Theory-to-Practice

A Case for Using Computer-Assisted Learning in Mathematics to Improve Instruction in Formal GED Programs

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Abstract

A significant problem exists in providing quality instruction to students preparing for the General Educational Development (GED) Exam due to the part-time nature of adult literacy programs. A lot of learning must take place very limited class time. A balanced approach which includes computer-assisted learning to deliver the mathematics curriculm is discussed. Not only would gains in mathematics be realized more quickly through the individualization inherent learning system, but class time to develop critical thinking skills through teacher led discussion and small group activities would be maximized.

Introduction

Most formal adult literacy classes that prepare students for the General Educational Development (GED) Examination are part-time programs. Since the testing covers the major high-school subjects of mathematics, writing, social studies, science, literature and the arts, it is a formidable task for a teacher to provide genuine learning opportunities across such a broad spectrum with limited class time. Consequently, GED teachers are faced with daily curricular decisions and the challenge of using the available time effectively.

Mathematics, particularly for adults who may have been out of school for many years, is a subject that generally requires a good deal of drill and practice exercises along with the understanding of basic concepts. Consequently, class time is used in modeling examples, practicing, and reviewing skills. While one could argue that much of this practice could be relegated to homework, most practitioners would likely agree that busy adults with varied responsibilities are not often conscientious about their academic work outside of class. Getting students to attend classes consistently is in itself often a triumph. Additionally, programs that allow students to enroll at various points throughout the program year ensure that, quite literally, not everyone in the class is on the same page.

So how can teachers best utilize classroom time in educating adults working toward their GED exam? Developing critical thinking skills, motivating students to become independent learners, and helping students forge connections among ideas are truly the tasks of the adult educator. With classes scheduled for only a few hours each week, educators can become frustrated by their inability to deliver effectively this type of instruction. Since the comprehensive nature of the mathematics component of the curriculum requires a great deal of the allotted class time, an alternative to using that valuable class time for math instruction would be a welcome solution. Enter technology. With the right computer-assisted learning system, the entire mathematics component of the GED curriculum can be delivered on an individualized basis, thereby releasing valuable instructional time for the four other subject areas where higher order thinking skills and critical reading skills, so vital to GED success, are more readily developed through other instructional methods.

Computer-assisted Learning

Computer-assisted learning systems are available for all subjects in the GED curriculum; however, mathematics seems uniquely suited for this type of instruction. Past studies of computer-assisted instruction with children have concluded that mathematics is, in fact, the area in which the most substantial gains in achievement are made (Wilson, 1992). Additionally, a survey of adult learners in British Columbia who

were exposed to several computer-assisted learning systems revealed that the most positive comments about learning gains were made with reference to mathematics (Thomas & Buck, 1994).

Computer-assisted learning programs designed specifically for adults are relatively new, but they are not untested. A study of the Invest (Jostens) learning system in Nova Scotia (Wilson, 1992; Moore, 1993) showed gains of more than 1.5 years in mathematics during an 11-week period. Additionally, the use of this system had a positive effect on retention as 93% of students stayed in the program as compared with 79% in the comparison group taught with traditional methods.

Not only were significant gains in academic achievement able to be quantified, but also intangibles such as improved motivation and confidence were realized. Discussions and open-ended survey questions at the conclusion of the study made clear the fact that adult learners responded positively to computer-assisted learning. If motivation and confidence can be improved through an instructional method, it stands to reason that academic improvement logically will follow.

Computer-assisted learning can take different forms. GED textbook companies are now producing software similar to their traditional textbooks and workbooks. While this type of software may provide valuable learning experiences and certainly aid in computer literacy skills, it does not provide the individualization and remediation that a more sophisticated system can.

Integrated Learning Systems

The most exciting computer-assisted learning system available is the fully integrated learning system (ILS). This is a comprehensive network that allows for teacher input to individualize several workstations. A quality ILS can monitor many students' performances at one time and can remediate each student based on an analysis of student errors. A classroom teacher can certainly provide this type of specific needs analysis and individualize instruction accordingly, but not without a major time investment. An ILS can handle these functions almost immediately. Additionally, the ILS can provide accurate reports of student progress at any point in the program.

Many students have not had the occasion to use even the most basic mathematics skills in their adult lives. These students need a great deal of review and practice. In addition, they must have a clear conceptual understanding of mathematical processes and applications to be able to succeed in solving the word problems on which the GED mathematics exam is based. Wilson (1992) discusses the surprising conclusion that the learning gains in the Nova Scotia study were strong in problem-solving and mathematical concepts. The INVEST ILS used in this study clearly went beyond what is already available to students in the form of workbook exercises and practice books. Using computer technology developed simply for drill and practice is an expensive alternative to workbooks. The fully integrated, computer-assisted learning system, on the other hand, can truly enhance the learning experience for adults in ways that are not available through traditional methods.

If Knowles (1980) is correct in asserting that adults must be in control of their learning, then the learner-centered, self-paced individualization provided by a quality ILS such as INVEST is perfectly suited to the adult learning environment. Never before has the potential existed to meet consistently the specialized needs of each individual learner within a formal, heterogeneously grouped GED classroom.

Accommodating Different Styles of Learning

Another important feature of computer-assisted learning systems is that they can easily accommodate the major learning styles. Visual learners are provided with opportunities to read words and see graphics that are carefully presented on uncluttered pages with particular attention paid to color and number of words per screen. Students wear headphones and are stimulated auditorially as a clear voice articulates key points. Most importantly, tactile and kinesthetic learners are able to use a keyboard and mouse to manipulate data and produce answers. Moore (1993) acknowledges the choice of the INVEST system largely because of its ability to deliver to auditory learners, an advantage not present in other similar learning systems.

An ability to tailor instructional methodology to particular learning styles may be a key factor in a program's success. Very often new GED students recall past negative educational experiences tied to their inability to assimilate information by traditional classroom methods. Often these students score highest on the tactile/kinesthetic area of a screen for learning style preferences and hold jobs in which they use their

hands, it is easy to see why, in a traditional teacher-centered, lecture-based environment, these students would not be successful.

A Balanced Approach

Interestingly, along with the gains realized and the highly positive comments overall, over 80% of participants in the Nova Scotia study (Wilson, 1992) indicated that they wanted more teacher instruction and more student-teacher interaction. Herein lies the key to successfully implementing computer-assisted learning in the adult classroom. Computers will not replace the classroom teacher any more than television did in the 1950s. Technology as an educational tool has a definite role, but only as one aspect of an overall program. The teacher-student relationship, as well as the relationship among students in the classroom community, will remain paramount in the struggle to maintain consistent attendance, boost self-esteem, and, ultimately, improve academic skills.

Critical thinking skills, so important for success on the GED test, may best be developed through the probing questions of a teacher-led discussion. Giving students the opportunities to interact in small groups, articulate opinions, and respond to reading passages will continue to be valuable. In essence, using a computer-assisted format as the major instructional method to provide step-by-step learning in mathematics, with its need for higher level conceptual understanding as well as time-consuming drill and practice, will maximize the time for teacher-student and student-student contact in the subject areas where that contact is most effective. With mathematics learning taking place in a computer lab, students can schedule time with the computer at their convenience. Ideally, 24-hour-a-day building access would provide a way for students with changing job shifts to keep up with their studies instead of missing out due to shift changes and overtime work hours.

With the limited amount of instructional time available in adult formal programs focused on preparing students for the GED exam, close scrutiny of such programs is inevitable. If the objectives of the mathematics curriculum could be met with the aid of technology at a time convenient to each student's schedule, the rest of the curriculum could be more thoroughly and effectively administered through more traditional approaches. This balance of techniques could well serve the varying needs of a diverse adult student population.

Conclusion

The experience of using a computer to assist in the learning process may be intimidating for certain students. Some teachers may also be skeptical of relinquishing such an important piece of the curriculum to a computer system. Training, for both teachers and students, is critical to the system's success. Initially, gains may be realized simply because of the novelty of the method. But a quality system will continue to produce results after the period of novelty has ended.

The immediacy of the feedback, the ability to analyze student errors and remediate, and the one-on-one individualization of an integrated computer-assisted learning program are valuable features. The individualization is especially crucial in a program where so many students miss classes. Outside responsibilities often interfere with attendance. It is not unusual to see a lot of turnover of students within a given program year as well. There is a constantly changing population in the adult classroom.

Incorporating an integrated learning system for the mathematics curriculum in a formal GED program clearly would improve instruction under such conditions. This is using technology not simply for its own sake, but as a tool to take students further in less time than can traditional instruction. In adult education programs, where time is so severely limited, the use of an ILS has a distinct advantage. It is imperative that administrators look past the inevitable fear of funding this technology. They must, instead, look forward to blending this technology into their existing programs as it clearly has a role in making a difficult job just a little easier.

References

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