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ABSTRACT

Computer-assisted instruction (CAI) is becoming more important to vocational education, since at least 2 million schools now have computers, and by the year 2000, 75 percent of jobs may require computer knowledge. A review of the literature about CAI in vocational education produced the following findings: (1) although CAI can be effective in vocational education, its superiority over other methods has not been proven; (2) previous computer experience is advantageous in CAI; (3) access and equity are issues associated with CAI; (4) CAI can be a tool for teaching the applications students will use in industry; (5) CAI is an effective tool for delivering competency-based education; and (6) currently, CAI serves in a secondary role in vocational education classrooms. Some guidelines for effective use of computer-assisted instruction include the following: (1) all instructional staff should be familiarized with CAI; (2) access and equity issues should be addressed; (3) existing curricula should be examined to determined ways to integrate CAI; (4) costs and benefits of CAI should be examined before it is adopted; (5) CAI cannot be the sole source of instructional support; (6) drill and practice programs should be used tc provide students with effective learning experiences while allowing teachers to have more time with other students needing extra attention; and (7) the role of CAI in vocational education should be broadened. It is concluded that more research is needed to determine the effectiveness of microcomputers as a tool in vocational education. (14 references) (KC)

# Computer-Assisted Instruction in Vocational Education

## Practice Application Brief

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# PRACTICE APPLICATION BRIEF

by Susan Imel
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# Computer-Assisted Instruction in Vocational Education

Currently, educators have access to a range of instructional technologies to support teaching and learning. One that is particularly appropriate for use in vocational education is the microcomputer. Prior to 1981, there were fewer than 30,000 microcomputers in U.S. schools, but by 1990 there were more than 2 million, with at least one in every school (Roth, Gooler, Tesolowski, and Winters 1990). Microcomputers are a tool that can help learners build job skills that are integral to work. Almost all vocational education graduates will need computing skills since it is estimated that by 2000, 75 percent of all jobs will use computers (Gooler and Roth 1990; Sutphin and Camp 1990). The availability of microcomputers in schools plus their potential for helping achieve the goals of vocational education make them an ideal instructional tool. Following a summary of literature-based findings on computer-assisted instruction (CAI), this *Brief* provides guidelines for effective use of CAI in vocational education instruction.

## Findings Related to Computer-assisted Instruction

What does the literature say about computer-assisted instruction and its application in vocational education? The following findings have been derived from the research and theoretical literature:

- **CAI can be an effective method of instructional delivery, but its superiority over other methods has not been proven through research in vocational education.** Although a research synthesis of military studies shows that CAI can save time and result in better achievement in military training, research in vocational education has not demonstrated such results (Kearsley 1989). Two studies in agricultural education found that there was no apparent advantage or disadvantage in instruction for students who used either a drill and practice program or microcomputer simulation teaching strategy in the instructional process (McCaskey, Birkenholz, and Stewart 1989; Ogle, Birkenholz, and Stewart 1989). In McCaskey et al.'s study, the best predictor of student achievement was past performance and what the student had previously learned.

- **Previous computer experience is advantageous in CAI.** Because of their greater familiarity with computers, students performed better than industry employees and males performed better than females in a research study investigating computer literacy (Harrison, Hay, Pierson, and Burton 1990). In another study examining attitudes toward computers, teachers with computer experience exhibited a more positive attitude toward them than those who had not had computer experience (Martin and Lundstrom 1988).

- **Access and equity are issues associated with CAI.** Low-income minority students and girls experience less access to computers and more drill and practice activities than do middle-class students and males (Cummins 1991). Current educational or parental practices may be influencing the differences between computer awareness of males and females, with males having more awareness. However, among males and females who have familiarity, it may be that girls work with more care and precision (Harrison et al. 1990).

- **CAI can be a tool for teaching the applications students will use in industry.** From their research, Harrison et al. (1990) concluded that graduates are acquiring computer skills and are likely to be more ready than people currently in employment to take on tasks in the workplace involving a computer. Branson (1991) also noted that CAI enables graduates to become well prepared for the workplace.

- **CAI is an effective tool for delivering competency-based education (CBE).** The goals of CBE, a common approach in vocational education, and drill and practice, a common form of CAI, are very similar. Both, for example, let learners know what to expect, measure performance, show what is to be learned, and provide open entry to and open exit from instruction (Gooler and Roth 1990).

- **Currently, CAI serves in a secondary role in vocational education classrooms.** The role of the computer is primarily as an adjunct transmitter of knowledge and skills (Cummins 1991). In a study (Clark et al. 1988) of business education programs, applications, tutorials, and drill and practice software packages were those used most often.

## Guidelines for Effective Use of Computer-assisted Instruction

The following guidelines for effective use of CAI in vocational education are derived from the findings discussed here as well as practices cited in the literature.

1. **Familiarize all instructional staff with CAI.** Lack of experience using technology is the major deterrent to its use in training and education (Kearsley 1989); therefore, instructional staff should be provided opportunities to become knowledgeable about computers. Training sessions and inservice programs can enhance teachers' attitudes toward computers by providing hands-on computer experience (Martin and Lundstrom 1988). Equipment and software change rapidly so instructional staff should be provided adequate resources to keep up with the latest developments through continual updating.

2. **Be prepared to address access and equity issues.** Because low-income minority students and girls may lack experience with CAI, spend time familiarizing students with computers. Activities that permit students to become knowledgeable about hardware and software in a nonthreatening environment should take place before CAI begins. When CAI is implemented, ensure that all participants have equal access to the range of available instructional programs.

3. **Examine existing curricula to determine ways to integrate CAI.** Computing in vocational education can be focused on teaching the applications students will use in industry as well as on teaching the subject matter (Gooler and Roth 1990; Sutphin and Camp 1990). Since one of the major

deterrents to using technology is lack of time to develop and prepare alternative modes of delivery (Kearsley 1989), curriculum planning should include sufficient time for considering the role of CAI.

4. **When considering adopting CAI, examine both its costs and benefits.** Although CAI has many potential benefits, they will be realized only if it is implemented appropriately. When compared to alternatives, CAI should be less costly, more effective, take less time to achieve objectives, provide higher quality instruction, be more versatile, and be preferred by the user (Branson 1991).

5. **Do not depend on CAI as the sole source of instructional support.** Learners have diverse learning styles that require a number of instructional approaches. Therefore, vocational educators should continue to use a variety of instructional methods, including CAI, to facilitate learning (Cordell 1991).

6. **Employ drill and practice programs in such a way as to emphasize their strengths.** For example, use of such programs could provide students with effective learning experiences while allowing classroom teachers to work with other students requiring more individual attention (Ogle, Birkenholz, and Stewart 1989). Drill and practice can also be an effective and efficient way of delivering competency-based instruction (Gooler and Roth 1990).

7. **Broaden the role of CAI in vocational education.** Although drill and practice CAI programs can help accomplish vocational education's goals and objectives, the computer also needs to be seen as a tool to enhance communication and discovery-oriented learning opportunities for students working cooperatively in small group settings (Cummins 1991). Teachers need to think of computers as a communicative tool that provides students with the opportunity to communicate with other people across the nation and around the world through electronic mail, electronic bulletin boards, and computer conferencing (McCaslin and Torres 1992). It can also be used as a tool to achieve some of the higher order thinking skills such as problem solving through the use of simulation activities (Curry and Moutinho 1992).

## Conclusion

Microcomputers have great potential for use in the delivery of vocational education. Of all the instructional technologies available, they have the most relevance for preparing students for their future work environments. However, more research is needed about their effectiveness as an instructional tool. Until their contributions are clearly demonstrated, it is doubtful that microcomputers will achieve their full potential as an instructional tool in vocational education.

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