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Pansy Waycaster, *Virginia Highlands Community College*, pwaycaster@vhcc.edu

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IMPLEMENTING MTH 155: STATISTICAL REASONING CO-REQUISITE

PANSY WAYCASTER

INTRODUCTION

In a recent report, *The End of the Remedial Course,* Mangan, (2019) has presented some disturbing facts about how mathematically unprepared students are for college. Nationally two-thirds of entering community college students are found to be not ready for college-level mathematics. A 2017 related report concluded that 96 percent of the two-year and four-year colleges surveyed enrolled students that were deemed unready for college-level work. Furthermore, Mangan (2019) sites a Community College Research Center (CCRC) report finding that, of students referred to three levels of remedial math, only 17 percent completed the sequence within three years. Consistent with these findings, May (2019) found that for the academic year 2016 cohort (new students) at Virginia Highlands Community College (VHCC), 36 percent took developmental mathematics courses and of these 14.4 percent successfully completed a college-level mathematics course by the end of the next fall. So what is being done to remedy this situation?

LITERATURE REVIEW

Several state institutions have responded to this low performance of the remedial students by cutting remedial mathematics courses entirely from their curriculum. Mangan (2019) summarizes these efforts.

- The California State University system has eliminated all free-standing remedial courses, and next year the state's entire community-college system will do the same.
- In 2015 Tennessee became the first state to drop remedial classes in favor of a statewide shift to co-requisite remediation.
- In 2013 Florida made remedial classes optional.
- For San Jacinto College in Texas, the days of putting students in sequences of up to three remedial courses are over. Currently, the State of Texas requires that 25 percent of students needing developmental education be placed in co-requite classes. Next year, this requirement jumps to 50 percent, and the following year to 75 percent.

In response to these migrations from development mathematics courses Mangan (2019) notes some concerns for this trend.

- Goosen, Associate Vice-Chancellor for college preparatory at San Jacinto College in Texas (p. 7): Despite the fervor for co-requisite courses, they may not work for those who are least prepared.
- Kurlaender, professor of education policy at the University of California at Davis (p. 12): We want to avoid a sink or swim situation.
- Tennessee (p. 16) eliminated student's delay in entering credit-bearing college-level courses and found the problem is that once they got there, they were just as likely to fail the college-level mathematics classes.
- Co-Requisite remediation, which starts with a college-level class with support alongside, allows many more students to pass a credit-bearing course.

- One of the most successful models of remedial reforms (p.19)—City University of New York's Accelerated Study in Associate Programs—allows students who need them (developmental courses) to start there. The program, which has been replicated nationally, nearly doubled three-year graduation rates.

So before remedial coursework is removed from our mathematics programs, consideration needs to be given to those students who need more mathematical help than a co-requisite support course. Direct placement into college-level classes can result in failure for these students. We do not want to ignore students with weak mathematics backgrounds who arrive on our campuses to continue their education. A more practical approach is to do an in depth study of a successful model for remedial education such as the one at City University of New York.

Overview

The concept of co-requisite mathematics courses emerged in Virginia from a Virginia Community College System (VCCS) Mathematics Pathways Project (Notes, 2016). One goal of the Mathematics Pathways Project was to clean up the master file of mathematics courses, as many of these courses were no longer being taught. By spring, 2016, thirty-two of the eighty-nine mathematics courses had already been cut out of the master file. To this end, MTH 155: *Statistical Reasoning*, was created to replace MTH 146 at all VCCS colleges. A second goal of the Mathematics Pathways Project was to get developmental students into credit courses sooner with equal or better success than those students entering without support. A new support course (Notes, 2017), Math Co-Requisite (MCR 5), was added for the MTH 155 course beginning fall, 2017. At this time the VCCS co-requisite workgroup composed of developmental leads from all

of the VCCS colleges developed a state model to implement pilots for several new courses—one of which was MTH 155. The projected timeline for full implementation for this course was fall, 2018; however, early adopters were encouraged to implement this course earlier.

Having received a Paul Lee Development grant on June 19, 2017, I proceeded to develop the MTH 155 course. The goal of this grant was to, not only develop the new MTH 155 course: *Statistical Reasoning*, but also to develop a co-requisite course which will enable qualified students to enter a credit-level math course sooner and to achieve equal or better success than those students meeting course prerequisite requirements. The prerequisites for the MTH 155 course will be completion of any three of the first five existing MTE developmental mathematics modules, already a vital part of the VCCS developmental mathematics program. Successful completion of MTH 155 will result in the prerequisite MTE modules 1-5 being satisfied.

Research Design

This project involved many activities. First, I met with faculty, counselors, and advisors at VHCC to bring them up to date with all the details of the new MTH 155 and the MCR 5 courses for spring, 2018. Discussions were ongoing among the mathematics faculty in the Arts and Science Division. Faculty, counselors, and advisors worked hard to ensure that students were properly enrolled in the new MTH 155 and MCR 5 courses. Next, I gathered viable textbooks from publishers for possible use in the MTH 155 course and chose *Statistical Reasoning for Everyday Life*, 5th edition, by Bennett, Briggs, & Triola. Following the selection of a textbook, I then developed a syllabus, lecture notes, and chapter tests for all 10 chapters. The same syllabus was used for both seated and virtual sections, with the exception that lecture materials were included in the software and online homework and tests were incorporated into

the virtual course. All tests for both seated and virtual classes were given and proctored in the Testing Center on campus. I also worked closely with Jonna Sutherland, Adjunct, Physics and Mathematics, in designing the MCR 5 course. The plan was to use supplemental materials for remedial work, developed by Jonna. She also assisted these students with their homework and lecture material in the actual MTH 155 class.

During the spring, 2018 in-service, I presented descriptive details of the MTH 155 and MCR 5 courses to faculty and advisors and responded to questions to assist them in continued registration for MTH 155 students. The MTH 155 course was implemented in the spring semester, 2018. Also in the spring, I attended the state VMATYC (math peer group) to share details of this new project.

A timeline for the above activities follows.

- Meeting with college faculty, counselors, and advisors — Fall 2017
- Registration for students in MTH 155 and MCR 5 for spring 2018 — Fall 2017 - Jan. 2018
- Textbook selection — Fall 2017
- Develop MTH 155 and MCR 5 courses — Fall 2017
- Implementation of MTH 155 and MCR 5 courses — January 2018
- Spring in-service — January 2018
- VMATYC (math peer group) meeting — Spring 2018
- Evaluation of data — Summer 2018
- Dissemination of findings and results VMATYC — Fall 2018
- Submission of article to *Inquiry* — Fall 2018

Data Collection

This MTH 155 course was offered in a seated and virtual format for the first time in the spring, 2018 semester. Co-requisite students also enrolled in MCR 5, which is a structured support course for MTH 155. I taught both the seated and virtual MTH 155 course sections for 3-hours credit each, and Jonna Sutherland taught the MCR 5 co-requisite course for 2-hours credit.

At the highest peak of registration there were 30 students in each section of MTH 155, but during the drop/add period, a few students withdrew from each section. Since both of the MTH 155 sections were co-requisite, proper placement into the course was most important because students had to have completed at least three of the first five MTE modules to enroll in the class. Continuous coordination with Robert May--Director, Institutional Research & Effectiveness, Michael McBride--Academic Counselor, Enrollment Management & Student Services, and Jonna Sutherland was essential to enrolling students who were truly qualified to take the MTH 155 co-requisite course. Robert May managed the constant updates regarding student MTE module completions; Michael McBride made regular checks on course readiness via multiple measures; and Jonna Sutherland kept ongoing changes in records of students enrolled and active in her MCR 5 class. Only four students enrolled in the MCR 5 class—two virtual students and two seated students. All of the remaining students had successfully completed the first five MTE math modules. The main advantage of this co-requisite MTH 155 course is that students who have not completed all five of the first five MTE modules are given the opportunity to enroll in the college level course and if they successfully complete it, their MTE module requirements will have been satisfied.

The MCR 5 course assisted students who were weak in some basic math concepts. Jonna Sutherland provided just-in-time review of concepts for current homework and upcoming lectures. This support allowed weak math students to progress along with those regular students who were better prepared to take the MTH 155 course. It also increased the number of students successful in the college-level math course required in their discipline.

Data Analysis

Final grades in this new course for both co-requisite and regular students were collected at the end of the spring semester, 2018, to determine the level of success of the project. One virtual section of MTH 155 was also taught in the first summer term, 2018; however, due to low enrollment, no MCR 5 co-requisite course was offered. All data from these spring and summer MTH 155 courses are included in the tables below.

	Spring 2018		Summer 2018	
Grade	MTH 155 Seated	MTH 155 Virtual	Virtual	Total
A	1	8	3	12
B	7	7	1	15
C	3	2	4	9
D	6	1	1	8
F	5	2	0	7
W	0	3	3	6
Total	22	23	12	57

MTH 155 Grade for MCR 5 Students Spring 2018	Total
A	1
D	2
F	1

Overall, 36 (63%) of the MTH 155 students passed the course with a grade of A, B, or C and 44 (77%) MTH 155 students passed the course with a D grade or better. Three of the four MCR 5 students passed the MTH 155 course. It should be noted that the one MCR student who failed the MTH 155 course only attended class a few times and never took any of the ten MTH 155 tests. So this student should have been withdrawn from both the MTH 155 and the MCR 5 classes early in the semester.

Implications

Since both the seated and virtual sections of the MTH 155 course had good enrollments in the spring, 2018, semester, both of these sections will continue to be offered in future fall and spring semesters and a virtual section will be offered in summer semesters.

Although large enrollments in both the seated and virtual sections of the MTH 155 course were not expected, it is obvious that both sections need to be offered routinely in each semester. More co-requisite students were expected to enroll in the MTH 155 course, but actual enrollment

of these students was low. Consequently efforts and changes are currently underway to better inform developmental mathematics students who have successfully completed three of the first five MTE math modules that they qualify for the co-enrolled MTH 155 course. These changes involve the MTT course offerings and will be implemented for fall semester, 2018, in hopes that more developmental math students will take advantage of this opportunity.

Conclusion

The VCCS Mathematics Pathways Project has been working since 2016 to improve the quality of the developmental mathematics courses. Current proposals for revision are incorporating a support course (Mathematics Co-Requisite—MCR 5) along with the newly created college-level mathematics course, MTH 155. The focus of this paper has been the work done with this co-requisite course. Results of the study show promising results with 77% of the MTH 155 students, which includes three of the four MCR students, passing the course with a grade of D or better. The main weakness of this pilot effort was that only four students enrolled in the MCR course. Consequently, more work needs to be done to get qualified developmental mathematics students into with this support course.

Discussion at the spring, 2019 VMATYC Western Region meeting (Notes, 2019) revealed current efforts and concerns about the ongoing VCCS changes with the developmental mathematics and support courses for college-level mathematics courses. Direct enrollment into transfer mathematics courses was the main topic. Emails subsequent to the spring meeting revealed several issues about the pilot for direct placement to begin in fall, 2020. Currently nine of the twenty-three VCCS colleges are in the pilot. Two of these colleges, Southwest and

Mountain Empire, are in our western region. Several issues were raised at the spring, 2019 meeting and through follow-up emails (2019).

- No current mathematics faculty were on the original direct enrollment steering committee. (personal communication, February 21, 2019)
- Subcommittee for the pilot at Mountain Empire Community College (MECC) met in March, 2019 to discuss the new mathematics support courses. No mathematics faculty were at this meeting. This subcommittee proposed three new co-requisite courses that are three credits each: one for MTH 154, 155, and 161. (personal communication, April 1, 2019)
- All placement will be done by multiple measures. (personal communication, April 1, 2019)
- Should we at least wait and collect a few years' data to see how the MCRs are working? (personal communication, April 2, 2019)
- We haven't had enough enrollment in the MCR course to gather any data. (personal communication, April 1, 2019)
- We have not given pathways time to analyze our efforts. (personal communication, April 2, 2019)
- Many of us see this as detrimental to the mission of community colleges which is opening the door to higher education for those who might otherwise not have the opportunity. (personal communication, April 2, 2019)

In closing, these email exchanges point out one unfortunate detail--that no mathematics faculty were involved in the design of a pilot project for direct placement into college-level mathematics courses. And no mathematics faculty were on at least one of the subcommittees to

implement this mathematics pilot. Such oversite is unacceptable. It is also regrettable that sufficient time has not been given to analyze data for the MCR support courses. Mathematics faculty in the VCCS have spent much time and work with this Mathematics Pathways Project, which appears to have been ignored by the VCCS in its move toward direct placement into college-level mathematics courses. It is hoped that the fall, 2020 implementation of the pilot will result in some constructive outcomes for the newly created mathematics and support courses. It is also hoped that the VCCS does not sacrifice its mission of open-enrollment for higher education.

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