
Literature Review: Douglas Clements, 1999

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Background

By the end of the 1980s, one fourth of licensed preschools had computers. Today almost every preschool has a computer.

Computer-Student Ratio

1:125 in 1984

1:22 in 1990

1:10 in 1997

We no longer need to ask whether the use of technology is “developmentally appropriate”. It is.

- Very young children have shown comfort and confidence in using software.
- They can follow pictorial directions and use situational and visual cues to understand and think about their activities [3].
- Typing on a keyboard is a source of pride not trouble.
- Children with physical and emotional disabilities can also use computers and it may help improve their self-esteem.

Children attending low-income and high-minority schools have less access to technology [5].

Also, we no longer need to ask whether computers can help children learn. They can.

What we need to understand is:

- How to best aid learning
- What types of learning to facilitate
- How to serve the needs of diverse populations

Important to realize that not every use of technology is appropriate or beneficial. Design of curriculum and social settings are critical.

Social Interaction

Early concerns that computers would isolate children was alleviated by research. In contrast, computers serve as a catalyst for social interaction.

- 95% of children's talk using Logo is work related
- Children spend 9 times as much time talking to peers while working with computers as they do working on puzzles. [10]
- Children prefer to work with a friend rather than alone.
- They foster new friendships in presence of computers.
- There is greater spontaneous peer teaching and helping when children are using computers [1].

Open-ended programs tend to foster collaboration.

Drill-and-practice can encourage turn-taking but also competition.

Video games with aggressive content can engender competitiveness and aggression.

Used differently, computers can have the opposite effect [1] [7].

Physical environments also affect children's interaction [6]. Two seats can encourage positive social interaction. Placing computers close to each other can facilitate idea sharing. Central location of computers encourages participation in computer activities as well as optimal teacher involvement [2].

Teaching with Computers

Assessment:

- Observing the child at the computer provides a "window" into their thinking process [11].
- Sometimes beneficial effects only appear after a year.
- Ongoing observations help us chart children's learning process [4].
- Differences in learning styles more obvious at a computer [12].
- Gender/cultural differences emerge in student programming styles [13].

Teachers *must* have in-depth training with technology for it to be successful.

Curriculum and Computers

Computers also offer unique opportunities for learning through exploration, creative problem solving, and self-guided instruction.

Must focus simultaneously on curriculum and technology [8].

Effectively integrating technology into curriculum demands effort, time, commitment, and, sometimes, even a change in one's beliefs.

Rote drill-and-practice software is not as effective in improving conceptual skills of children as discovery-based software [3]. However, this is best in open-ended projects rather than free exploration [9].

Computer activities yield best results when coupled with suitable off-computer activities:

According to Haugland'92 when children use developmental software alone, they gain in intelligence, non-verbal skill, long-term memory, and manual dexterity. When coupled with supplemental activities, children also gain in verbal skills, problem solving, and conceptual skills. With drill-and-practice software, children

spent three times as long on the computer, but demonstrated less than half the gain as developmental with supplemental.

In mathematics, specifically, drill-and-practice can help students develop competence counting and sorting [3]. However, the it is questionable whether the exclusive use of such software would meet NCTM's standard of "mathematically literate" children.

Software that emphasizes discussing and problem solving in geometry, number sense, and patterns with the help of manipulatives and the computer may be more in-line with NCTM standards.

For example: geometric drawing programs, logo, etc.

References

- [1] D.H. Clements and M.T. Battista. The development of a logo-based elementary school geometry curriculum (final report). NSF Grant No.: MDR-8651668, 1992. State University of New York at Buffalo/Kent State University.
- [2] Douglas Clements. Current technology and the early childhood curriculum. In B. Spodek and O.N. Saracho, editors, *Yearbook in early childhood education*, volume 2, pages 106–131. Teachers College Press, New York, 1991.
- [3] Douglas Clements and B. Nastasi. Electronic media and early childhood education. In B. Spodek, editor, *Handbook of research on the education of young children*, pages 251–275. Macmillan, New York, 1993.
- [4] M. Cochran-Smith, J. Kahn, and C.L. Paris. When word processors come into the classroom. In J.L. hoot and S.B. Silvern, editors, *Writing with computers in the early grades*, pages 43–74. New York: Teachers College Press, 1988.
- [5] R.J. Coley, J. Cradler, and P.K. Engel. *Computers and classrooms: The status of technology in U.S. schools*. Educational Testing Service, Princeton, NJ, 1997.
- [6] J. Davidson and J.L. Wright. The potential of the microcomputer in the early childhood classroom. In J.L. Wright and D.D. Shade, editors, *Young children: Active learners in a technological age*, pages 77–91. National Association for the Education of Young Children., Washington, DC, 1994.
- [7] G. Forman. Computer graphics as a medium for enhancing reflective thinking in young children. In J. Bishop, J. Lochhead, and D.N. Perkins, editors, *Thinking*, pages 131–137. Lawrence Erlbaum Associates, Hillsdale, NJ, 1986.
- [8] C. Hohmann. Staff development practices for integrating technology in early childhood education programs. In J.L. Wright and D.D. Shade, editors, *Young children: Active learners in a technological age*, page 104. National Association for the Education of Young Children., Washington, DC, 1994.
- [9] T. Lemerise. Piaget, vygotsky, and logo. *The Computing Teacher*, pages 24–28, 1993.
- [10] A.A. Muller and M. Perlmutter. Preschool children's problem-solving interactions at computers and jigsaw puzzles. *Journal of Applied Developmental Psychology*, 6:173–186, 1985.
- [11] S. Weir, S.J. Russell, and J.A. Valente. Logo: An approach to educating disabled children. *BYTE*, 7:342–360, 1982.
- [12] J.L. Wright. Listen to the children: Observing young children's discoveries with the microcomputer. In J.L. Wright and D.D. Shade, editors, *Young children: Active learners in a technological age*, pages 3–17. National Association for the Education of Young Children, Washington, DC, 1994.
- [13] N. Yelland. The strategies and interactions of young children in logo tasks. *Journal of Computer Assisted Learning*, 10:33–49, 1994.