

Learning Technology

Publication of IEEE Computer Society
Technical Committee on Learning Technology (TCLT)

Volume 8 Issue 3 ISSN 1438-0625 July 2006

Special issue on:
“Innovation in Distance Learning Technologies in Developing Countries”

http://lttf.ieee.org/learn_tech/issues/july2006/index.html

Delivering Computer-Assisted Instruction Without Computers

Introduction

The effectiveness of computer-assisted instruction (CAI) programs has been well documented, especially in the areas of basic arithmetic and language learning. The problem in developing countries is that many classrooms and homes don't have the computer capability to take advantage of the interactive, individualized instruction that CAI offers. Peer-assisted instruction (PAI) incorporates two proven instructional methods, CAI and peer tutoring, and addresses the major limitations of both – CAI's need for computers and peer tutoring's need for skilled tutors. In a PAI classroom activity, pairs of students alternate roles as learner and facilitator. In a home setting, a relative can act as the PAI facilitator. The facilitating peer performs the instructional management tasks handled by the computer in CAI programs: presenting items, taking and judging learner input, providing immediate feedback, branching based on learner achievement, and record keeping.

Note that the facilitating peer is not acting as a teacher. The organizing principle of PAI is that the facilitator's role is based on and limited to the basic CAI approach as it was established in the 1960s and which was an extension of what programmed instruction and teaching machines had been doing since the 1920s (Fry, 1963).

Individualized Instruction

The goal of PAI is to provide interactive, individualized instruction. Writing in 1967, Patrick Suppes – an early designer and researcher of computer-assisted instruction – noted that the theme of individualized instruction had been prominent in educational theory for over 50 years. “Psychologists have shown that individuals differ in their abilities and their rates of learning. Unfortunately, the cost to provide individualized instruction that adapts to these differences is prohibitive if it depends on the use of professional teachers. The computer offers perhaps the most practical hope for a program of individualized instruction under the supervision of a single teacher in a classroom of 25 to 35 students (Taylor, 1980, pg. 233).”

Peter Rosenbaum, an early participant in the development of CAI programs, expressed the idea of replacing the computer with a peer facilitator in a 1973 book titled *Peer-Mediated Instruction*. “Might it not be possible to devise a special buddy system interaction that would simulate these causes [of proven CAI effects], thereby achieving similar, conceivable even greater, instructional gains at low cost? In other words, might it not be possible for one student to simulate the computer for his peer (pg. 14)?” Rosenbaum oversaw the development and implementation of a number of peer-mediated instruction programs in public education and corporate training, but there is little evidence of continued use or development of the approach. However, some peer-tutoring strategies have incorporated elements of the “simulated CAI” approach.

Peer-Tutoring

There is a large body of research and writing related to peer tutoring strategies. These usually involve a student at a higher grade or achievement level providing direct instruction to younger or less successful students, either in classroom or individualized settings. Although the student tutor is a peer, such interventions cast the tutor as the teacher. However, the focus here is on interventions that emphasize in-group, reciprocal, paired-learner strategies. One such strategy is Peer-Assisted Learning Strategies (PALS). The PALS approach involves the use of prepared materials (that are available for purchase) and focuses on basic mathematics and reading skills (Fuchs et al. 2001). A central concern of reciprocal peer-tutoring strategies is how much can be expected from the peer who is assisting the learner. PAI’s organizing principle of simulating CAI ensures that the facilitator role does not extend beyond the capability of peers.

Peer-Assisted Instruction

PAI is an organizing principle more than it is a distinct process or product. Teachers and instructional developers can enhance existing instructional activities by incorporating the type of interactions that would take place in a CAI program designed to teach the particular content. Consider an instructor in a foreign language class who uses vocabulary flashcards in a group setting. In PAI the instructor arranges learners in pairs and has them drill each other using multiple sets of flashcards. One student is in the role of learner and the other in the role of facilitator. The facilitator is responsible for the instructional management tasks that a CAI program would typically perform, including:

1. Select an appropriate level of initial difficulty based on the learner’s choice or on a record of the learner’s previous achievement.
2. Define the item pool and randomize items (i.e., shuffle the cards).
3. Present items, take learner input, provide immediate and corrective feedback, and keep score.
4. Retire items or place them in the item queue according to the rules of the particular queuing routine being used.

5. Provide summary feedback at the end of the drill and – based on the learner’s performance – direct the learner to repeat the drill, branch to a more difficult level of the drill, reference remedial instruction, or end the session.
6. Record data concerning the particular drill, the level of difficulty, and the learner’s score in a database that can be checked by the instructor and can be used to direct the learner’s progressive mastery over numerous sessions.

The teacher’s role in a PAI activity is that of a learning consultant who circulates between dyads monitoring progress and providing needed assistance. The instructor who embraces PAI is led into a level of instructional design that is seldom engaged in classroom settings. It requires discipline and creativity, but rewards the effort with low-cost, interactive, individualized instruction.

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