

The following is an excerpt from:

Overbaugh, Richard C. (1998). Technology Literacy for Educators. In H. E. Taylor (Ed.), *What's Going On---Trends and Issues Confronting Today's Classroom Teacher*. Pages 190-206.

Computer Assisted Instruction (CAI)

Many models of learning exist to help design effective instruction. Perhaps the most well known and still viable are the seven stages of learning identified by Gagne (Gagne & Briggs, 1979). However, the simpler four stage process proposed by Alessi and Trollip (1991) provides a reasonable framework for discussing computer assisted instruction software: (a) presentation of information or learning experiences; (b) initial guidance as learner struggles to understand the information or execute the skill to be learned; (c) extended practice to provide fluency or speed or to ensure retention; and (d) assessment of student learning. The first four CAI types lie on a complexity continuum from simple to complex and a cost continuum from least expensive to most expensive.

Drill and Practice

Drill and Practice software is the simplest, least expensive, most popular, and most abused type of computer assisted instruction software in schools. Drill and practice software assumes previous knowledge and only fits in the third stage, extended practice and *perhaps* the fourth, assessment, but it does not teach. Repetition is effective for practicing existing knowledge for fluency, automaticity, recall and perhaps elaboration, or learning to apply the knowledge to different situations (e.g., learning to use foreign words in different or increasingly difficult contexts).

Drill and practice software is often abused through use as a reward or when it is assumed students will be taught something from the software. The software is easy to write and usually

very inexpensive which leads to a prevalence of poor quality programs especially in financially limited schools. Quality Drill and Practice programs do exist but careful evaluation should be conducted before purchase.

Tutorials

In contrast to drill and practice programs, tutorials do *not* assume prior knowledge. Tutorials teach material and may also include a drill and practice component as well as assessment. Therefore, tutorials can play an integral part in instruction or be used as stand-alone instruction for enrichment and remediation.

Problem Solving

Problem-solving software is any software that is based on the traditional four-step problem-solving process: (a) defining a problem; (b) devising a solution; (c) implementing the plan; and (d) evaluating the plan. If the evaluation step shows the solution was incorrect, the learner returns to the definition step or devises a new solution plan.

Simulations

Computer simulations include any near-to-real experience provided by a computer. For example, many schools cannot afford field trips or expensive materials but can afford computer-based simulations. Another example is where the real experience may be too dangerous (e.g., a chemistry experiment involving caustic or volatile substances) or impractical (e.g., breeding animals in the classroom to study genetics or taking a trip to the Smithsonian Institute in Washington D.C. or the Louvre in Paris) leaving a virtual, or simulated, experiment or trip the next best option. Additionally, computer simulations can be used for time compression. Events such as continental drift and plate tectonics that took/take place over a long period of time can be compressed into a brief time span, providing a visual representation that helps learners grasp a potentially abstract idea.

Instructional Games

Instructional games have potential instructional use but are often misused. When carefully integrated as part of other academic instruction, games can provide rich, varied and interesting components. For example, the *Carmen San Diego* series is often used to teach reference skills, map reading, and geography. Many times, however, the games are used as reward for better students which means they have little more than entertainment value.

Software Evaluation

Before leaving computer assisted instruction, a final, and extremely important skill, needs to be mentioned: software evaluation. Evaluation is not easy and requires a substantial amount of time. However, evaluation is critical in order to avoid wasting money. In fact, evaluation is especially important because of the technical wizardry inherent in current software. Society has become mediacentric and software developers build in many sounds, graphics, and movies that are little more than initial attention getters. Once beyond the glitz, many seemingly exciting and fun software packages have little to offer teachers and students.

Most school systems have a standard evaluation form or many are available in books (e.g., Geisert & Futrell, 1995). At the very least, software should be evaluated according to several criteria. One evaluation criterion is technical/mechanical attributes such as the ease of use, reliability, and hardware requirements. Second, whether the instructional design is agreeable to the teacher should be considered. Even if software is well designed, if the teacher's style is not agreeable with the instructional design of the software, the software will be little used. Finally, a field test should be conducted with a few students from the intended audience to identify additional or overlooked problems.

Productivity Tools as CAI

Productivity tools used as CAI can be used to teach content in many ways. Word processors, databases, spreadsheets and presentation/authoring programs can be adapted to many situations, limited only by the imagination which can often overcome the need for expensive

content specific software. The obvious appeal lies in the availability of "works" packages such as *ClarisWorks* in nearly every classroom. A few brief examples follow.

Word Processors

While word processors have no inherent ability to improve student writing (beyond limited surface revisions such as spell checkers and subjective grammar checks), easy revisions help in the writing process. When students are guided through prewriting and rewriting activities, easy low-level and high-level editing are easy to do, enabling students to overcome negative attitudes towards research and revision. Additionally, templates, such as "standard" lab report formats, can be created for students to fill in the blanks.

Databases

Databases are perhaps one of the most useful tools because of their uses for organization and data manipulation. Students in nearly any subject can use databases from research to learning classification skills. Second graders are quite capable of researching countries or cities around the world and compiling information such as language spoken, currency and currency exchange, historic and contemporary facts and features. Additionally, databases can be used to classify data and manipulate data for problem solving.

Spreadsheets

By design, spreadsheets are more suited for math and science but can also be used to teach other lessons such as budgeting, currency exchange rates, and time allocation skills. A favorite in elementary schools is to use M&M's or dice and a spreadsheet to teach probability.

Presentation/Authoring/Programming

Presentation programs (e.g., *ClarisWorks* slide show, *Kid Pix*, and *Powerpoint*) and authoring programs (e.g., *HyperCard*, *HyperStudio*, and *Digital Chisel*) are viable media for student knowledge representation. Students can use computer-based presentations just as they can write papers and do class presentations or unit projects. Not only does using the computer

for organizing and presenting material motivate students, the multiple processing time required leads to higher levels of learning. For example, students studying a particular decade to make a multimedia presentation have to: research to find major events; research events for themselves; organize materials; decide how to present their work; create the presentation. By finding and revisiting the material many times, students are actively involved in creating meaningful knowledge.