

**NORTHCENTRAL UNIVERSITY
ASSIGNMENT COVER SHEET**

Learner: **Steven Diaz**

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LTM5003

Dr. Amy Peterson

**Educational Applications of Educational
Media**

**Assignment 11: Impact of Technologies
on the Curriculum**

Dr. Peterson,

Thank you for your mentorship during the 12 weeks of this course. Your prompt assignment's feedback was a key factor to help me overcome the challenges I had with my time management. I hope this will not be the last course that I have you as a mentor.

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Impact of Technologies on the Curriculum

Steven Diaz

Northcentral University

Impact of Technologies on the Curriculum

My area of interest in using technology to enhance teaching and learning is in developmental mathematics, an area that many institutions of higher education, the government, businesses or industries, and the mathematics and science education communities have major concerns. The beginning of every new academic year, the media typically reports disconcerting statistics of how unprepared are high school students to confront the challenges and rigor of college courses, and the significant number of freshmen students taking mathematics remedial courses. A solid foundation in mathematics is a critical component to understand and manage the constant changes of events in today's technological and information society. Students taking remedial math courses have a second opportunity, and most likely the last one, of gaining a solid foundation in mathematics. Math instructors should provide a classroom environment where students can succeed attaining such solid foundation when experiencing innovative teaching and learning approaches. Technology is the catalyst for the new or different teaching and learning approaches. For such reason, I consider critical the use of graphic calculators, interactive whiteboards, classroom response system or clickers, computer mediated instruction, and a course web site as technological resources to enhance teaching and learning in developmental math courses.

From my experience teaching developmental math courses, students typically are weak with math facts (e.g. multiplication table), packed with conceptual mistakes (e.g. combining like terms in algebraic expressions), lack study habits, unmotivated, poor time management due to other valid responsibilities (i.e. work, family, sports, etc.), and high-levels of math anxiety. Taylor (2006) identified similar characteristics but pointed out additional ones: they earned a GPA of C average or less in high school, scored low in standardized tests, encouragements at

home is almost nonexistent, struggle defining realistic goals and are usually the first member of the family attending college. She also stated that these students are aware of their deficiencies due to their habituated failures in high school math courses but still covet for a college education.

The key for making a reality the students' desire for a college education depends on the math instructor, who can provide a learning environment different than what they unsuccessfully experienced during high school. Roblyer (2006) said that using technology can induce teachers to use instructional approaches that are more student-centered, active and pertinent or connected to the kind of experiences we live everyday. In a statement to a committee of the House of Representatives on Education and Labor, the executive director of State Educational Technology Directors Association (SETDA), Mary Ann Wolf, stated "The use of technology can support the teaching and learning of mathematics by bringing a multitude of learning experiences to captivate student interest and build mathematics understanding, proficiency, application and confidence" (National, 2008, para. 4).

For the last two years, I have experienced frustrations on the poor performance of my developmental math students due to my over reliance on lectures and recitations. For the developmental math student, these traditional methods do not meet their needs as learners; instead, it fosters passive learning, augments their previous negative experiences with math, and increase disengagement of the learning process. If I want my students to succeed then I need to change my teaching style, so my students become active learners, where they are engage doing mathematics, taking control of the learning process, communicating mathematical ideas and gaining motivation to acquire the basic skills they lack. The American Mathematical Association of Two Years College (AMATYC) advocates integrating technology to promote active learning and assist students exploring, understanding and visualizing mathematical

concepts when working with real-world data (as cited in Schwartz, 2007). I have already started integrating technology in my classroom but not to the point that I expect and visualize for creating an active learning classroom environment. The full integration will take considerable amount of time and effort to plan and gain the necessary experience to adjust to new ways of teaching and learning.

Kissane (n.d.) considered the graphic calculator as the “most satisfactory educational device” (p. 209) for three reasons: its physical size makes it easier to use than a computer, its economical price makes it affordable than computers or laptops, and the built-in capabilities do not require upgrades or maintenance as computers do. However, the use of graphic calculators is one of the technological resources that I have not yet integrated in the developmental math courses since students tend to abuse its usage for simple computations that only requires recalling math facts or basic computational algorithms. Therefore, I imposed the policy of not allowing calculators in the developmental math courses to force students memorize and recall math facts and basic computational algorithms. Students’ overdependence on the calculator to perform simple computations is probably why many students have not develop the important skill of number sense, which is necessary to determine how reasonable is the answer when solving problems. Roblyer (2006) noted the importance of this skill to make generalizations, which are conducive to the learning of algebra concepts. Therefore, developing number sense in developmental mathematics courses is a high priority.

Unfortunately, I have also realized that not allowing students the opportunity of using graphic calculators in the developmental math courses, it is hindering their opportunities to understand fully abstract algebraic concepts that they have struggled understanding since high school. Gage (2002) recognized many benefits of the graphic calculator: it provides immediate feedback which

gives the opportunity to question misconceptions before they become fixed; it serves as a concrete model to understand the concept of variables; and, it permits students to try different mathematical ideas to answer *what if* questions. Van Dyke (2003) recognized the graphic calculators as an accessible and meaningful tool to introduce the concept of functions, which students usually struggle, by following a natural progression from concrete (i.e. graph and table) to abstract learning experiences (i.e. equations). Roblyer (2006) mentioned these calculators can be also used as data analysis tools to model or explore real-life phenomena and to explore symbolic representation and patterns.

Kissane (n.d) stated the graphic calculator can provide several educational experiences involving algebra, but they should be used to develop intuition and profundity of mathematical ideas and not for *plug and chug*, which is what typically occurs in most of our math classrooms (Wiske, 2000). Kissane (2000) emphasized that students need to learn how to use graphic calculators effectively, not only operating the calculator but also using good judgment when to use it or not and learning how to find the reasonableness of calculator output. Therefore, I find important integrating graphic calculators in developmental math courses to help students develop number sense; understand algebra concepts concretely, and to appropriately use these calculators.

Taylor (2006) stated that remediation must address the students' emotional and academic needs; therefore, teaching and learning should be interactive. The element of interactivity is what I have been searching to include in the learning experiences of my developmental math courses. I passionately enjoy lecturing in which I use different tones of voice, hands gestures, walk around the room, constantly asking questions, draw many diagrams and examples on the board, and like to use sense of humor. However, my lectures do not generate sufficient

engagement and interaction with all my students. Only few students are actively participating and, it is always the same students. Those students, who do not participate in the lectures, tend to be tuned out, struggle to stay awake, or are immersed with their cell phones chatting or texting with friends. Obviously, my lectures are not as appealing as the multimedia devices my students use outside the classroom that catch their full attention and interests. The dean of the College of Arts and Sciences of the University of Alabama, Robert Olin, recognized the impact of technology in students' lives when he stated "It's part of their lives; they expect us to use it. Clever faculty will use whatever it takes to engage the students better" (as cited in "Replicating Mathematics," 2008, para. 24). Considering that I am a clever instructor, I find it important to integrate interactive whiteboards and classroom response systems (i.e. clickers) in my developmental math courses to add the element of interactivity my lectures lacked.

An interactive whiteboard (IWB) is a touch sensitive screen that works simultaneously with a computer and a projector. Everything that is done with a computer, it also can be done just using the IWB's screen. For such reason, IWBs are an excellent tool for whole-class teaching. I once had the experience of using an IWB when I taught middle school mathematics and I recollect what the Department for Education and Skills (DfES) of United Kingdom (2004) stated about what this type of board provides: an engaging focal point in the classroom. Students were always anxiously waiting what I was going to present on the IWB and were highly engaged in the classroom activities to just have the opportunity to use the board. These boards have the potential of increasing students' learning retention since instruction will be more memorable; it accommodates different learning styles; and the notes or presentations generated on the IWB can be distributed by e-mail or posted in the course's web site for later review (Smart Technologies, 2004).

Smart Technologies (2004) believe these boards are captivating students' attention, interest, and enthusiasm, and successfully competing with their favorite gadgets (i.e. game devices, phones, iPods, etc.). Jones (2004) summarized the main benefits for using IWBs: (1) It allows teachers to use more diverse, creative and seamless materials; (2) It increases students' engagement, enjoyment, and motivation in whole-class teachings; and (3) It encourages students' participation since they can interact with the materials. However, Tanner and Jones (2007) stated that once the novelty of the IWBs wears off, what are more valuable about these boards are the automation, edit-ability, transformability, and feedback capabilities, which will continue providing a higher engagement, interaction, and deeper understanding of mathematics in the classroom. I definitely want to replicate my previous experience with IWBs in my developmental math courses.

Similarly as IWBs, classroom response systems (CRS) have the potential to enhance interactivity in the classroom. According to Hines (2005), CRS are wireless interactive response system that encourages all students to participate by using a clicker to respond to the instructor's questions, which provides immediate feedback to the instructor and students of how well they grasp the class topics. Miller (2007) recognized clickers as possible strategy to transform the classroom from abstract learning into hands-on experience; therefore, students will be more involved with their learning. Teachers can prepare fun activities or assessments simulating game shows where the audience is surveyed or polled and the results are displayed on fancy spreadsheets and remarkable graphics. Hines (2005) stated that students and teachers find exciting taking tests or quizzes with clickers. Nelson and Hauck (2008) identified several benefits for instructors and students using these clickers. For instructors, clickers can be used to track attendance, assess students' levels of lecture comprehension, and to adapt their teaching

styles and content on a real time basis. Increased levels of interest and participation during class, higher comprehension of the instructor's lectures, and better preparations for tests are among the benefits that students experience when using clickers. I have never used clickers in my classroom; however, I have experienced its effectiveness to enhance learning in seminars and conventions for educators. The use of clickers will be my next logical technological tool to be integrated in the classroom.

One of the main concerns that I have with my developmental students is their poor study habits. Learning mathematics is a cumulative experience, where new concepts and skills build from previous ones; therefore, grasping and mastering these concepts require continuous practice. However, many developmental math students incorrectly assume that attending class, listening to the instructor's lectures and writing a few notes is sufficient to perform well in class. This study approach was probably sufficient to pass a math class in high school where they have more instructional time to learn the course content, but not appropriate at the college level. In developmental math courses, there is less time to cover the course content that students should have learned in several years during middle and high school. I consider this passive approach for learning as one of the key factors for my students' poor performance in the basic skills math courses. Many students lack self-discipline and study habits to handle the work load and rigor involved in the math courses at the college level, which combined with their poor basic math skills, math courses become an overwhelming experience; therefore, they decide to stop pursuing a college education.

For the above reasons and to my realization that extensive lectures are an ineffective use of instructional time, I decided recently to redesign the basic skills math courses in which students are actively learning by doing mathematics using computer mediated learning. Gifford stated

that computer mediated learning is a learner-centered model in which interactive media software is the main vehicle to deliver instruction and provide feedback (as cited in Kinney & Robertson, 2003). In the new design for the basic skills courses, instructional time takes place in a computer lab, students control the pace of their learning and have available and easily accessible a wealth of resources including the interactive media software, instructor-made resources posted in the course website, the Internet, the textbook, math tutors, and the instructor. In other words, the classroom becomes a learning center supplied with a variety of resources, which students must take the initiative and decide how to use such resources depending on their needs and learning styles.

My role as instructor has changed from lecturer to facilitator, even though; there will be times that I will lecture on those topics where students have historically struggle the most. During the selection of interactive multimedia software that supports mediated learning, I was looking for software that assess students' previous knowledge of the course content, and that the instruction and assessments were not based on multiple choice items. The selected software was ALEKS from ALEKS Corporation and in partnership with McGraw-Hill Publishers, which according to ALEKS (2008) web site,

“ALEKS is a web-based, artificially intelligent assessment and learning system. ALEKS uses adaptive questioning to quickly and accurately determine exactly what a student knows and doesn't know in a course. ALEKS then instructs the student on the topics she is most ready to learn. As a student works through a course, ALEKS periodically reassesses the student to ensure that topics learned are also retained” (para. 1).

One of the useful features that I like about ALEKS is that it shows visually (i.e. pie chart) how much the student has learned and how much still need to learn. This summer I started a pilot

course using ALEKS and students have been actively engaged learning and doing mathematics for 4 hours!

The last critical technological resource that I consider important to integrate in my developmental mathematics courses is a course web site. At the educational institution that I currently work, every faculty has access and capabilities to create a course web site in Blackboard, a web-based course management system that can be used to deliver online courses or to supplement on-site courses. Blackboard offers a variety of tools such as discussion forums, chat rooms, assessment and survey tools, gradebook, announcements board, and more. From my experience, a course web site is an effective communication tool, in particular with developmental math students who need instructors that are easily accessible and available for advising and assistance. In the fall 2008, I will be experimenting with virtual office hours using the virtual classroom in Blackboard for those students who need assistance but cannot physically visit my office or the Academic Enhancement Center for tutoring. The virtual classroom is a chat room but with the capabilities of using a virtual whiteboard similar as in the physical classroom.

In addition, I use the course web site as a repository site for my handouts, Power Point presentations, old tests, syllabus, videos, podcasts, and more, which students can reference at any time and place. However, one of the main purposes of a course web site is to serve as a portal to Internet resources related with the course content. Bookbinder (2000) stated that math teachers who create a web site with links to appropriate sites are leading students to web exploration and research, enhancing their course by providing students the opportunity to construct new knowledge on their own. My course web site is an integral part of the new design of my developmental math courses since it will provide students supplementary resources not available

in ALEKS. Creating and maintaining a course web site is one way of displaying my skills as a facilitator in my new role as an instructor.

According to Kinney and Robertson (2003), the goal of integrating technology into developmental mathematics programs is to offer students more options in terms of "where, when, and how" they learn mathematics. I believe the five technological resources that I mentioned in this paper will help me achieve such goal. My personal philosophy of education is "Education opens the doors of opportunity for a better future." Therefore, my mission is to provide a classroom environment where my developmental math students have the opportunities to succeed. Technology is only a tool to help me accomplish my mission but it has also transformed my ways of teaching.

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