

Case Study: Developmental Math Reform at Marshall University

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CI 707 Curriculum Change
at Marshall University
in partial fulfillment of the requirements
for the degree of

Doctor of Education
in
Leadership Studies

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Graduate School of Education and Professional Development

South Charleston, West Virginia
2014

Keywords: Developmental Education, Mathematics, West Virginia, Marshall University
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Introduction

Traditional developmental education at most colleges and universities has been a model that provides remediation on the front end to prepare a student for a college-level course. While it seems logical this model would work, “long sequences of fragmented, reductive coursework are not an on-ramp to college for underprepared students, but a dead end” (Charles A. Dana Center, Complete College America, Inc., Education Commission for the States, & Jobs for the Future, 2012, p. 3). At many institutions, developmental math is a one-size-fits-all model that does not provide skills needed for the student’s chosen academic major. “Too often [developmental course work] serves as a filter – which sorts students out of college – rather than as a funnel – guiding them into a program of study” (Charles A. Dana Center, Complete College America, Inc., Education Commission for the States, & Jobs for the Future, 2012, p. 4).

The Charles A. Dana Center, Complete College America, Inc., the Education Commission for the States, and Jobs for the Future (2012) aligned in a joint statement to recommend a set of core principles for reforming developmental education. Those principles include:

1. Completion of a set of gateway courses for a program of study is a critical measure of success toward college completion.
2. The content in required gateway courses should align with a student’s academic program of study – particularly in math.

3. Enrollment in a gateway college-level course should be the default placement for many more students.
4. Additional academic support should be integrated with gateway college-level course content – as a co-requisite, not pre-requisite.
5. Students who are significantly underprepared for college level academic work need accelerated routes into programs of study.
6. Multiple measures should be used to provide guidance in the placement of students in gateway courses and programs of study.
7. Students should enter a meta-major when they enroll in college and start a program of study in their first year, in order to maximize their prospects of earning a college degree.

(Charles A. Dana Center, Complete College America, Inc., Education Commission for the States, & Jobs for the Future, 2012, p. 6)

At the same time these agencies were researching developmental education and defining principles for developmental reform, the State of West Virginia was analyzing state- and institution-level developmental performance data and suggesting that state institutions make developmental education one of its top priorities to improve college completion in the state. This case study will explore the journey of one West Virginia public institution, Marshall University, as it reconsiders developmental math education.

Institutional Context

In January 2011, the West Virginia College Completion Task Force co-chaired by James Clements, former president of West Virginia University, and Joanne Tomblin,

First Lady and President of Southern West Virginia Community and Technical College, met for the first time. The committee included representation from business leaders, higher education administrators, faculty, state policy leaders, and public education. (West Virginia Higher Education Policy Commission and West Virginia Community and Technical College System, 2012). Marshall University was not represented.

The task force was charged to “examine state and national data on college completion and develop recommendations for increasing the number of West Virginians with high quality certificates and degrees” (West Virginia Higher Education Policy Commission and West Virginia Community and Technical College System, 2012, p. 1).

The Task Force developed a strategy that focused on five key recommendations:

1. Make graduation a visible and tangible priority across the state
2. Reduce time it takes for students to earn a college certification or degree
3. Improve developmental education
4. Increase adult completion rates
5. Connect funding to priorities

(West Virginia Higher Education Policy Commission and West Virginia Community and Technical College System, 2012, p. 1)

A second meeting of the task force was scheduled in April 2011. The agenda included a review of college completion rates for different student populations with a particular focus on the challenges faced by students needing developmental education. Dr. Frances Hensley, Associate Vice President of Academic Affairs at that time, and Sherri Stepp, Director of University College, were invited to share Marshall University’s perspective on addressing the needs of these students. Part of a larger state and

nationwide movement, this was the beginning of Marshall University's journey toward rethinking developmental education.

Data shared at the Developmental Education Workshop sponsored by the WVHEPC and WVCTCS in October 2012 reflected that 31.7% (618 of 1951) of Marshall University first-time freshmen in 2010 were enrolled in developmental mathematics as compared to 20% statewide. In the 2006-2010 student cohort, Marshall University students passed developmental courses at a rate of 68.8% while the statewide pass rate was 64.7%. Additionally, the fall 2010 to fall 2011 retention rate for Marshall University for first-time freshmen taking developmental education was 60.7% while statewide the fall-to-fall retention rate was 51.5%. Marshall students in the 2006-2010 cohort who participated in developmental education graduated at a rate of 31.3% compared to 27.2% statewide.

While data show that Marshall was faring better than the state average in retention and graduation, the retention and graduation rates for developmental students are significantly lower than Marshall's general student population. The fall-to-fall retention rate for students not enrolled in developmental courses was 72.8% and the comparable graduation rate for developmental students was 54%.

The West Virginia Higher Education Policy Commission (WVHEPC) and the West Virginia Community and Technical College System (WVCTCS) secured grant funding from Complete College America with support from the Bill and Melinda Gates Foundation (West Virginia Higher Education Policy Commission and West Virginia Community and Technical College System, 2012). The WVHEPC and WVCTCS along with representatives from Complete College America sponsored multiple statewide

workshops and summits to assist college teams in reconsidering the delivery of developmental education on their campuses. Marshall University sent a team to each of these meetings and began implementing multiple reforms in developmental math course pedagogy, curriculum, and course structure.

The grant funding has enabled these teams to attend and participate in these workshops without the limitations of home institution budgets. In addition to travel support, grant funds have also provided support for instructor training, course development, and implementation of support programs such as summer bridge programs.

Motivation for Change

Marshall University is motivated for change in developmental education based on two reasons reflected in the work recommended by the West Virginia College Completion Task Force. As noted in a previous section, the third strategy directs West Virginia institutions to improve developmental education and the fifth strategy includes development of a connection between funding and priorities (West Virginia Higher Education Policy Commission and West Virginia Community and Technical College System, 2012). West Virginia is actively reviewing the successes and mistakes of other states who have implemented performance based funding and has “developed a set of clear models that tie funding to student achievement and graduation and reward institutions for helping students acquire the skills they need to participate fully in the economic and social life of the state” (West Virginia Higher Education Policy Commission and West Virginia Community and Technical College System, 2012). West Virginia has not yet implemented a performance-based funding model, but seems this

could happen in the near future. Marshall University and other state schools must be prepared for this course of action.

Approximately 80% of Marshall's student body are West Virginia residents (Quick Facts about Marshall University, n. d.). Our strongest recruitment population, West Virginia high school graduates, is declining (Western Interstate Commission for Higher Education, 2012). The administration and the Office of Recruitment are looking for alternate populations of students to bolster declining enrollments. According to the Education Commission of the States (2010), developmental education students are viewed as an opportunity to improve performance and increase persistence and degree attainment. Developmental students come from a variety of backgrounds and present a variety of challenges and the need for different approaches. This population includes underprepared high school graduates, non-traditional students, adults returning to school to meet increasing job demands, veterans, and immigrants (American Association of State Colleges and Universities [AASCU], 2008).

For many of the staff at Marshall University, there is a third motivation. It is simply the success of the students. Academic advisors are often faced with frustrated students losing the developmental battle. Beyond state mandates, retention, persistence, and performance-based funding, developmental education reform is needed for the success of each individual student. Sharratt and Fullan's (2011) recommend applying principles that help underprepared students understand the life application of math skills requires not only effective instruction but an emotional commitment from the teacher as well.

Change and Change Agents

The process toward change was guided by Dr. Corley Dennison, former Associative Vice President for Academic Affairs and Dean of Undergraduate Studies. He formed a campus team comprised of current developmental math instructors, math department leadership, and University College staff. University College staff administer math placement examinations, coordinate a math summer bridge program, and advise conditionally admitted students who nearly all need developmental coursework. (It is important to note that developmental English teachers and English department leadership were also included, but the focus of this case study is math.)

Initial meetings were held on campus with the larger group and, as grant funds became available via the WVEHPC and Complete College America, team members were sent to various state meetings for structured planning and development workshops. The focused team included Dr. Dennison, Sherri Stepp, Director of University College, and Laura Stapleton, a member of the math faculty. At one crucial workshop in Morgantown, WV, President Stephen Kopp and Provost Gayle Ormiston participated in team planning. Under the direction of Dr. Dennison, reform initiatives were recommended to the math department leadership. To date, the math department has not responded.

Sharratt and Fullan (2011) recommend a “reciprocal accountability” meaning that “if I have an expectation of you, then I have an obligation to provide you with whatever you need to be successful in meeting that expectation” (p. 10-11). For curricular change in developmental math, this means the support of Academic Affairs, the leadership of the

College of Science, the chair(s) of the math department, and the developmental math instructors.

Key Elements of New Curriculum

State educational institutions have been challenged to find the quickest path to completing developmental and gateway math courses by using a variety of instructional designs. The Marshall University Mathematics Department has responded to this call to action by developing alternative delivery methods and creating new co-requisite courses combining college-level instruction with additional remediation and academic support. Pilot courses were implemented in fall 2013 and additional courses are being developed for fall 2015.

Appendix A provides a timeline of developmental math course changes. Prior to any reforms, policy mandated by the WVHEPC states that students must achieve a 19 Math ACT or 460 Math SAT score to enter 100-level college-credit-bearing courses. Students with scores below that level must be remediated. Students with a Math ACT of 17 or 18 (or equivalent SAT) were eligible to enter MTH 099. Students below 17 must enter and pass MTH 098 before entering MTH 099. Both courses are credit/no credit and a 75% grade is required to receive a credit.

With a 19 Math ACT, or upon completion of MTH 098 and/or MTH 099, students had two 100-level math pathway options. MTH 121 Concepts and Applications is a math designated for non-STEM (science, technology, engineering, or math) students who intend to major in either liberal arts, the fine arts, or other select majors not requiring algebra. MTH 127 College Algebra Expanded is designated for students whose academic majors will require algebra and lead toward calculus.

One reform effort involved a new teaching pedagogy in MTH 098 which became MTH 098Q. Generous grant funding allowed Marshall to participate with the Carnegie Foundation for the Advancement of Teaching to train math instructors in new math delivery model called Quantway (Quantway, n. d.). Our commitment to the program is two years of instruction in the program (2013-14 and 2014-15). This math strategy encouraged teachers to be more facilitator than instructor and encouraged classroom group work through a method called Productive Persistence (Productive Persistence, n. d.). The value in this reformed math pathway allowed non-STEM students to advance from MTH 098Q directly to MTH 121Q, the concepts and applications course taught with Quantway pedagogy. This allowed students to skip MTH 099 and complete a 100-level credit-bearing course within two semesters rather than three.

Another strategy for non-STEM students involved the creation of a co-requisite course that provided access to a 100-level credit-bearing course immediately. The new course is titled MTH 121B Concepts and Applications. The original version of MTH 121 is a 3-credit-hour course. MTH 121B is a 4-credit hour course that embeds developmental work alongside college-level work. Non-STEM students with a 17 or 18 Math ACT were granted direct access to this course without completion of MTH 099. Students at the MTH 098 level would need to receive credit for that course before entering MTH 121B but the co-requisite model eliminates the need to complete MTH 099.

Marshall also offered a math summer bridge program for past three summers. The 2012 program was coordinated directly through the Office of Academic Affairs and the 2013 and 2014 programs have been coordinated by the staff of University College.

The program has varied slightly each year. Most recently, the 2014 program offered two one-week sessions. The program was free to students and free housing is available to students who need it. Students receive five days of instruction from developmental math faculty. The final day includes a review and the opportunity to take the COMPASS placement exam with the opportunity, but no guarantee, to place in a higher level course.

At the time of this paper, the first session just concluded. We offered 96 seats. Due to anticipated attrition, we pre-registered 112 students. Eighty-five students actually attended the program. Fourteen students tested into 100-level math and another 21 students tested up from MTH 098 to MTH 099. Overall, 35 students (41%) improved their math placement. The 2014 program received significant support from WVHEPC grant funding.

Current Level of Implementation

MTH 121B is fully implemented for the non-STEM math students. The math department is currently developing an alternate course for students placing in the traditional MTH 098. Though the planning is not finalized, it is believed that it will be a 100-level course with co-requisite study skills alongside remedial math instruction. The math department is also developing an alternate pedagogy and pathway for students needing MTH 127 College Algebra. Both reformed models are expected to be available in Fall 2015.

Flexibility in placement cut scores is another reform that has been suggested by the WVHEPC. Dr. Kathy Butler, former Vice Chancellor for Academic Affairs, provided a statement on May 6, 2014, encouraging flexibility in the cut score levels for math placement (WVHEPC, 2014). As a general rule, most colleges and universities

place students into math courses based on a single standardized test score (Charles A. Dana Center, Complete College America, Inc., Education Commission for the States, & Jobs for the Future, 2012, p. 3). Complete College America and other agencies are encouraging institutions to study and evaluate student performance just above and below the specified cut scores. Some schools have already been able to determine that students just below the established cut score perform just as well as students with scores at or just above the cut score. Part of this success factor lies in the fact that students are aware that they are enrolled in a college level course that will count toward degree completion and they eliminate a part of the stigma associated with being remediated.

University College advisors and the developmental math instructors have presented a flexible cut-score plan that is currently being evaluated by the leadership in the Math Department. The plan recommends a reduced Math ACT requirement for MTH 121B to include a score of 16. It also recommends the equivalent reduction from a COMPASS math placement exam for like placement.

Another area that needs to be considered involves a third math pathway. The current math pathways relate to STEM and non-STEM students. A third path that would be particularly valuable to health care fields is a statistics pathway. This pathway is not currently offered at Marshall and might need to be considered as future math pathways are evaluated. Appendix B reflect proposed math pathways for non-STEM, STEM, and STAT students. Please note that these recommendations are still under consideration of the math department.

Successes and Challenges

Implementation of the changes is recent; therefore, there is not yet a lot of data available. Michael Smith, a representative in Marshall's Office of Institutional Research is developing a report to monitor continued student progress through these courses as well as persistence and graduation rates.

The math teachers did not believe the Quantway model achieved the goals that Carnegie professed. They believed the pedagogy was too challenging for effective delivery for our population of students (Personal conversations with Laura Stapleton, Shannon Miller-Mace, and Tracy Marsh, developmental math instructors). Under the strategy of productive persistence, students were to utilize their group structures to persist toward answers to their problems. When teachers encouraged them to work in their groups or seek assistance from other classroom groups, the students became frustrated with the instructors. Committed to Carnegie for one more year, the teachers are concerned about student performance. Preliminary data reflect that students in the Quantway sections of MTH 098Q and MTH 121Q performed no better than students in the regular sections of the course.

Preliminary data on student performance in MTH 121B reflects a significantly higher success rate than regular sections of MTH 121. Teachers are encouraged by the success and ready to fully implement the needed number of course sections to meet the demands of non-STEM students enrolling in Fall 2014.

Summer bridge data is also encouraging. While the success rate of students testing into 100-level math courses is no higher than our regular placement exam results of approximately 12%, summer bridge participants are outperforming non-bridge

participants in their first and second math courses. Additional data also suggest that bridge participants are also retained at a higher rate than developmental students who did not participate in bridge. (Please note: This data is based on conversations with Michael Smith in the Institutional Research office. Data is not yet available for distribution.)

Results are inconclusive at this point, but preliminary anecdotal data is encouraging. Once data is available, we will have quantitative data that will reflect the purported success and failures of certain strategies. Additional qualitative research would be essential to determine teacher and student perspectives on the changes. During this time of transition, it is likely that several students have experienced more than one model of pedagogy and/or course structure. Comparative data would be helpful in considering future strategies.

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Appendix A: Timeline for Developmental Education Changes

Class	2010-11	2011-12	2012-13	2013-2014	2014-15	2015-16
English	ENG 101B ENG 101C <i>Replaced ENG 100</i>	ENG 099	ENG 099	Fall: ENG099 ENG 101+ENG 280 Spring: ENG 099 ENG 281	ENG 101P	ENG 101P
Math	MTH 098 MTH 099 <i>Replaced Math Workshop</i>	MTH 098 MTH 099	MTH 098 MTH 099	MTH 098 MTH 098Q MTH 099 MTH 121B MTH 121Q (Spring)	MTH 098 MTH 098Q MTH 099 MTH 121B MTH 121Q	MTH 121B PENDING: 098 Changes 127 Changes
Course History Details: Math				Course History Details: English		
<p>MTH 121 (3hrs, graded) or MTH 127 (5hrs, graded): Math ACT 19 (SAT 460)</p> <p>MTH 121B (3hrs, CR/NC) Math ACT 17 – 18 (SAT 400 – 450)</p> <p>MTH 121Q (Quantway, 3hrs, CR/NC): Completion of MTH 098Q</p> <p>MTH 098Q (Quantway, 4hrs, CR/NC): Math ACT <17 (SAT<400)</p> <p>MTH 098 (3hrs, CR/NC): Math ACT <17 (SAT <400)</p> <p>MTH 099 (3 hrs, CR/NC): Math ACT 17 – 18 (SAT 400 – 450)</p> <p>WMTH 001 (3hrs, +W/-W): Math ACT <17 (SAT<400)</p> <p>WMTH 002 (3hrs, +W/-W): Math ACT 17 – 18 (SAT 400 – 450)</p>				<p>ENG 101 (3hrs, graded): Verbal ACT 18 (SAT 450)</p> <p>ENG 099 (3hrs, CR/NC): Verbal ACT <18 (SAT <450)</p> <p>ENG 101P (4hrs, graded): Verbal ACT <18 (SAT < 450)</p> <p>ENG 281 (4hrs, graded): Verbal ACT <18 (SAT <450)</p> <p>ENG 280 (1hr, graded) Co-requisite with ENG 101: Verbal ACT <18 (SAT <450)</p> <p>ENG 101B (4hrs, graded): Verbal ACT 16-17</p> <p>ENG 101C (3hrs, CR/NC): Verbal ACT below 16</p> <p>ENG 100 (3hrs, graded): Verbal ACT <18 (SAT < 450)</p>		

Appendix B: Proposed Developmental Math Pathways

