ABSTRACT
        This paper provides an overview of a pilot study conducted
in Northeast Ohio. A survey was distributed to ten middle school principals
representing urban and suburban school districts; each principal was asked to
select two teachers to participate in the survey. The study considered two
questions: Are the technologies available in schools supportive of the
classroom goals of teachers and students? and, What resources influence the
use of technologies in their learning activities? This study examines what
learning activities are applied across a variety of subject areas, how
technology assists students' learning activities, and why technology is/isn't
used in the typical learning activities. The study documented the typical
learning activities and potential role for technology within the classroom
learning environment of the effective middle school teacher. Learning
activities such as data collection, data analysis, visual/written
communications, and design were employed as core categories for analysis of
technology use, non-use, and potential. (Author/AEF)

Teachers and Technological Tools in the Middle School

Seung Jin
Curriculum and Foundations
Cleveland State University, USA
E-mail seung.jin@popmail.csuohio.edu

Ronald J. Abate
Specialized Instructional Programs
Cleveland State University, USA
E-mail r.abate@csuohio.edu

Abstract: This paper provides an overview of a pilot study conducted in Northeast Ohio. The study considered the questions; 1) Are the technologies available in schools supportive of the classroom goals of teachers and students? and 2) What reasons influence the use of technologies in their learning activities? The present study attempts to examine what learning activities are applied across a variety of subject areas, how technology assists students' learning activities, and why technology is/isn't used in the typical learning activities. The study documented the typical learning activities and potential role for technology within the classroom learning environment of the effective middle school teacher. Learning activities such as data collection, data analysis, visual/written communications, and design were employed as core categories for analysis of technology use, non-use, and potential.

After two decades of personal computing in the schools it is easy to overlook the fact that many teachers' experiences with technology fall short of the successful and exciting experiences reported by researchers (Ambron and Hooper,1990). What is reported; the individual instances of success, innovative technologies, and well funded development projects provide a stimulating look at what can occur when circumstances are optimal. Unfortunately teachers work in less than optimal conditions. The occupational world of most teachers is quite different from that of an educational technology researcher. Classroom teachers do not design the software, hardware or technologies they use. They have minimal control over instructional time, preparation time, or the teaching content mandated by their district. In regard to technology support, the classroom teacher has comparatively little daily assistance with technology.

For the average teacher the use of technology has not been an empowering experience. Consequently, the level of technology use has remained relatively low. There is concern that the quantity of technology needs to increase (Morrison, Lowther, and DeMeulle, 1999). Criteria identified in recent technology surveys suggest that emphasis is placed on the quantity of technology available in schools rather than the purpose of the intended technology use. From the standpoint of the students, the end users of the technology, or the teachers, the facilitators of learning, the process is the reverse of what is expected. The critical variable of interest is student learning. Technology offers one tool for accomplishing this learning. Using level as the primary variable ignores the goals of the teachers and the needs of the students. Quantity alone disregards the context of the learning activity and discounts whether technology supports classroom instruction.

Agreement with the position that the quantity of technology in schools needs to increase is dependent in part on assumptions regarding the design of the technologies provided teachers. A key assumption is that the technology identified in surveys was designed for use by teachers and students. This is not the case for much of the technology hardware available in schools.

2

Two questions merit considerations; 1. Are the technologies available in schools supportive of the classroom goals of teachers and students? and 2. What reasons influence the use of technologies in their learning activities? These are complex questions but they can be considered in light of studies of how people work in technology intensive workplaces. Holtzblatt and Jones, (1993) have pointed out that well designed technologies that take into account the reality of what people do on the job can boost productivity, enhance job satisfaction, and give workers a clear sense of what needs to be accomplished in their workplace. The essential point is that technological tools that are insensitive to the work being performed lead to the negative consequence of reduced productivity. The argument for teacher and student use of technology hinges in part on how well available technology represents and supports what teachers and students do. A sizable amount of software has been developed for the classroom including tutorials, drill and practice software, and educational games. These applications are designed to deliver instruction by complementing or replacing the teacher. Underrepresented in the software designed for school use category are tools for increasing productivity. Much of the tool/productivity software such as the word processors databases, spreadsheets, and graphics were designed for an industrial or business audience. Both the context and the content of classroom teaching are markedly different from that of industry.

Those of us in teacher preparation who work in the field of educational technology recognize technology as an outstanding resource. It provides opportunities for learning, tools for productivity, and a medium for creativity. However, many teachers still perceive technology to be confusing, complex and cumbersome. Despite the proliferation of graphic user interfaces, teachers report that productivity software is not intuitive and that the software fails to address the needs of their classroom situation. Productivity software is essentially re-purposed for classroom use. Consequently, teachers are hesitant to implement the technology with their students since the audiences are dissimilar. As an example, elementary teachers participating in an inservice technology workshop indicated a preference for using *The Writing Center*, a writing and publishing tool designed for classroom use over Microsoft Word despite the expanded feature set offered in Word and pressure by their administrators to use the more powerful software (P. Comstock, personal communication, June 16, 1998).

Review of Literature

Morton (1996) points out that "while the real world uses computers to move forward, schools often use them in a misguided efforts to support 19th-century instructional practices." In the beginning period of computer education teacher s learned BASIC as an introduction to technology use in classrooms. They couldn't use their training in their classroom. After that period, teacher education programs for technology use in schools focused on general terms such as computer literacy that emphasizes productivity tools like word processing, database, spreadsheet, and communications in a broad spectrum of activities. However, the general computer literacy skills ignored the integration of technology into regular activities in various subject matters. Guidelines for teachers were needed on how to integrate computers in various subjects (Yaghi, 1996).

In 1997 National School Technology and Readiness (STaR) Assessment conducted a survey on technology presence, use, and integration in typical American schools. STaR Assessment was based on data collected from nearly 80,000 public schools as well as supplementary data. According to the STaR report, only less than 3% of classrooms have fully integrated technology into the curriculum while 59% American schools have no technology or inadequate technology in their schools. 12% of schools are using technology yet still not devoting adequate time and resources to quality content, and the remaining 26% are still considering technology an "extra" (National STaR Assessment, 1997).

The Tennessee State Department of Education examined the teachers' perceptions about the use of technology. According to the findings, technology was viewed as a beneficial tool for classroom teaching. But the negative comments were on issues of inappropriate use, lack of teacher training and support, piecemeal and unintegrated use, too few computers for too many students, lack of an integrated infrastructure, and lack of a systems approach (Lewis, 1996).

Niederhauser (1994) examined how teachers' best beliefs about the effectiveness of using computers in instruction, the amount, frequency, and type of CAI teachers engaged in, frequency of use, subject area for software used, and the types of technology training they had received. The finding was that some teachers considered technologies as tools that students use in collecting, analyzing, and presenting information, while others viewed them as transmission tools that can be used to present information, give immediate reinforcement, and track student progress.

From a study by the Office of Educational Research and Improvement (OERI) in Education Reform Program, the researchers found that only a minority of classrooms where the school environment already provided adequate levels of technology access, technical assistance and supported time for learning about technology integrate technology for learning activities. To integrate technology in the classroom they suggested: 1) help in planning for technology uses and acquisitions, 2) training in how to use new hardware and software, 3) demonstrations and advice on how to incorporate technology into instruction, 4) On-demand help when software problems or hardware failures arise, and 5) low-level system maintenance. The researchers have argued that the critical transformation for classrooms is the shift from teaching discrete skills and information within specific subject areas to centering instruction around authentic, challenging tasks (Means and Olson, 1995).

On the other hand, the emphasis on technology in American schools has focused on quantity of technology rather than the use of technology in the classrooms (Jurema, 1996). Some argue that simply having more technology does not persuade teachers to use it into their classroom teaching and that teachers adopt a technology when that technology helps them do better what they are currently doing (Marcinkiewicz, 1994: Cuban, 1989).

Purpose of Study

The goal of this preliminary study was to establish a baseline on what technologies are most useful for students, what technologies fit appropriately and effortlessly into classroom learning. The study considered the questions; 1) Are the technologies available in schools supportive of the classroom goals of teachers and students? and 2) What reasons influence the use of technologies in their learning activities? This preliminary study examined technology use from an activity-oriented view. This viewpoint guided our research focus: 1) What are the typical activities that students do in the classroom. 2) How can technology assist students' learning activities? 3) Why is/isn't technology used in the typical learning activities? The long-term goal of the study is to suggest an idea for teacher preparation programs that can assist in the design and integration of technology.

Methods

Within the field of software design there exists an organizing structure for initiating an analysis of user needs (Kuhn, 1996). The structure is a design approach that employs an activity-oriented view assessed from the perspective of the user audience. This pilot study initiated an examination of technology use from an activity-oriented view. Middle school teachers and students were targeted as the user audience. Central to the goal of identifying learning activities was to understand the middle school teachers and the tasks they wish to achieve with their students. A secondary goal was to identify existing technology based tools that might serve the teachers and students with these learning activities. The process of determining typical learning activities and enhancing some of those activities with technology began by surveying teachers.

The phenomena of learning in a middle school setting occur across a wide range of conditions. Agreed upon descriptions of classroom activities are elusive. A survey was developed to obtain a baseline of learning activities that span the curriculum. The survey was distributed to ten middle school principals representing urban and suburban school districts in Northeast Ohio. The principals were instructed to select two teachers to participate in the survey. The criteria were provided to the principals for teacher

selection. The teacher was to have at least three years of teaching experience, the students of this teacher should consistently perform at or above expectation, and the teacher should also have a history that included parental requests to have students placed in his or her class. Expertise in technology was absent from the selection criteria. The selected teacher completed an anonymous survey composed of three sections and returned it to their principal.

The first section consisted of six questions that contributed background information on the respondent. Included in this section were questions on teaching experience, grade level, subjects taught, technology expertise, student expertise in technology, and the type of technology available to the teacher.

The second section provided a list of nineteen possible learning activities along with a five-point scale indicating the anticipated frequency of the learning activity. Traditional and technology based methods for implementing the activity were listed below the learning activity. The teachers were directed to rate all items that applied. The nineteen activities represented a range of learning activities including; writing, collecting data, organizing data, analyzing data, presenting information, discussions, reviewing instruction, and developing projects. Ideas for the learning activities were based on sample activities included in assignments submitted by teachers enrolled in an instructional development course during the past ten years.

The third section of the survey included eight questions pertaining to students use of computer based tools. These statements were also scored using the five-point scale. In addition, the teachers were asked to select the reason(s) for the score. Twenty-four reasons were provided. The teachers were encouraged to select all reasons that applied or to choose "Other" and explain this choice. The respondents were informed that this was a pilot survey and that comments were welcomed.

Results

Eighteen of the twenty surveys were returned for examination. Three surveys were not returned in time to be included in the results. Participants indicated minimal difficulty completing the survey. All of the surveys were coded to insure confidentiality.

Section One of the survey provided background information on the participants. The pool of respondents represented all levels of teaching experience from less than 4 years to over 20 years. The teachers taught in grades 5 through 8. The scope of subjects included Language Arts, Mathematics, Science, Social Studies, Foreign Language and Computers with many teachers responsible for more than one content area. The rating of teacher skill in the use of technology ranged from novice through expert with a mean score of 2.94. However, the mean score was not reflective of the population. A bimodal distribution emerged with 40% of the teachers rating themselves as somewhat experienced and 35% rating them as advanced. The average rating of students' skill with technology was 1.89, just below "Somewhat experienced."

The technology available to the teachers varied considerably. This was true within schools as well as between them. All respondents indicated the availability of minimally a computer in the classroom or access to a computer lab. In addition all but two respondents indicated the availability of a monitor and videotape player. Calculators were not listed as technology equipment in Section One. Some respondents added calculators to the "Other" category of this section. Based on responses provided in Section Two on learning activities, 15 of 18 respondent's classes had access to calculators. The three classes that did not use calculators were taught by Language Arts teachers.

Section Two of the survey was included to ascertain what learning activities are commonly implemented in the classroom and to discover what if any technologies the teachers employ with the learning activities. Seventeen of nineteen learning activities had an average score for one or more method of implementation near or above 4.0 signifying that the activity occurred at least occasionally in the classroom. Two activities; Writing Correspondence 3.06 And Drawing Maps 3.06 failed to rate at a meaningful level. In retrospect, both activities could have been incorporated into other learning activity categories.

As expected, traditional methods of implementation averaged higher than technology based methods. The singular near exception was the use of calculators for analyzing data. Respondents rated calculator use at 3.78 to a manual computation rating of 3.83.

Section Three focused on student use of computer based instructional tools such as word processors, databases, draw and paint programs, the Internet, Spreadsheets, E-Mail, Presentation software, and calculators. Two tools; word processors and calculators recorded average student use ratings of 3.28 and 3.72 respectively. The average score for the other tools was 1.98. Common problems cited for low use of the eight tools included; Not enough equipment, I lack training, Time consuming, and Not useful. Common reasons cited for use of the tools included; Students have skills to use, Useful, and Equipment is available.

Conclusion

This study provided a snapshot of the middle school teachers who participated in the survey. The teacher sample was diverse but the sample size was small. The bimodal distribution of technology skills reported by the teachers may not be indicative of the general middle school teacher population.

The teacher responses confirmed that the learning activities listed in the survey were representative of the learning activities that occur in middle school classrooms. As such, the activities offer a starting point for examining an activity-oriented view of middle school teachers and students as technology users. In particular, it advances a framework for further examination of the original questions.

Regarding question one: Are the technologies available in schools supportive of the classroom goals of teachers and students? Two tools, word processors and calculators were occasionally used in many of the learning activities such as writing or data analysis. In addition, the frequency of activities involving data collection, data analysis and project development imply that other existing tools such as graphics programs, spreadsheets, and Internet access may be recommended for classroom use.

Regarding question two: What reasons influence the use of technologies in their learning activities? Several variables proved revealing. Lack of equipment was identified as a key reason for student non-use of tools. Limits on available equipment influenced teacher's ability to incorporate computer tools in the learning activities. This issue was compounded by a belief reported in Section One of the survey that students lacked the skills to use the tools. Consequently, it is difficult to confirm whether the technologies currently available are well suited or if access to equipment is the problem. The argument that they may not be well suited is supported indirectly as 14 out of 20 respondents reported that they either had access to many computers in their class, a computer lab or both.

Other variables may be influencing student use of computer tools, only 5 teacher responses out of a possible 144 responses indicated that a specified computer tool was selected because it was "Easy to Use." One can hypothesize that even when technology was the method of implementation it was not perceived to be easy to implement. Fifteen percent of the responses indicated that the reason for student use of computer tools was that it was useful. Two opposing interpretations of this low result are: 1) the teachers do not perceive technology as useful in supporting a learning activity independent of their ability to use the tool or 2) lack of equipment and problems such as lack of skill by students and teachers, or difficulty with use discouraged the teachers from identifying the tools useful.

As a pilot, this study generated more questions than it answered. As expected the technology skills of the middle school teachers span a wide continuum. The survey Section Two responses suggest that the learning activities listed reflect some of the common learning activities that middle school teachers implement with their students and Section Three suggests that reasons for use and non use of technology are varied. In this preliminary phase of the study, emphasis was placed on reframing the question of why the level of technology use is low away from a traditional view to a more teacher-centered view of

technology. Clearly, a more extensive follow-up study is required to establish the factors that influence the use of technology and to determine if current tools are supportive of the classroom goals of teachers and students.

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