ONLINE INSTRUCTIONAL INTERVENTION IN A SEATED GENERAL EDUCATION MATHEMATICS COURSE

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Abstract

Nontraditional learners represent the majority of college enrollment today (Bean & Metzner, 1985; Donaldson & Graham, 1999; Merriam & Caffarella, 1991; Remedios & Richardson, 2013). Yet, academic interventions offered for traditional seated college courses may not be adaptable for the nontraditional classes. The reasons for this discrepancy may include time constraints of the learners (Hout, 2012; Donaldson & Graham, 1999), inaccessibility to the traditional campus services (Samuels, Beach & Palmer, 2012), and the evidence that the nontraditional learner often does not identify or relate to their traditional counterparts on a socio, psycho, or economic level (Levine, 1993).

Technology has proved to be a successful form of delivery for academic interventions in the traditional seated classrooms. Using technology to deliver real time, synchronous tutoring and supplemental instruction via Internet has positively affected course mastery (Blanc, DeBuhr, & Martin, 1983). However, colleges have been reluctant to integrate technology into the nontraditional classroom because of a perceived lack of mastery of or comfort with technology on the part of their students (Dearnley, Dunn, & Watson, 2006). For this reason, higher education institutions have considered nontraditional learners reluctant to enroll in online or hybrid courses (Shaw, 2005). Therefore, the nontraditional learner is limited in the interventions available for academic success, especially proactive services, equitable to their seated counterparts (Rovai, 2003). This lack of support for the nontraditional learner translates into a higher rate of enrollment attrition (Diaz, 2002; and Allen & Seaman, 2007)

We will demonstrate how instructional intervention with technology in an online format for a seated, nontraditional course can be achieved in a manner that is equitable to the interventions in a traditional class. We will outline the tools used, how these were implemented, and their impact upon student content mastery as reflected in the data collected. Furthermore, we will propose how these methods could be applied to online courses for nontraditional students.

Introduction

The University of Mount Olive (UMO) currently serves approximately 1,000 traditional students and 3,500 nontraditional students. While the adult re-entry populations at colleges and universities are surging, the difference between the traditional and nontraditional demographic groups has presented a challenge to academic institutions. Not only is age disparity a contributing factor, life experiences, personal needs, and students' level of academic expectations play a critical role among students and their decision-making process. Allen and Seaman (2009) reported that a key difference between traditional and nontraditional instruction is the preferred mode of instructional delivery. Whereas the younger generation might be more technologically demanding (Turgut & Irgin, 2009), Allen and Seaman (2009) reported that the time constraints of the adult re-entry population require other more flexible methods of instructional delivery. Most importantly, rather than an open-ended experience, adult learners strictly adhere to a compact, closed period of study. There is a finite time in which to study and complete the requirements for each individual course and, additionally, to complete the entire degree program itself (Houde, 2006). The nontraditional student is usually financially independent, might be working full-time and attending school part-time, and more likely to be a parent themselves (NCES, 2009).

Choy (2002) noted that the independent definitions for adult learners and nontraditional learners are not necessarily mutually exclusive; yet, considered simultaneously, the seven characteristics of nontraditional learners usually reflect the experience of the adult learner. These characteristics, first defined by Cross (1981), include elements of the following: (a) delayed enrollment; (b) possible presence of dependents; (c) potential single parenthood; (d) probable full-time employment; (e) personal financial independence; (f) likely part-time attendance; and (g) perhaps no high school diploma or a diploma earned via passage of General Educational Development tests. Furthermore, Choy (2002) posited that when the characteristics are applied to the general student population, 73% of all college students could then be categorized as nontraditional learners.

At UMO, the average age of a nontraditional student is 38. UMO operates one main campus, nine satellite campuses (holding seated classes), and one online/virtual campus in eastern North Carolina. Both two and four-year degrees are offered, as well as an MBA degree. Nontraditional students form the population enrolled in the satellite campuses, which are dispersed throughout the eastern half of the state. Traditional students form the dominant demographic at the main campus.

The distance between nontraditional students and the satellite campuses presents a challenge, a challenge best addressed by technology intervention. The cost and time to commute between campuses is a burden on nontraditional students. Likewise, the cost effectiveness to hire multiple instructors by the university must be considered. These economic concerns can be remedied by online courses (Bartley & Golek, 2004). However, Diaz (2002) and Allen and Seaman (2007) suggested 13.5% of nontraditional adult learners compared to 7.2% of traditional learners drop out of online programs resulting from technology issues, the inabilities to physically interact with instructors, and instructors' inability to maintain or increase student motivation level in a virtual environment. Therefore, the challenge to implement an online intervention and, at the same time, reduce the nontraditional students' anxiety and resistance, was formidable.

This issue was evaluated closely by the Math Department and the Academic Resource Center (ARC). Both departments jointly examined how proactive instructional interventions were offered to the traditional students, and how these could be extended to the nontraditional math courses.

Background

Math and reading abilities of the nontraditional students were assessed at the beginning of their enrollment at UMO. The Edmentum platform was used for this purpose. At the conclusion of the math portion of the assessment, each student was assigned an automated three or four-digit score by the Edmentum program. Every 100 points correlates to a grade level in math ability (e.g., a score of 1050 corresponds to the math abilities of a mid-year high school sophomore).

The average math score for an incoming nontraditional student in the 2015-2016 school year was 663. Therefore, the typical nontraditional student demonstrated mastery at a sixth-grade math level. It should be noted that to be fully prepared for entry-level UMO college math courses, incoming students are expected to test at or above the tenth-grade level (hence, a score of or above 1,000). However, these incoming students presented on average with a three grade level gap in their math abilities.

Interestingly, the nontraditional students had a larger gap to overcome than the traditional students. One reason for this may be the notable difference in the time between their previous math class and the college math in that traditional students tend to be recent high school graduates. Since nontraditional courses at UMO presently are offered as accelerated courses (five or ten weeks) rather than the traditional 15 week duration, the nontraditional students have less time to master the math concepts while, at the same time, they present with a greater deficiency of math knowledge.

The most popular math course for the UMO nontraditional students is MAT 121 (Contemporary College Mathematics), which is delivered year-round at the main campus and all satellite campuses. The student is expected to only be enrolled in this single class during this time. The course is an intensive five-week seated accelerated class which meets four hours one night per week. It consists of five four-hour weekly evening as well as required home learning activities: research, individual and group projects, and homework.

At the end of the Spring, 2015 school year, the UMO Math Department piloted the Supplemental Instruction program with MAT 121 for nontraditional students.

Supplemental Instruction

The Supplemental Instruction (SI) program is a national peer instructional program developed at the University of Missouri Kansas City (Widmar, 1994, pp. 4-5) which targets historically difficult courses. The desired outcome is to improve content mastery as well as student retention. UMO began their own SI program, modifying this to meet the unique needs of this university.

At UMO, the SI program was piloted in one traditional math course in Spring 2013, and implemented for all introductory-level traditional math courses in Fall 2013. These courses included MAT 110 (Intermediate Algebra) and MAT 120 (College Algebra). UMO has experienced remarkable success in the traditional program of the general education math courses. The students meet with their peer math SI leader one hour per week. The leader focuses on both transferable learning skills and course content. In spite of the marked success of the SI program within the Math Department, SI was not yet been implemented for the nontraditional sections of math courses.

The math SI leader was considered an extension of the course professor. The SI leader met with the professor weekly to review the course, plan the sessions, etc. The desired outcome was to open communication between the students and the leader/professor, decrease student frustration, as well as improve student morale, confidence, and participation with math content. The SI leader maintained a collaborative learning environment, targeted student learning objectives (SLOs) for the course, and was accessible to the students. Extensive reviews were provided prior to each exam.

Complementing the success of the traditional math SI program, the ARC began a weekly, a four-hour session voluntary tutoring session for these traditional students. The Math clinic was open on a walk-in/walk-out basis, and students were able to meet with trained math supplemental instructors on a personal basis to review individual difficulties.

Attendance of regular SI sessions was mandatory for MAT 110 and MAT 120. Attendance at the syntheses was optional, as was attendance at the ARC Math Clinic.

The effectiveness of the SI program in MAT 110 is illustrated in Figure 1. The effectiveness of SI in all sections of MAT 120 was similar: improved pass rates on the exams, improved completion rates of the homework, and improved pass rates for the course.

Since the initial year (2013-2014), the SI program has expanded to serve new math courses as well as courses in other disciplines.

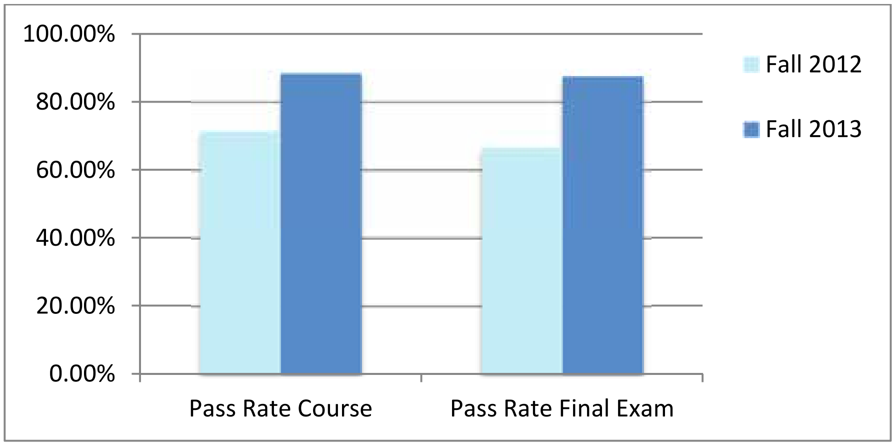

Figure 1: Comparing pass rate for the course and final exam in MAT 110 for Fall 2013 (SI-supported) and Fall 2012 (no SI)

Toward the conclusion of the 2014-2015 school year, the SI program began to be implemented within the nontraditional courses as a proactive intervention model. Proactive intervention addresses challenges in effective instruction in an attempt to offset potential course failure (Martin et al, 1983). SI is, indeed, proactive in nature.

According to the National Center for Educational Statistics (2011), the retention rate for the nontraditional student population is significantly lower than that of the traditional body. Reversing this trend requires that institutions identify issues which would hinder nontraditional students and align all services, both traditional and nontraditional, with their particular needs (Jeffreys, 2007).

Allen and Seaman (2009) noted that nontraditional students require more flexibility in the methods of instructional delivery. This was noted when attempting to transfer the existing traditional model to the nontraditional classroom. Replicating the traditional SI model for the nontraditional learner presented with specific challenges. One of these was the scheduling of the intervention itself. While traditional students were required to meet for an additional hour per week with the SI leaders outside of the classroom, nontraditional students' personal schedules usually did not allow for an additional group meeting outside of the class time. The reasons for this usually were work responsibilities, family obligations, and numerous other commitments. Therefore, a more adaptable format had to be adopted in order to facilitate this intervention for the nontraditional learners.

The solution was to implement a virtual SI program. Virtual SI incorporates both online course instructional methods and the purposes of the SI program itself. Effective distance learning should offer both synchronous and asynchronous learning environments, removing location and time restrictions that may otherwise impede student participation (Vaugh, 2010). In particular, students who attend courses at multiple satellite campuses or drive a long distance to attend a satellite campus might be overburdened by classroom attendance requirements. However, Enright (1975) advocated the implementation of cognitive learning strategies with application of technology for individualized learning as a preferred method of postsecondary institutional programs for improved learning.

Virtual (Online) Supplemental Instruction

The goal of the virtual SI program is to achieve equitable results between the traditional and nontraditional SI program, albeit the delivery format would be different. Therefore, nontraditional SI sessions were held using virtual conference/web-based software: GoToMeeting. A virtual whiteboard was used for instruction, and these sessions were recorded, making these available for student on an ongoing basis throughout the entire course.

As is the case for the traditional SI sessions, MAT 121 nontraditional students met with their SI peer leader virtually for one hour per week. Typically, the nontraditional SI session was held two to three days after the lecture. In addition, a virtual synthesis, compatible with the traditional format, was held before each of the two in-class tests.

The typical weekly cycle was as follows:

1. The SI peer leader and the course professor met to discuss concerns, targeted SLO's for student mastery, and lesson plans for the upcoming session.

2. On the day of the virtual SI session, the nontraditional students received an email from their SI leader providing a link for the GoToMeeting virtual conference. Students were able to connect using any Internet-enabled device. This included the use of a telephone, if necessary. Minimal technology skills were required of the students to follow the precise instructions and to set up their connection in order to join the virtual SI meeting, and the ARC was available to assist the nontraditional students in understanding the use of GoToMeeting when and if necessary.

3. The session(s) were recorded.

4. The recording was uploaded to the course Moodle site. Students could review the session as needed.

GoToMeeting proved to be an effective tool. The students reported no difficulty using the instrument and were able to receive the assistance on a weekly basis.

MAT 121 Results and Findings

Virtual SI was piloted in two MAT 121 classes: Spring 2015 and Summer 2015 at the Mount Olive Evening College campus of UMO. These two courses were taught by the same full-time professor, and the results were compared to two previous courses taught by the same full-time professor (Summer 2013 and Summer 2014).

Upon review, the data demonstrated a measurable increase in student learning outcomes, as demonstrated on the midterm exam (Test 1) and final exam (Test 2).

Test 1 was given at the start of the third week, approximately midway through the course. The test was a 50-point exam. During the Summer 2013 and Summer 2014 classes (no SI support), the mean score was 26.06 among 50 students. During the Spring 2015 and Summer 2015 classes (SI-supported), the mean score was 32.17 among 46 students. The difference is statistically significant at the $p=0.01$ level.

Test 2 was given at the end of the fifth week, near the end of the course. During the Summer 2013 and Summer 2014 classes, the mean score was 27.58 among 50 students. During the Spring 2015 and Summer 2015 classes, the mean score was 34.04 among 46 students. The difference is statistically significant at the $p=0.01$ level.

The final course grade used the standard 10-point scale. Tests made up approximately half of the student's overall grade, with outside requirements (homework, research, and group and individual projects) composing the other half of their overall grade. For the Summer 2013 and Summer 2014 courses, the mean score was 75.97 (grade of C) among 50 students. For the Spring 2015 and Summer 2015 courses (with the virtual SI intervention), the mean score was 81.05 (grade of B-) among 46 students. The difference is statistically significant at the $p=0.05$ level.

In addition to these measurable results, anecdotal information supported an increase in the students' meaningful class participation. The instructor noticed improved participation in in-class group activities, and more thoughtful in-class discussions.

Implementation of Findings

As a result of the success in Spring and Summer 2015, virtual SI support will be extended to course sections across all satellite campuses. Virtual SI support has also been extended to online courses, including MAT 120 (College Algebra) and BUS 302 (Business Statistics). Furthermore, the virtual support system has been expanded to include peer tutoring and Math Clinic for increased collaborative learning opportunities for both traditional and nontraditional students at UMO.

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