

Chapter 2

Computer Interventions for Children with Disabilities: Review of Research and Practice

Robert D. Tennyson
University of Minnesota, USA

ABSTRACT

This chapter presents an argument for the employment of computers in education and the possible improvements especially for students with disabilities. Early in the chapter questions concerning technological change are discussed in reference to research and practice. The view in disability education is moving towards lifelong learning and the need to apply advances in both technology and research to accomplish this goal. Employment of cognitive theories coupled with emerging technologies is hypothesized to improve the paradigm shift in education from classroom centered instruction to distributed learning environments. Proposed is that research in cognitive psychology, especially with findings for constructive theories can be successfully applied to disability education.

INTRODUCTION

Visualize, if you will, two tenth grade students with learning disabilities that are actively involved in the study of toxins in the St. Louis River of Minnesota (USA). They have spent a week in the library using the computerized catalog and the CD ROM periodicals index with full text to locate information from which to propose a hypothesis for their investigation, "The Cause of Water Pollution of The St. Louis River." They

obtain an Excel database of River Watch monitoring results from the MPCA (Minnesota Pollution Control Agency). From that data they decide to focus on the topic "Acid Rain." Their data are the raised pH levels collected at all sites over a four year period. They obtain computerized details on Acid Rain from the MPCA and then search the Internet for other schools with similar interests. The home page of a southern Minnesota school involved with deformed frog research has some links to information sources. They also find more Acid Rain background material on the Green Net, the River Net, and GLIN (Great Lakes Information

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Net). From these sources, they download pictures and text, and proceed to construct a storyboard multimedia presentation, using PowerPoint. This presentation will be the final summary (qualitative and quantitative) of their processes and efforts. As part of their learning activities, they will also analyze the actual water quality by taking samplings at the Indian Point site on the St. Louis River of Minnesota, and will compare those findings with the established criteria from the MPCA on river based toxins. The most interesting thing about this whole scenario is that these students are in a special education science class at the high school level.

TECHNOLOGICAL CHANGE (IS TECHNOLOGY OUTPACING EDUCATIONAL CHANGE?)

The above scenario is typical of one technologically mature approach to using computers on a daily basis in one class at the Duluth Central High School in Duluth, Minnesota. Computers have been used for instruction in schools for over 35 years in Minnesota, with some real successes and some definite concerns that we will explore in detail in this chapter. Miniaturization of computer chips in the 1970's has provided education with a powerful technological tool--the microcomputer. But, the concern is that the educational microcomputer does not come with directions as to its appropriate use! Educational theory and the resulting research will be explored as a possible diviner of instructions for how computers should be used to support instructional interventions for school children with disabilities. The 1990's and 2000's paradigm shifts in research from scientific reductionism to holistic social constructivism (Lytras & Tennyson, 2008) and in practice from 20th Century industrialism to today's post-industrial information society, will be used to explain the complex and interrelated issues of using computers for instructional interventions in special education.

The existing knowledge base related to computers in the state of Minnesota will be explored thoroughly in the next pages, as Minnesota has been in the forefront of the adoption of computers in education: Starting with mainframe access across Minnesota in the 1970's, followed by local MECC (Minnesota Educational Computing Consortium) site coordinators and microcomputer efforts in the 1980's, and recently consummating with the legislative funded technology site testing and the Internet explorations of the 2000's.

Technological change is driving both the computer industry and education at a frenetic pace, while at the same time; schools worldwide are striving to find the most educationally sound applications for the newly emerging computer technologies. We will also explore the driving mechanisms of computer use in educational institutions of many kinds (public, private, and distributed) by looking at how miniaturization, networking, artificial intelligence, and business initiatives are driving the change process. At the close of this chapter, we to describe some of the *emerging knowledge base* issues supporting computer interventions with children.

RESEARCH AND PRACTICE (CAN RESEARCH IMPROVE EDUCATIONAL PRACTICE?)

Schools around the world have married the computer for better or worse, with wedding expenses in the multiple billion dollar range. Meta-research indicates that computers can improve instruction, so the investment has not gone to waste (O'Neil & Perez, 2008). Properly designed computer instruction is equal to or more effective than traditional large group or small group instruction (Tennyson & Breuer, 2003). The research results build an incomplete picture but they suggest that certain hardware and software employed with particular populations under competent teachers

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