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**DYNAMIC EDUCATION FOR K-8 PRE-SERVICE MATHEMATICS TEACHERS:  
DELIVERING CONTENT USING WEB-ENHANCED AND ITV MODALITIES**

Nancy J Priselac  
Garrett College  
Mathematics Department, McHenry, MD 21541  
[npriselac@garrettcollege.edu](mailto:npriselac@garrettcollege.edu)

Stephen M. Priselac  
Fayette Institute  
Computer Science Department, Uniontown, PA 15401  
[smpl@charter.net](mailto:smpl@charter.net)

### **Introduction**

The attention of the nation's community colleges is being directed to the demanding need for teacher preparation programs in mathematics with connections to science and technology. The roles that Maryland Community Colleges continue to play in recruiting future teachers, preparing future teachers, and providing them with an understanding of the current technological workplace is critical. It is necessary to design more relevant programs delivered in nontraditional ways to address opportunities for traditional and nontraditional students to enter teacher preparation programs. Though many people taking advantage of distance learning opportunities can do so from their homes, Garrett College is offering its teacher education mathematics courses using compressed video technology augmented by services offered on the Internet. The college continues to create a new "global village," one that stretches far beyond the farming community where educational news once traveled largely by word of mouth to newly identified educational sites where one can choose a course or program by pointing of a mouse or turning of a TV channel.

### **Placement Tests**

Placement testing (COMPASS or Accuplacer) is mandatory for all students entering the Community College System in Maryland. Garrett College requires the COMPASS (Computer-adaptive Placement Assessment and Support System) developed by ACT (ACT, 1994) and uses their national cut-off scores for placement. Students must successfully exit College Algebra as a pre-requisite for the Elementary Mathematics I course.

## Associate of Arts in Teaching Program

Outcomes-based standards were developed collaboratively between the two-year and four-year public and independent institutions in Maryland for implementation through individually designed community college AAT degree programs. Program outcomes are based on the standards of the Maryland State Department of Education (MSDE), the National Council for Accreditation of Teacher Education (NCATE), and the Interstate New Teacher Assessment and Support Consortium (INTASC). Conferral of the AAT degree requires successful completion of the program with at least a cumulative 2.75 GPA and a passing score on PRAXIS I. Every community college in Maryland has an Associate of Arts in Teaching Program approved by the Maryland Higher Education Commission. The Garrett program now has a more robust sequence of courses in the teacher education program. Students are required to take twelve mathematics credits at Garrett to exit with an AAT degree. These courses include College Algebra, Statistics, Elementary Mathematics I, and Elementary Mathematics II.

### Praxis Tests

The Praxis Series™ entitled Professional Assessments for Beginning Teachers is a set of rigorous and carefully validated assessments that provides accurate, reliable information for use by state education agencies in making licensing decisions. Nearly 80 percent of states that include tests as part of their teacher licensure process rely on the Praxis Series™. Colleges and universities may also use the basic academic skills assessments to qualify individuals for entry into teacher education programs. The three categories of assessments in the Praxis Series correspond to the three milestones in teacher development. Students entering a teacher training program must successfully complete **Praxis I™** which includes Academic Skills Assessments. Prior to a student's teaching, **Praxis II™**, the Subject Assessments section must be successfully completed. At the end of the first year of teaching, the **Praxis III™** that includes the Classroom Performance Assessments must be successfully completed. Elementary Education majors at Garrett College enrolled in the AAT program are required to pass the Praxis I basic skills in mathematics section with a Maryland Score of 177 prior to receiving their degree. If the student obtains a composite score of 527 on the Praxis I Math, Reading and Writing tests, he/she will receive the AAT degree without achieving a score of 177 on the math test. Students must pass the Praxis II in their related subject area and in the pedagogy section that includes a large selection of topics from educational psychology prior to student teaching. Students are expected to pass the Praxis III at the end of first year of teaching.

### The Plan: Garrett College's Web-Enhanced Elementary Mathematics I and II Teacher Education Courses

The plan to incorporate technology and web-based instruction in a distance-learning mathematics teacher education course at Garrett College in Western Maryland, USA, was piloted in Fall 2002. The web-based Interactive TV course is offered to Garrett College and Hagerstown Community College students. The instructor is located on the Garrett College campus and teaches in a fiber optic Maryland Interactive Distance Learning Network (MIDLN) classroom. This Garrett ITV classroom connects to an identical ITV classroom located on the Hagerstown Community College campus. The potential exists for four MIDLN classrooms to be connected simultaneously from any college

location in the state of Maryland. These classrooms resemble TV studios where students communicate among studio sites in real time. The instructor controls most technology in the classroom with a handheld remote. Technological tools and appropriate mathematics software are available to aid teachers and students in content delivery. Computers with Internet access, symposiums, electronic whiteboards, graphic calculators, laptop computers, laser discs, document cameras, digital cameras, VCRs, and flatbed scanners illustrate some of the technology used in each classroom. Research has not yet indicated which technology tools actually make learning efficient. But as a practitioner, this instructor knows that appropriately selected technology can work together transparently and seamlessly to enhance classroom learning.

Electronic learning environments in higher education settings are changing the current learning paradigm from that of information transfer to a new paradigm which actively engages the learner and uses technology to enhance learning for each individual. However, distance learning design concerns should always contain some basic considerations. Hart (1996) describes a survey of University of Hong Kong faculty members that investigated preferences for classroom features. There was little agreement on the “perfect” technology-based classroom. Riley and Gallo (2000) conclude that the best technology solutions can’t be effective if the learning environment is not comfortable. Reflecting on current and expected changes in pedagogy and technology, Blackett and Stanfield (1994) advocate remembering three principles for general classroom planning: 1) plan for the full range of teaching methods, 2) plan for change and flexibility, and 3) focus on the exchange of ideas and acquisition of knowledge. Wilson (1993) reported the thoughts and projects of higher education professionals exploring the issue of high-tech classrooms. He discusses that distance learning (DL) inclusion in a schedule is an indication that industry and academia have welcomed technology as a method of making the training and education process more effective, efficient and immediate. According to Wilson, institutions and companies refusing to adopt technology as a part of their training strategies are now viewed as archaic and non-conformist.

### **Presentation of the Distance Learning Segment**

The presentation team will provide participants with a multi-media slide show that will depict a panoramic view of the Verizon Fiber Optic MIDLN Classroom. The team will then show a mathematics teacher education slide show to illustrate technology and support materials used during the course. Mathematics for Elementary Teachers 5<sup>th</sup> Edition, written by Musser, Burger and Peterson, is used by the students to prepare teaching episodes in support of the learning of specific content. All material in support of the course is located at the Hagerstown Community College Blackboard website (<http://hcc.blackboard.com/>). Garrett College’s Blackboard site will be ready for Spring 2004 semester.

### **Web-Enhanced Distance Learning, Assessment and Elementary Mathematics I and II Teacher Education**

The Elementary Mathematics I and II Teacher Education course sequence is a web-enhanced college level multi-media distance learning mathematics course offered for Garrett College and Hagerstown Community College students simultaneously in two different locations. The Garrett fiber-optic electronic classrooms (e-classrooms) were funded in part including all electronic equipment, by a

grant from Bell Atlantic (1994) and upgraded by a Verizon grant (2002). Each classroom has the same color scheme and the same electronic support system that allows the teacher to control front and rear cameras, fax machines, VCRs, and document camera during classroom presentations. Elementary Mathematics I is a three-credit course offered in a multimedia classroom designed for students majoring in mathematical reasoning. Sets, cardinal numbers, operational algorithms, topics from number theory, rational numbers, real numbers, and geometry are instructed using cooperative group techniques. Geometer's Sketchpad and Derive software are used for visualization purposes. Elementary Mathematics II is a three-credit course offered in a multimedia classroom and covers topics including graphing calculator use, understanding geometry coordinates and mathematical systems. The relation between algebra and geometry is established with an emphasis on probability and statistics. Students continue to use Geometer's Sketchpad and Derive software for visualization purposes. Both classes' enrollment is limited to majors for Elementary Education and the Human Services Certificate.

### Summary

We must continue to research major factors in 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 technologies 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 skills learning; a focus on lifelong learning; and more collaborative group learning. Teachers must become facilitators of learning rather than disseminators of knowledge.

The e-classroom designed by Verizon may seem like a large capital outlay but it is not much higher in cost than a typical instruction-based computer classroom to furnish and equip. The per-room operational cost via a dedicated compressed video network with appropriate band-width has created a high cost factor which must be recognized.

In the last two decades of the 20<sup>th</sup> century, educators have watched resources like computers, the Internet, and multi-media presentations change the method and practice of education at all levels. It stands to reason that the next decade will provide us with possibilities and challenges we cannot yet image. Presentations are going beyond basic multi-media slide shows. Attention is now directed toward assessment as we document how students learn, and how teachers teach. Keep that thought and reach out and touch the future.

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