

DELIVERING COLLEGE ALGEBRA CONTENT USING WEB-ENHANCED, ON-LINE AND ITV MODALITIES

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Introduction

Garrett College (GC) www.garrettcollege.edu and the Garrett County Board of Education (BOE) <http://www.ga.k12.md.us> continue to partner to train K-14 teachers in a new curriculum designed to exhibit a vibrant and exciting set of learning experiences related to the integration of mathematics and technology. The new designs are established to motivate students at all levels of mathematics to use appropriate technology including the Internet in locating research materials within a web-enhanced course; in this case, College Algebra. Assessment outcomes are linked to the Maryland Core Learning Goals, the Maryland Voluntary State Curriculum, NCTM Mathematics Content Standards and the Maryland Technology Plan (<http://www.msde.state.md.us/>). Garrett College in Maryland is positioned to open its doors to new opportunities for its liberal arts mathematics students in Fall 2008 by considering College Algebra as an on-line course. Garrett already offers College Algebra by interactive television (ITV) and as a web-enhanced course for most face-to-face sessions. During the 21st Century, our nation will depend on an ever stronger mathematics competence among its citizenry if our nation is to compete successfully in the ever increasing technologically sophisticated global world. All students will have an increased need to be able to interpret data, think logically and deductively, have a sense of numbers that make sense in various contexts, and apply College Algebra where appropriate. The prerequisite for College Introductory Algebra in Maryland is Intermediate Algebra. The Department spent the last decade developing a developmental fast track to support student success in College Algebra using ITV and web-enhanced modalities.

Background

In Fall 1991, after three semesters of research, it became evident that five mathematical courses of background knowledge would be essential to increase the success rate of under-prepared students entering college algebra courses at the college. At the same time, several community colleges in the state were studying national placement indicator alternatives for mathematics and language arts and a statewide mathematics committee was attempting to reduce the number of placement tests being used by the community colleges in Maryland. Garrett opted to use the COMPASS Placement Test and,

ultimately all sixteen community colleges in the state chose either COMPASS or ACCUPLACER for placement test purposes. The COMPASS Placement Test offered Garrett the capability to assess five different levels of content expertise in the areas of Arithmetic, Pre-Algebra, Introductory Algebra, Geometry, and Intermediate Algebra. Students were able to complete the sequence in five semesters if they started in the Arithmetic course. It soon became evident that students most at-risk opted out of finishing the developmental sequence because of the five-semester timeframe. The Department developed the Developmental Mathematics Fast Track in Fall 1995 as an alternative to address the five-semester timeframe constraint. Arithmetic and Pre-Algebra were added to the Fast Track System in Fall 1999. Modifications were made to establish rigor within the developmental sequence and to comply with the University System admission requirements of Introductory Algebra, Geometry and Intermediate Algebra for any enrolling student. A student enrolling in the Fast Track generally completes all five courses in two semesters and maintains high success rates in college algebra. Garrett also offers semester courses in Introductory Algebra, Geometry and Intermediate Algebra for students not having a preference for the Fast Track. Table 1 illustrates success rates for each of the five developmental courses offered in the Fast Track as compared with success rates for students enrolled in the traditional face-to-face courses.

Table 1
Success Rates for Developmental Mathematics
Comparing Fast Track with Face-to-Face Modalities
Fall 1996 – Fall 2005

Semester	Introductory Algebra				Geometry				Intermediate Algebra			
	Fast Track		Face-to-Face		Fast Track		Face-to-Face		Fast Track		Face-to-Face	
	N	%	N	%	N	%	N	%	N	%	N	%
F 2005	29	76%	52	63%	34	80%	11	91%	7	100%	19	74%
F 2004	24	100%	45	69%			14	100%			25	88%
F 2003	18	67%	39	79%	26	85%			11	73%	19	95%
F 2002	23	83%	29	90%	34	88%	7	71%	10	90%	24	92%
F 2001	10	70%	39	77%	16	94%	16	81%	7	100%	25	88%
F 2000	17	82%	29	83%	21	81%	16	100%	11	82%	24	96%
F 1999	15	93%	54	76%	24	96%	10	90%	14	79%	23	83%
F 1998	8	88%	58	90%	16	88%	10	79%	14	64%	16	75%
F 1997	14	79%	54	65%	14	100%	13	54%	5	100%	41	78%
F 1996	16	75%	68	68%	25	72%	9	89%	17	59%	16	88%
Total	174	81%	467	76%	210	87%	106	84%	96	83%	232	86%

Semester	Arithmetic		Pre-Algebra	
	Fast Track		Fast Track	
	N	%	N	%
F 2005	13	77%	35	83%
F 2004	10	100%	34	92%
F 2003	7	100%	33	91%
F 2002	7	86%	24	100%
F 2001	3	100%	30	100%
F 2000	1	100%	37	89%
F 1999	6	100%	32	91%
Total	47	95%	225	92%

Prior to 1994, the success rates for developmental mathematics courses were generally lower than those published in Table 1. In Introductory Algebra, 174 students enrolled in the fast track and 81% on average were successful. In the face-to-face classes 467 enrolled in Introductory Algebra with 76% successful rate on average. The fast track students had a slightly higher (81%) success rate than the face-to-face classes at 76%. In Geometry, 210 students enrolled in the fast track and 87% of them were successful while 106 students enrolled in the face-to-face Geometry and maintained an 84% success rate. Once again, the fast track Geometry group was slightly more successful than the face-to-face group. Ninety-six students enrolled in Intermediate Algebra fast track and maintained an 83% success rate while 232 students enrolled in the face-to-face courses and maintained an 86% success rate. The face-to-face students were slightly more successful. From Fall 1999 through Fall 2005, Arithmetic and Pre-Algebra were taught using only the fast track method since it had proven to be so effective. Forty-seven students enrolled in Arithmetic and achieved a 95% success rate. Two hundred twenty-five students enrolled in Pre-Algebra and achieved a 92% success rate. A closer look at Table 1 will indicate that in Fall 2003, Geometry was only offered by the fast track. There was an 85% success rate. In Fall 2004, we did not offer Geometry or Intermediate Algebra via the fast track because it was necessary to train new teachers. Since Fall 2004, we have offered all five developmental courses using both the fast track and face-to-face modalities. Students enrolled in the fast track receive 100 hours of instruction since they include our most “at-risk” students. The curriculum is developed to be activity-based. We use the inquiry methodology that anticipates that students will be fully engaged in learning, have the ability to explore, have the expectation that they can explain concepts and extend them to new contexts and can evaluate appropriately. There is a common departmental exam for both the fast track and face-to-face classes to assure uniform assessment to obtain success rates.

College Algebra Reform

More than a decade ago, the “Classroom of the Future” came to reality at Garrett College. There was ITV connectivity throughout western Maryland with every university, college, and high school within the county area. Two years later we were able to interact with schools, colleges, and universities throughout Maryland. This interactive, distance learning classroom enhanced the college’s ability to service many students with courses and training previously denied in a rural area.

One of the challenging concerns for the fiber optic interactive, distance learning classroom is setting the proper classroom environment. Students, instructors and teaching assistants were asked to challenge their pre-conditioned ideas about appropriate classroom protocol in this new interactive setting. We learned to make adjustments to meet the needs of various learning situations. Instructors make every effort to confront major issues and be assured that they are resolved prior to the first class session. It is now routine to teach students in one face-to-face ITV classroom while connected to three remote classrooms, some which are located over 200 miles from the main site. Table 2 presents success rates for College Algebra classes comparing ITV and face-to-face modalities.

Table 2
Success Rates for College Algebra
Comparing ITV and Face-to-Face Modalities
Fall 1996 – Fall 2005

Semester	College Algebra			
	ITV		Face to Face	
	N	%	N	%
F2005	18	100%	69	77%
F2004	22	91%	62	92%
F 2003	23	96%	56	82%
F 2002	20	100%	72	86%
F 2001	19	100%	59	81%
F 2000	31	90%	67	88%
F 1999	26	96%	55	87%
F 1998	25	92%	52	92%
F 1997	31	87%	75	99%
F 1996	40	100%	55	91%
Total	255	95%	622	88%

Table 2 data reflects strong success rate indicators for students both in the ITV and face-to-face College Algebra classrooms. On average, 255 students achieved a 95% success rate overall in the ITV setting and 622 students achieved an 88% success rate in the face-to-face classroom setting. All Garrett College Algebra classes instruct rigorous content which is assessed using a departmental exam. Student success rates for college algebra remain high in all distance learning courses. The Garrett Mathematics Department has been taking advantage of distance learning opportunities for their students for the past decade. The college began offering College Algebra content courses via compressed video between Garrett College and local high schools in Fall 1995. Many students in the ITV College Algebra courses were dual-enrolled high school students. Both college-level and dual-enrolled high school students have the opportunity to take advantage of interactive television technology while learning the appropriate content in the College Algebra course. Students at all sites use compressed video technology and have the knowledge of how to take advantage of the educational support services offered on the Internet. The time is right to prepare for on-line courses. Computers with Internet access, symposiums, electric white boards, graphic calculators, wireless laptop computers, laser discs, digital document cameras, VCRs, digital cameras, and flatbed scanners illustrate some of the technology available and used regularly by college mathematics faculty. We are now ready to address the student population that finds it difficult to attend classes on campus. Join us for a virtual tour and discussion of this new on-line program for mathematics students in the Liberal Arts Program at Garrett College.

Summary

We must continue to research major factors in College Algebra distance learning instruction that have an effect on satisfaction, teaching and learning. These factors include ergonomics, environmental conditions, faculty training, staff partnerships, seamless fusion of technology and technology integration into the curriculum. According to Coppola and Thomas (2000), among the expected changes in the world of higher

education are: established standards of learning proficiency; a focus on what students really need to know; an individual learning plan for each learner; more instructional time; varied technology to help students master their learning goals; a better system of diagnosing learning difficulties and prescribing effective remedies, more individualized instruction for learning skills; a focus on lifelong learning; and more collaborative group learning. Teachers must continue to become facilitators of learning rather than disseminators of knowledge. In the last two decades of the 20th Century, educators watched resources like computers, the Internet, and multi-media presentations change the method and practice of education at all levels. We expect the next decade to provide us with possibilities and challenges we cannot yet imagine. Attention must now be directed toward assessment as we document how students learn, and how teachers teach.

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