Impact of the New Educational Technology Standards on USA Schools

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Abstract. The USA National Council for Accreditation of Teacher Education (NCATE) has developed a new conceptual framework consisting of six standards to assess teacher preparation programs after the year 2000. Standard 1 targets those resources of knowledge, skills, and dispositions associated with use of technology in classroom settings by pre-service educators. These professional standards will have significant impact on technology diffusion in educational settings as well as on teacher preparation programs in terms of training and learning outcomes. To effectively apply these standards and create safe and healthful learning environments, the redesign of the educational system must also include an understanding of the principles or ergonomics and its application in educational settings.

INTRODUCTION

The USA National Council for Accreditation of Teacher Education (NCATE) has developed a new conceptual framework consisting of six standards to assess teacher preparation programs applying for national certification after the year 2000. Within those standards, Standard 1 targets those resources and skills associated with use of technology in classroom settings by pre-service educators.[1] The U.S. Secretary of Education officially recognizes NCATE as the national professional accrediting agency for schools, colleges, and departments of education that prepare teachers, administrators, and other professional school personnel. The Council for Higher Education Accreditation, a private organization that oversees accrediting agencies, also recognizes NCATE. For these reasons, the standard has significant potential for modifying the existing infrastructure of American K-12 educational systems.

Standard 1 provides specific guidelines for technology resources within the classrooms, as well as knowledge resources and skills for educators. It signifies a significant shift in the structure of the USA educational system toward adoption of best practices to support the rapid development of an educational system supporting an information-based society. The resources and skills suggested in this standard impact the design or redesign of educational environments and are of significance to human factors experts working in these areas. This submission presents a few implications for the implementation of these standards in the redesign of public educational settings in the USA.

REVIEW OF THE STANDARDS

NCATE requires implementation of professional academic standards specific to candidates' knowledge, skills, and dispositions. These academic standards are developed by professional organizations to standardize and define proficiency levels of technology usage. The professional organizations that have contributed to their development include the International Technology Education Association/Council on Technology Teacher Education (ITEA/CTTE), the International Society for Technology in Education (ISTE), the American Association of School Librarians (AASL), and the Association for Educational Communications and Technology (AECT). Other professional organizations comprised of educators may also have technology specific standards, however, those standards have not been formally adopted by NCATE as primary standards.

The following information is provided by NCATE to help institutions decide which set of standards is appropriate for a particular program. Copies of the standards may be obtained from the NCATE web site at: http://www.ncate.org/standard/programstds.htm.

- Use ITEA/CTTE for programs preparing teachers for technology education that focuses on human innovations in communications, construction, manufacturing, and transportation (formerly vocational education programs). Further information about this organization may be located at: http://www.iteawww.org/index.html.
- Use ISTE for endorsement programs preparing teachers of computer literacy and applications and endorsement/degree programs for secondary computer science teachers. Further information about this organization may be located at: http://www.iste.org/.
- Use AECT or AASL (or both) for programs preparing school library media specialists. Further information about the AASL organization may be located at: http://www.ala.org/aasl/.
- Use AECT for programs preparing educational personnel for positions in the broader arena of educational communications and instructional technology in areas such as K-12 education, higher education, business, military services, government, and health/community services. Further information about this standard may be located at: http://www.aect.org/.
- Use either AECT or ISTE (or both) for programs preparing K-12 technology leaders, technology specialists, and technology coordinators at the state, district, or building levels.

The most prevalent standard being adopted in teacher education and at state offices of education appears to be the technology standards proposed by ISTE. See Table 1 for a generalized match of categories in ISTE to other professional standards.

Each professional organization has organized their standards in a way that best reflects the curriculum and focus of their members. Broad categories common to these groups include definitions of the concept of technology, the impact of technology on society and the individual, and specific guidance for implementation of technology through processes of licensure; design, development, and utilization of instructional materials; and management and evaluation with and of technology. There are, however, few specific standards that address safety or related efficiency issues within the teaching/educational environments.

Table 1. General categories of technology standards. See professional standards for specific professional standards

ISTE Standard	AECT	AASL (ALA)	ITEA/CTTE
1.1 Foundations: Basic Computer/Technology Operations and Concepts.	development	utilization	discipline specific skills
1.2 Foundations: Personal and Professional Use of Technology	development	licensure, professionalism	philosophy, discipline specific skills
1.3 Foundations: Application of Technology in Instruction	development	utilization	philosophy, teaching skills
2.1 Specialty Content Preparation Foundations: Social, Ethical, and Human Issues	design	Professionalism, access	philosophy, teaching skills,
2.2 Specialty Content Preparation Foundations: Productivity Tools.	development	utilization	discipline specific skills, instruct content
2.3 Specialty Content Preparation Foundations: Telecommunications and Information Access	development	utilization	instructional content
2.4 Specialty Content Preparation Foundations: Research, Problem Solving, and Product Development.	development	management	instructional content
3.1 Professional Preparation Foundations: Teaching Methodology	design	licensure, utilization	licensure, teaching skills
3.2 Professional Preparation Foundations: Hardware/Software Selection, Installation, and Maintenance.	utilization	utilization, management	managing technology
4.1 Specialty Content for Leadership: Research and Theories in Educational Environments	design	management	philosophy
4.2 Specialty Content for Leadership: Instructional Design/Development.	design	management	instructional content
4.3 Specialty Content for Leadership: Information Access and Delivery.	utilization	professionalism, utilization	management
4.4 Specialty Content for Leadership: Operating Systems	utilization	organization	management
4.5 Specialty Content for Leadership: Software/Hardware Selection, Installation, and Maintenance.	utilization	organization	management
5.1 Professional Preparation for Leadership: Instructional Program Development	management	management	instructional content
5.2 Professional Preparation for Leadership: Teaching Methodology	design, management	licensure, leadership	licensure, teaching skills
5.3 Professional Preparation for Leadership: Staff Development.	management	management, leadership	management
5.4 Professional Preparation for Leadership: Facilities and Resource Management.	management	management, leadership	management
5.5 Professional Preparation for Leadership: Managing the Change Process	design and evaluation	management, administration, leadership	management
5.6 Professional Preparation for Leadership: Field Experiences	management		

DISCUSSION AND CONCLUSIONS

The USA educational system was last significantly redesigned at the beginning of the 20th Century. At that time, the educational system moved from an economic system focused on providing workers for agricultural practices to an economy heavily focused on industrial practices. The metaphor for education as well as the school building was created to resemble an assembly line where children were moved into one door as 1st graders, had educational parts added by teachers as they advanced through the grades, and finally emerged at the other end as workers educated for jobs in a factory.[2] This became the physical model of schools of the Progressive Era.

The focus of the American public education system is now shifting toward training workers who process information and knowledge. Information processing skills includes the ability to effectively utilize computerized systems and apply problem solving in cooperative learning environments. As a result, the physical environment of the classroom should also reflect that change.

The general types of standards being adopted in the USA education system can be found in Table 1. This table indicates a variety of categories for the utilization and management of technology. For specific wording, refer to the original standards available from each professional organization as indicated in the above criteria for adoption by programs within teacher education.

In the past, "technology" included tools such as pencils, books, chalk, and erasers. The new technology standards specify the need for an understanding of computer hardware, software installation and configuration, and management of resources as well as people using technology. The standards also mandate the ability to use instructional methods incorporating computers, projectors, scanners, telecommunication devices, or other new emerging technologies appropriate to curricular needs. Those skills have only just begun to be included in pre-service educator training programs.

Interestingly, other than required management of resources, none of these technology standards specify the physical structure of the classrooms. By far the most pressing problem to human factors experts in the redesign of public education environments will be those factors that influence the flow of learning. For example, the aging infrastructure of the public education system has left a legacy of buildings primarily constructed before the advent of electronic information technologies. The structure of these buildings does not provide spaces for cooperative learning environments, which are more appropriate for information workers. For example, the old structures are full of rows of desks used by students working alone with books, paper, and writing utensils, or listening to an instructor at the front of the room. In a cooperative learning environment, the single desks would be easily changed from long rows to groups for students who are working together and for teachers who must move among the students to facilitate learning. The currently popular types of desks and chairs or tables make that difficult to accomplish.

The redesign of education from an Industrial Age model to an Information Age model must include the redesign of furniture and tools for children using Information Age technologies. The usual approach for the design of appropriate furniture and tools for adults is to locate appropriate antropometric data and apply it. However, the data-based resources for anthropmetric data on children are extremely limited. The CHILDATA Project[3] assembled anthropometric data on children from birth to 18 years from around the world. This author is unaware of any comprehensive, current anthropometric data specific to the USA population. In most cases, the keyboards, monitors, and mice provided to children are based on adult-size data.

The furniture currently found in the typical classroom includes chairs, writing surfaces such as desks and tables, and cabinets for supplies. The old infrastructure was based on textbooks, paper, and chalk or white boards, and media carts. Currently, with few exceptions, the manufacturers of furniture now purchased and used in educational settings are producing low-budget furniture specific to writing rather than furniture to support technology intensive classrooms. As a result, computer monitors are being placed on existing surfaces that were designed for writing. This places the monitor at a level that is not appropriate for viewing when using computers. Computers are placed on tables that were purchased for lunchrooms or other general purposes, not for computing. Chairs are not adjustable because they were purchased for classrooms full of non-adjustable writing surfaces. Adjustable chairs and work surfaces are almost unheard of in elementary and junior high schools because the caregivers of children are concerned about safety issues related to falling objects. The only things that are adjustable in schools are the child and the teacher who learn to accommodate to nonadjustable environments.

New furniture purchases are made from sales literature that markets the same writing-appropriate furniture. The only difference is that now the tables show computer monitors on top of them. Part of this arises from a lack of understanding of ergonomics in general and specifically in educational settings. To my knowledge few, if any, schools of teacher education currently teach the principles of ergonomics and how to apply them to setting up learning stations in schools. This should not be surprising because the focus is on preparing people to teach reading, writing, math, and specific knowledge content. There are other possible areas of ergonomic awareness in education such as librarians, resource managers, or technicians. Also, occupational therapists are called upon to work with the redesign of specific areas used by students with impairments. It should be noted that most of these resource personnel are not usually involved in the purchasing decisions and process used by district administrators when furnishing schools.

The role of teacher as technology specialist is evolving. The standards being promoted by national agencies and professional organizations are not time tested standards but rather standards evolving from perceived needs. Research should be done to determine the efficacious nature of these standards in education settings. The redesign of educational settings should also proceed from best practices and knowledge accumulated in the design of adult workstations, but with modification made for differences in anthropometric variations for the K-12 populations and differences in the educational environments. This is a fundamental shift in thinking that must occur before a systematic process for creation of education-appropriate furniture and hardware for children can begin.

Education is an environment of learning areas. It is critical that those involved in this change process understand that the primary responsibility of a student is to learn and apply knowledge. If educators and human factor experts do not make this significant shift in thinking, the classrooms of tomorrow will not adequately provide an enriching environment for students being prepared to work, play, and live in an information-rich society.

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[1] National Council for Accreditation of Teacher Education. (2000). *Professional Standards for Accreditation of Schools, Colleges, and Schools of Education*, 14-42.

[2] Merrow, J. (1997). *The Merrow Report: In Schools We Trust*. Air date: January, 1997. Public Broadcasting System.

[3] Norris, B., Wilson, J. R. (1995). *The Handbook of Child Measurements and Capabilities – Data for Design* Safety. Institute for Occupational Ergonomics, University of Nottingham, Nottingham, UK.