly higher ($m = 21.34$, $sd = 4.02$) than students in Group One ($m = 17.07$, $sd = 4.54$) and students in Group Two ($m = 16.37$, $sd = 4.81$). Group One and Group Two were not significantly different from each other. See Table 2 for descriptive statistics and Table 3 for the ANOVA.

Table 2

Common Final Exam Descriptive Statistics

	N	Mean	Standard Deviation	Minimum	Maximum
Group 1	55	17.07	4.54	7	25
Group 2	145	16.37	4.81	3	27
Group 3	280	21.34	4.02	5	28

Table 3

Common Final Exam ANOVA

ANOVA					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	2682.81	1341.41	71.41	< .0001
Error	477	8960.68	18.79		
Total	479	11643.49			

Conclusion

This co-requisite model shows promise in three outcomes. First, students who were unable to demonstrate acceptable mathematics proficiency based on the ACT were able to demonstrate college-level mathematics mastery with this model of just-in-time, learner-centered support. Second, students receiving co-requisite treatment were able to move through the developmental and gateway sequence more efficiently. This pace could help support a more timely progress towards degree attainment, which helps mitigate certain risk factors associated with delayed progress, such as stopping or dropping out (Vandal, 2014). Students with extended pathways and interrupted enrollment are often less likely to complete an undergraduate degree than students with shorter pathways and continuous

enrollment (McCormick & Carol, 1999; Smart & Paulsen, 2012). Finally, students were able to receive the treatment at a reduced credit load, which corresponds to decreased cost burden, which is another factor impacting retention and persistence among at-risk populations.

Here, the co-requisite model has expanded the understanding of being learner-centered to include academic risk factors that may not be directly linked to mathematics proficiency: namely, the daily access to mathematics faculty, coupled with the accelerated course sequencing, allows fewer opportunities for unexpected challenges that tend to affect students in need of social, emotional, and intellectual support. While access and support were available in the emporium model pre-requisite sequence, study participants appeared to benefit from the required daily interactions with instructors, classmates and content offered by the co-requisite model. This particular just-in-time model allowed students to focus on college-level mathematics without first spending a semester revisiting content previously covered in secondary mathematics courses.

A few limitations in this study should be noted. The sample is limited to a single institution and may not be representative of all students with developmental mathematics needs. The researchers were not able to control for demographics or particular sub-populations beyond at-risk students who performed below ACT expectations for college readiness. The researchers were not able to account for instructor preparation, credentials, paradigms regarding pedagogy, or classroom teaching experience.

The use of co-requisite instruction bears promise and requires further inquiry. Recommended areas for further research include the impact of co-requisite courses on achievement and the application of co-requisite courses beyond developmental education. While many states are attempting to scale this or similar accelerated learning models, developmental educators have the opportunity to investigate and promote best practices in co-requisite education to ensure its outcomes continue to create equitable opportunities for all students.

Dr. Charlene Atkins is assistant professor of mathematics and developmental mathematics coordinator in the College of Education at the University of Central Missouri in Warrensburg, Missouri. C. T. Beggs is the director of TRIO—Student Support Services—in the College of Education, also at the University of Central Missouri.

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