Relevant Research Examples

For more research, link to: http://caret.iste.org/

Curriculum Integration

1) Integration within the curriculum framework

"And in the ACOT study, student engagement remained highest when technology use was integrated into the larger curricular framework, rather than being an "add-on" to an already full curriculum."

Sandholtz, J. H., Ringstaff, C., & Dwyer, D. C. (1997). Teaching with technology: Creating student-centered classrooms. New York: Teachers College Press.

2) Integration with curriculum framework strengthens information literacy skills

"Moreover, using technology within the curriculum framework can enhance important skills that will be valued in the workplace, such as locating and accessing information, organizing and displaying data, and creating persuasive arguments."

Critical issue: Using technology to improve student achievement. (1999). Retrieved March 12, 2001, from North Central Regional Educational Laboratory Web site: http://www.ncrel.org/sdrs/areas/issues/methods/ technlgy/te800.htm

3) Collecting, organizing, and analyzing information

"These technologies provided an excellent platform—a conceptual environment—where children could collect information in multiple formats and then organize, play, visualize, link, and eventually construct new ideas about relationships among facts and events. The same technology could then be used powerfully by students to communicate their ideas to others, to argue and critique their beliefs, to persuade and teach others, to add greater levels of understanding to their own growing knowledge (p.5-6)."

Dwyer, D. (1992). *ACOT: History, findings, impact. Cupertino, CA: Apple Computer, Inc.*

4) Mathematics courses that emphasize **small-group processes, analyses of real-world situations, the use of computational tools, and incorporate adaptive tutoring software into the curriculum** can result in improved mathematics skills as measured by standardized

assessments. These types of courses also result in improved problem-solving skills and enhanced ability to translate between equivalent representations of algebraic content.

Koedinger, K., Anderson, L.k Hadley, W., & Mark, M., (1997*). Intelligent Tutoring Goes to School in the Big City*. Pittsburg, PA: Human-Computer Interaction Institute, Carnegie Mellon University.

5) I**ntegrated learning programs should be considered as a supplement for the systematic development of basic academic skills** but should not replace project-based activities that are designed to teach students the relevance and application of the basic skills as they are mastered.

Mann, D., Shakeshaft, C., Becker, J., & Kottkamp, R. (1998). *West Virginia Story: Achievement gains from a statewide comprehensive instructional technology program.* Santa Monica, CA: Milken Exchange on Educational Technology.

6) Integrated Learning Systems (ILS)/ Computer-assisted Instruction (CAI)

"The computer-integrated instructional program, (Project Child) found that elementary students in project classrooms from kindergarten through fifth grade consistently had higher test scores and better discipline than their counterparts. "

Butzin, S. M. (2000, June). Project Child: A decade of success for young children [Feature]. Technology Horizons in Education Journal, 27(11). Retrieved from http://www.thejournal.com/magazine/vault/A2882.cfm

A meta-analyses of 500 computer-based instruction studies concluded that computer-assisted instruction and drill and practice software can significantly improve students' scores on standardized achievement tests"

Kulik, J.A. & Kulik C.-L. C. (1987a) Computer-based instruction: What 200 evaluations say. Paper presented at the Annual Convention of the Association for Educational Communications and Technology, Atlanta, GA. (ERIC Document Reproduction Service No. ED 285 521)

7) **Drill and Practice Software**

As a result of these meta-analyses, many conclude that computer-assisted instruction and drill-and-practice software can significantly improve students' scores on standardized achievement tests (Kulik, 1994; Sivin- Kachala & Bialo, 2000), in all major subject areas, preschool through higher education (Coley, 1997).

Sivin-Kachala, J., & Bialo, E. (2000). 2000 research report on the effectiveness of technology in schools (7th ed.). Washington, DC: Software and Information Industry Association

8) Learning Styles and Special Needs

"Technology can provide the means for students with special needs to communicate via email and use the Internet for research, and can also help teachers accommodate students' varying learning styles."

Silverstein, G., Frechtling, J., & Miyoaka, A. (2000). Evaluation of the use of technology in Illinois public schools: Final report (prepared for Research Division, Illinois State Board of Education). Rockville, MD: Westat.

"Gifted students can work at their own pace and explore subjects in more depth than the basic curriculum. Technology can also analyze and provide immediate feedback on performance, and can suggest modifications in instruction where necessary to improve student achievement."

CEO Forum on Education and Technology. (2001). Education technology must be included in comprehensive education legislation. Washington, DC: Author.

9) Interdisciplinary, project-based learning

In another longitudinal study, researchers investigated the impact of project based learning using multimedia. Data from teachers' self-reports, as well as classroom observation data, suggest that project teachers were less likely to lecture than non-project colleagues, and instead took on the role of facilitator or coach. In project classrooms, students spent a greater amount of time than non-project peers in active, small-group collaborative activities or small group discussions. In short, project classrooms were much more student centered than non-project classrooms, and were "organized around the collaborative construction of complex products"

Penuel, B., Golan, S., Means, B., & Korbak, C. (2000). Silicon Valley Challenge 2000: Year 4 report. Menlo Park, CA: SRI International.

10) **Technology Integration and Student Achievement**

In an eight-year longitudinal study of SAT-I performance at New Hampshire's Brewster Academy (Bain& Ross, 1999), students participating in the technology-integrated school reform efforts (School Design Model) demonstrated average increases of 94 points in combined SAT I performance over students who participated in the traditional school experience.

Bain, A., & Ross, K. (1999). School reengineering and SAT-I performance: A case study. International Journal of Education Reform, 9(2), 148–153.

The Idaho Council for Techno logy in Learning (1999) conducted research on the effect of the technology initiative in Idaho. Researchers examined the test score gains, technology usage patterns, and technology literacy along with five other elements of the initiative. The sample consisted of over 35,000 8th and 11th grade students, and the researchers concluded "*There is a positive relationship between academic performance in core studies, language, math, and reading and the integration of technology in Idaho's K- 12 schools (p. vii).*" They also concluded that the gains were greater for 8th graders than for 11th graders and that the differences between the academic gains of Idaho students with high exposure to computers over a four year period and the academics gains of those students who had little interaction with computers over that same time were practical and educationally meaningful. *The technology factors that were the strongest predictors of achievement gains were the ability to choose the appropriate software tool, the amount of computer use at school, exposure to Internet and email use, and the amount of computer use at home*.

Idaho Council for *Technology* in Learning (1999). *The Idaho technology initiative: An accountability report to the Idaho Legislature on the effects of monies spent through the Idaho Council for Technology in Learning*. The State Division of Vocational Education, The State Department of Education, Bureau of Technology Services.

11) **Laptop usage and Student Achievement**

"evaluation of the Anytime, Anywhere Learning program in the Beaufort County School District showed a positive relationship between laptop computer usage and academic achievement using standardized test scores, and this relationship was strongest among free and reduced lunch children."

Stevenson, K.R. (1998). *Evaluation report-year 2. Schoolbook Laptop Project. Beaufort County School District*. Beaufort, S.C.: *Beaufort* County School District. Available: http://www.beaufort.k12.sc.us/district/ltopeval.html

12) Student assessment should included considerable student participation ad feedback. Peer assessment is a potentially useful adjunct to teacher and student assessment procedures.

McKenzie, J. (1998). *Creating technology enhanced student-centered learning environments*. **From Now On: The Educational Technology Journal.** 7(6).

13) Community Technology Centers had a positive impact on participants' job skills, access to employment opportunities, education and outlook on learning, technological literacy, academic skills and knowledge, personal efficacy, use of time and resources, civic participation, and social and community connections.

Mark, Cornesbise, & Wahl (1997)

Staff Development Research

19) Improving Student Achievement

"…results of over 300 studies of technology use, authors concluded that teacher training was the most significant factor influencing the effective use of educational technology to improve student achievement. Specifically, the report states that students of teachers with more than ten hours of training significantly outperformed students of teachers with five or fewer training hours."

Sivin-Kachala, J., & Bialo, E. (2000). 2000 research report on the effectiveness of technology in schools (7th ed.). Washington, DC: Software and Information Industry Association.

"…students whose teachers received professional development on computers showed gains in math scores of up to 13 weeks above grade level."

Wenglinsky, H. (1998). Does it compute? The relationship between educational technology and student achievement in mathematics (Educational Testing Service Policy Information Report). Retrieved March, 12, 2001, from ftp://ftp.ets.org/pub/res/technolog.pdf

"…the greatest gains in student achievement occurred when teachers were trained in the use of technology."

Schacter, J. (1999). The impact of education technology on student achievement: What the most current research has to say. Retrieved from the Milken Family Foundation Web site: http://www.mff.org/pubs/ME161.pdf

Helping teachers to learn to integrate technology into curriculum is a critical factor in the successful implementation of technology in schools

Sivin-Kachala, J., & Bialo, E. (2000). 2000 research report on the effectiveness of technology in schools (7th ed.). Washington, DC: Software and Information Industry Association.

"…when teachers are learning to integrate technology into their classrooms, the most important staff-development features include opportunities to explore, reflect, collaborate with peers, work on authentic learning tasks, and engage in hands-on, active learning."

Schacter, J. (1999). The impact of education technology on student achievement: What the most current research has to say. Retrieved from the Milken Family Foundation Web site: http://www.mff.org/pubs/ME161.pdf

14) Effective training models

Observation

Preservice elementary teachers learn technology integration strategies by working with and observing practicing teachers and students while they use technology. For their practice teaching assignments, preservice teachers should be placed with teachers who are exemplary users of technology

Abbott, J. A., & Faris, S. E. (2000). Integrating technology into preservice literacy instruction: A survey of elementary education students' attitudes toward computers]. Journal of Research on Computing in Education, 33(2), 149–161.

Modeling by trainers

Education faculty should integrate technology applications into preservice teacher assignments and field activities so that new teachers have opportunities to acquire technical skills and practice instructional strategies

CEO Forum. (1999). Professional development: A link to better learning [Online]. Washington, DC: Author. Available: www.ceoforum.org/reports.cfm?RID=2.

Just in Time Learning

Staff development must be individualized to the needs of the teacher. Teachers must decide on what the topic should be and when the staff development or training should occur. Time for teachers to plan, learn about, and implement technology applications is essential. Educators need an understanding of ways to integrate technology into education reform initiatives. Involvement of teachers in planning statewide, school, and classroom uses of technology is critical.

Cradler, J., & Cradler, R. (1995). Prior studies for technology insertion. San Francisco, CA: Far West Laboratory.

Continuous Support

There is a continuing need for the school site presence of a technology coordinator who can serve as a mentor or "translator" of technology applications and instructional integration for teachers. Appropriate technology resource personnel are not only for the early stages of a technology initiative or technology plan

Strudler, N. (1994). The role of school-based technology coordinators as change agents in elementary school programs: A follow-up study. Presented at AERA, New Orleans, LA, April 5, 1994.

15) Relationship between training and use

66% of teachers who received more than 32 hours of technology related training felt well to very well prepared to use technology in their classrooms (NCES, 2000a). The percentage who

felt well to very well prepared to use technology dropped to 34% for those who received from 9 to 32 hours and to 24% for those who received less than 9 hours of technology-related professional development.

National Center for Educational Statistics. (2000a). Teachers' tools for the 21st century: A report on teachers' use of technology [Online]. Washington, DC: Author. Available: http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2000102.

16) **Which strategies build teacher confidence and interest in technology?**

*Answer: **Being mentored** by an experienced teacher who is proficient with technology, **sufficient time** for collaborative learning and practice with technology, **active participation** in professional meetings, and use of computers at home by teachers.*

• **Mentors** who can help teachers adapt technology applications to their classroom needs are important to the success of innovative uses of technology

Zhao, Y., Pugh, K., Sheldon, S., & Byers, J. L. (2002). Conditions for classroom technology innovations. Teachers College Record, 104(3), 482–515.

• Considerable **time for collaborative learning and practice** is required for teachers to gain confidence in using technology

Coley, R. J., Cradler, J., & Engel, P. K. (1997). Computers and classrooms: The status of technology in U.S. schools (Policy Information Report). Princeton, NJ: Educational Testing Service.

• **Participation in professional associations** and sharing with colleagues within and beyond one's school contribute to increased confidence and motivation for using technology and correspond with increased use of learner-centered instructional strategies

Becker, H. J., & Riel, M. (2000). Teacher professional engagement and constructivist compatible computer use (Report No. 7) [Online]. Irvine: University of California, Irvine, Center for Research on Information Technology and Organizations. Available: www.crito.uci.edu/tlc/findings/report_7/TEXT.html.

Teachers **need long-term professional development** to adapt and infuse curricula with technology

(Wetzel, 2001a, 2001b; Wetzel, Zambo, Buss, & Padgett, 2001)..

Teachers **need ready access to technology** while they plan, along with flexible scheduling for team teaching and for learning to use technology during the school day (Honey & McMillan, 1996).