Integrating Technology into Adult Learning

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The range of uses and applications of technology suggests a number of alternative approaches for integrating technology into adult basic education. There are four basic approaches to integrating technology into adult learning and instruction. The unique educational benefits as well as limitations of the four approaches are technology as curriculum, as delivery mechanism, as complement to instruction, and as instructional tool.

Technology as Curriculum

From the perspective of maximizing the acquisition of information about and competence in using specific technology applications, a curriculum focused on the computer and its applications might be desirable. Components of such a curriculum include keyboarding skills, database manipulation, spreadsheet use, word processing, desktop and Internet publishing, and Internet search skills. Hands-on opportunities to develop a comfort level with the various applications and discussions about the kinds of tasks that might be best managed with each application would provide a basis for using the technology in the various situations in which it is appropriate.

Benefits. There are a number of benefits to a "technology course" that deals only with technology applications. First, because the course focuses on technology alone, an efficient structured approach that deals with each aspect of technology in a clear, orderly, and concise way is possible. Little time is lost dealing with peripheral learning issues or any alternative goals of education beyond technology instruction. In a relatively short time, all learners have acquired a discrete set of technology skills that they are then encouraged to apply as needed.

Limitations. Such a course is limited to the content that is addressed. This is not a concern for people who do not have other educational needs that must also be addressed before goals can be reached; however, for learners whose literacy and numeracy skills are limited, one must ask if the technology skills can be applied in useful ways. Spreadsheet manipulation skills may be of little use to someone who is unsure of when and how to use parentheses in mathematics or who does not know how to compute sales tax. Similarly, any competence with word processing and electronic mail tasks will probably not be useful to a learner who is fearful of writing because she feels her writing skills are poor. Thus, any technology competence learned in such an isolated environment may not easily be applied by the learner in any meaningful ways and will probably deteriorate as an unpracticed and unused skill.

Technology as Delivery Mechanism

Another way that technology can be used in an adult education environment is as an instructional delivery mechanism. Individualized learning systems (ILS) have been designed to provide instruction and practice in each of the subskills that together forms an entire curriculum. Following an initial placement test, each learner is placed at the particular point in the sequence of programmed lessons that is appropriate for him so he does not have to work at tasks that have already been mastered and will not be given tasks for which he does not display prerequisite knowledge. Each learner's progress is tracked within the system so that a learner can return to the same subskill level at which she was working when she stopped using the system. In addition, the learner is unable to progress from one subskill to another without first achieving some predetermined level of mastery. Individual learners' progress through the series of activities can be reported to an instructor as well as to the learner.

Benefits. An ILS represents total individualization of instruction. Each learner may travel a unique branched path through the curricular content. Time need not be spent waiting for an instructor to address the needs or interests of other students. Assessment is ongoing and objective. Because the ILS can be accessed by learners at any time the system is available, the difficulties many learners have in attending classes on a regular basis or at specific times are overcome.

Limitations. Integrated learning systems are limited by the presentation and assessment of small, clearly defined subskills. Learners are given little reason or encouragement to try to integrate the subskills with other meaningful knowledge or experiences they have or to see interrelationships among the subskills. All activities focus on discrete isolated skills that are never embedded in any context other than one generated by the learning system. Research on skill transfer suggests that skills developed in a narrow, limited environment are not easily applied in other environments (Ginsburg, Gal, and Schuh 1995; Mikulecky, Albers, and Peers 1994; Nunes, Schliemann, and Carraher 1993).

Although complete individualization within a closed system can be viewed as a benefit, it can also be considered a limitation. Success in the workplace is increasingly dependent on team skills, collaborative activities, and communication skills, but an isolated learning environment does not provide opportunities to develop these skills alongside the more academic "foundation skills" such as those described in the SCANS (Secretary's Commission on Achieving Necessary Skills 1991) report.

Although the delivery of instruction takes place with the aid of computer technology, learner interactions with the computer are generally limited to retrieving the program, identifying oneself, and performing a few keystrokes or some limited keyboarding when responding to questions appearing on the monitor. Thus, although significant time is spent at a computer terminal, few technology skills are required and little usable technology competence is gained as a byproduct of using the ILS.

A final limitation of ILS programs is the high cost, both of the required software involved and of the number of computer stations that are necessary if a number of learners are to study concurrently. Since the program is individualized, learners will generally not be able to share computer equipment although, with efficient scheduling, computer equipment can be used by many learners over the course of a day.

Technology as a Complement to Instruction

Some adult education programs conduct traditional classes for adult learners but also make available opportunities for learners to use computers to practice skills addressed in class or extend learning. In some settings the instructor assigns a learner to work on a

particular piece of educational software that targets a weak or undeveloped skill area; in other settings, a number of software programs are available and learners can explore and use whatever interests them. Additionally, applications software such as word processing programs or spreadsheets may be available.

Commercially available software abounds. Much of it was originally designed for the K-12 market but many pieces of software may also be appropriate for adult learners. The educational content ranges from drill and practice of routine arithmetic computations to complex simulations that require significant content knowledge, creativity, and an ability to integrate ideas from separate curricular areas.

Within this educational approach, the teacher is the primary coordinator of instruction. The extent to which the teacher integrates the technology-based activities with other classroom-based activities can vary with different teachers' styles, the kinds of software available, and whether or not learners are all assigned to work with the same piece of software. Some teachers will use drill and practice software as an alternative to handwritten practice of specific skills (particularly arithmetic computations and spelling) because many students may prefer the computerized versions and because assessment "scores" are available quickly for both the learner and teacher. Other teachers will use a computer simulation activity such as "Oregon Trail" to engage learners in an exploration of 19th-century U.S. history and/or to introduce a discussion on budgeting which in turn would lead to a budgeting activity using spreadsheets.

Benefits. The main benefit of using commercially created software is that the teacher does not have to create a resource for use by learners. Using good quality software can provide learners with a great variety of experiences that are not limited by classroom walls or by the knowledge or experiences of the teacher. Indeed, good software may also provide an opportunity for teachers, as well as students, to learn.

Additionally, some learners appreciate the opportunity to practice a target skill in private with immediate feedback; these learners may have felt uncomfortable stating aloud in class that they still felt shaky about some arithmetic operation when the rest of the class was moving on to the next topic.

Limitations. There are many commercially available pieces of software of varying educational quality, and the cost of acquiring a software library is not inconsiderable. Finding out about all of the different software packages and making good choices of what to acquire is daunting. Many organizations are developing databases of software reviews (among these is the National Center on Adult Literacy) to ease this burden somewhat, but making appropriate choices for specific teachers, learners, and programs often requires extended time to search for and experiment with the software.

Another limitation to this approach is arranging for learner access to the software. If a computer lab is not conveniently on site or is not available during convenient times, learners may not be able to access the software frequently.

Finally, the use of commercial software to complement instruction requires that teachers have time to rethink and modify classroom activities to mirror or complement the technology-based activities so the technology-based activities actually enhance classroom work. Since the software is inflexible, the teachers must provide the flexibility in the system. If teachers are unable or unwilling to be creative in this regard, the learners may be learning on two separate trajectories that are not integrated and cause confusion rather than clarification.

Technology as an Instructional Tool

In this approach, technology is seamlessly integrated into the instructional activities of the class. The primary goals and outcomes of instruction remain the stated goals of a class or program—improving literacy and numeracy skills, progress toward high school completion or another gatekeeping target, or functional skills. The development of technology-related skills is a valued, but secondary, outcome. Just as books, workbooks, a chalk board, and paper are tools that are used as needed within the classroom or to support learning, technology applications are used when they are appropriate. (Although commercially developed instructional software could be integrated into instructional activities by teachers, for purposes of contrast only generic computer applications will be included in this approach.) The form and content of instruction is completely determined and controlled by the instructor and the computer technology is used by teachers and learners as they might commonly be used in everyday environments such as a workplace, home, or library.

The added value of the technology within this approach is that educational activities can be enriched and extended with the use of technology in ways that are virtually impossible without technology. For example, learners can use word processing applications when writing essays and to edit each other's work, use a desktop publishing program to create a class newspaper, use spreadsheets to develop alternative budgets for a class picnic, and use the Internet to bring endless resources and information into the classroom (e.g., poems written by African Americans for an activity during Black History month, government statistics on joblessness, interest rates and down payment requirements for car loans, new stories from radio and print media). Electronic mail allows learners to share interests, information, and ideas with learners in other, remote classes.

Benefits. Integrating technology into instruction by using technological tools to support learning activities gives learners opportunities to develop technology skills and experiences in contexts that are similar to those in which technology is used outside the classroom. The skills gained, particularly around the meaningful use of everyday technology applications, can be transferred to other settings such as the workplace.

Educators have long decried their inability to bring realistic, meaningful activities into the classroom because of the impermeability of classroom walls. The Internet, in particular, can lower this barrier by quickly and easily bringing information and resources into the classroom. The limits of one teacher's knowledge and the limited print resources typically available in most adult education classrooms need not determine the breadth and depth of the learners' experience.

Relying on the Internet and computer applications to provide the content and context for adult learners' exposure to technology is probably less expensive than buying a collection of commercial educational software. Computer application programs such as word processing and spreadsheets are generic tools and can be used and reused. Educational software targets specific skills or activities; the content may not be appropriate for all learners in a class and may not be useful to a particular learner over a long period of time.

Limitations. The success of this approach of instruction is predicated on the willingness and ability of adult educators to develop their own classroom activities. The texts that are commonly found in adult education settings generally are designed to promote mastery of academic subskills, and are predicated upon a model of drill

and practice. Curricular resources that appropriately integrate and benefit from technology are currently being developed and shared by teachers in informal settings such as conferences and listservs. More resources have been developed for the K-12 educational environment and are available on the Internet; these can be adapted for adult learners.

A further constraint that can have impact on a teacher's ability to use technology as an instructional tool is access. Convenient use of technology benefits from "as needed" access; ideally, computers (at least one) should be available within the classroom, should be connected by modem to the Internet, and should be able to send and receive electronic mail.

Choosing and Using the Different Approaches

Integrating technology into adult education instruction via any of these four approaches will require curricular change. To different degrees, each of the approaches may also have an impact on the dynamics of many classes, the role of the learner, and the role of the teacher. Although the variation among classroom structures, learners, and teachers is limitless, the addition of technology encourages movement in some directions that may be somewhat consistent across sites and roles.

Some learners may come to adult education with technology experience, whereas many others will need opportunities to develop familiarity. Learners' time and energy may have to be spent on the development of basic technology skills, including keyboarding, computer literacy, Internet search skills. Depending on the technology integration approach chosen, the particular skills needed in a particular classroom may vary, but to maximize learners' ability to interact with and benefit from technology beyond the classroom, provision of a full complement of technology experiences may be desirable.

The fourth integration approach—technology as instructional tool—probably has the greatest impact on the classroom environment, learners, and teachers. The most powerful and engaging educational activities that use technology are those that are complex, realistic, and may have more than one reasonable methodology and answer. Just as real world problems and situations often require the input and support of a number of people working together, learners can work together in teams to collect information,

brainstorm and weigh alternatives, plan, and come to a solution. For example, a class with Internet access could be given the task:

> *I need help planning my trip. This winter vacation I want to spend a week in a place with a temperature that is likely to be at least 80 degrees. I like to swim so a beach would be nice. I also like to go site seeing so there should be something of interest in the area. I don't own a car so you have to decide how I will travel and where I will stay. I have $1000 to spend on this trip. Please write me a letter and tell me of the plans you have for my trip, how your plan meets my requirements, and how much everything will cost.*

Such a problem does not have one answer or one solution path, the task is reasonable and realistic, and the information needed is accessible. Working in pairs or groups is efficient and more fun, and it reduces the possibility that someone will get stuck on one aspect of the problem and not be able to progress. Learners have an opportunity to communicate orally and in writing and practice writing a business letter. The activity has research, geography, and math components. Activities such as this can help learners develop and hone skills in a holistic environment. The emphasis is not on acquiring discrete skills but rather on developing problem-solving strategies and applying knowledge and skills in meaningful ways.

In such an instructional environment, the role of the teacher is very different from the "sage on the stage." The teacher is not the sole source of information; indeed the teacher will not know in advance the "answers" that the learners propose. Instead, the teacher provides guidance as needed to groups of learners. Upon completion of the activity, the teacher might facilitate a discussion of the problem-solving approaches and group processes learners used.

In such an environment, learners are much more independent and active than in an educational environment that is focused on the acquisition of discrete subskills. They are expected to gather information and make, communicate, and justify their decisions. Their own experiences can contribute to their work.

Conclusions

The integration of technology into instruction, particularly when used as an instructional tool, can empower learners to take more responsibility for their own learning and creates a powerful learning environment. However, the integration of technology into adult education instruction is a worthwhile but daunting task. Teachers' and learners' expectations of classroom structure, curricula, support materials, roles, and instructional activities may all need to be re-evaluated and revised. This is an unsettling process, but it is also an opportunity to question assumptions, experiment, and ultimately improve the delivery of education to adults. We all acknowledge that the information age has had a profound impact on the world around us; thus it is not unreasonable to posit that the information age should also affect the form and function of adult education. However, integrating technology into instruction in meaningful, constructive ways requires that those charged with the task be aware of alternatives and feel comfortable exploring and experimenting to arrive at a workable implementation.