A Survey of Computer Utilization in Elementary Classrooms
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ABSTRACT

A field survey of the utilization of elementary classroom computers for academic purposes was conducted in Alameda County, California during the first half of 2006. The survey was conducted to improve K-12 teacher credential training courses in educational technology (ISTE-NETS, 2006), based on actual field conditions. The survey included 84 classrooms in 38 schools, belonging to 12 different public districts, a private, and a catholic school. Information was also collected for one computer lab, and a school using a mobile computer cart. Although the information gathered by the survey confirms findings of similar investigations (CDE-CTAP, 2002), regarding the limited availability of up-to-date equipment, facilities, and teacher training in elementary classrooms, the additional information gained through this survey was used to improve teacher education courses at a local university.

THE PURPOSE OF THE SURVEY

For the purpose of improving teacher preparation courses in computer-based educational technology offered at regional university in California, a survey of 88 elementary classrooms was conducted, focusing on the inventories of computers, their functionality, and their specific utilization for academic, curricular purposes. The information gathered through the survey was intended to help align teacher preparation in educational technology at a local university, so as to reflect the realities of the actual classrooms, within the appropriate knowledge and skills recommended in the National Educational Technology Standards, International Society for Technology in Education (ISTE-NETS).

The results of the survey were then used to update the corresponding course syllabi and activities, in an effort to better prepare teachers candidates for the realities they will be encountering, as they join their profession in the field.
The need for the survey arose, as it became apparent that more specific information regarding utilization of computers in the classroom for academic purposes was not available. This was concluded after reviewing the contents of the Statewide Results from the 2002 California State Technology Survey (CDE-CTAP, 2002), which reported daily utilization figures in Table 5.2, “Reported Frequency of Technology Use by Content Area” of its summary, and warned about data limitations due to data “likely to reflect the input of only one of several individuals at a school, rather than the sum of responses for all teachers in each school.”.

**DESCRIPTION OF THE SURVEY**

The survey focused on identifying in detail, the number and type of computers available, as well as the actual time children spend being “helped” by computers in the classroom. Although at the present time most schools have resorted to centralization of resources in a computer lab, and/or partial classroom-computer lab distribution, or the use of mobile “computer carts”, these modes were not the focus of the investigation. The attention to the classroom computers was due mostly to the greater potential that technology has to distribute its potential effectively, and the recognition that classroom exposure time is indeed far greater than the 1 or 2 hours a week the children are allowed under a centralized computer lab approach.

The information for this survey was gathered mostly by 84 students at a local university teacher preparation program, undergoing their classroom field experience at regional elementary schools. The survey, available either in hard-copy form, or through the Internet, contained 24 questions. Six of the questions (APPENDIX A), inquired about the “Approximate hours each student”
spends “each week” using CLASSROOM computers on WRITING, MATH, SCIENCE, READING, ART, and LEISURE activities. The implication is that if the academic objective of classroom materials and experiences is for children to learn and perform better on subject-matter activities, and computer investment is aimed to support that goal, this should be reflected in an increased utilization of the related facilities, and eventually on measurable gains in subject-matter performance.

The survey included also questions regarding the age, and functionality of the computers in the classroom, in consideration to the fact that the pace of technological change can cause them to become less capable to support newer, more powerful applications, and more likely to remain in disrepair when broken. Two questions were also included inquiring about the public/private source of the funding for the classroom computers, since it seems apparent, at least in the region surveyed often are the parents themselves, and other private sources are supporting efforts to bring computers into elementary classrooms.

RESULTS

1) PC / Apple platforms (Figure 1): Of the 84 elementary classrooms included in the report, 64 (76%) had at least one Windows PC computer platform, and 29 (35%) at least one Apple Macintosh platform, nine reported having both platforms, and five did not have any computers at all. The figures seem to point to a prevalence of the PC Windows platform in the region classrooms.
2) **Number of computers in the classroom** (Figure 2): The majority of classrooms (65%) reported having between 1 and 3 computers, and the rest (35%), between 4 and 8 computers.

3) **Classroom Computers 3 years old or newer** (Figure 3): Only about one-third of the classrooms surveyed reported having more than half of their machines to be 3 years old or newer, with a slightly greater number reporting newer PC Windows computers (34%) than Apple Macintosh (28%). If we consider that newer, more powerful applications with educational value typically need the newer machines, then in about
two-thirds of the classrooms surveyed, more than half of the machines are most likely inadequate for supporting such applications.

Figure 3 – Less than Half of the Classroom Computers 3 Years of Newer

4) **Number of Classroom Computers working satisfactorily** (Figure 4): About two-thirds of the classrooms surveyed reported having more than half of their classroom computers working satisfactorily (not in disrepair). Correspondingly, **about one-third of the classrooms reported having more than half of their computers in unsatisfactory working conditions.** The situation appears to be very similar, regardless of the PC Windows, or Apple Macintosh platform involved.

Figure 4 – More than Half of the Classroom Computers Working Satisfactorily
5) **Number of Classrooms with (high speed) Internet Connection**: 91% of the classrooms surveyed reported having computers with high speed (fiber optics) connectivity to the Internet.

6) **Hours per Week each student spends working on GRADE-LEVEL, STANDARDS RELATED Writing, Math, Reading, and Science activities, using Classroom Computers** (Figures 6 - 8): As shown in Figures 6 through 8, the largest proportion of classrooms surveyed reported using their classroom computers **None or Less than 1 hour per week per student** working on activities related to the major areas of the curriculum, i.e. Reading, Writing, Math, and Science. Considering that an estimated number of total classroom hours in a typical elementary classroom of about 6 hours per day (30 hours per week), this is indeed a negligible proportion of productive time.

![Bar Chart](image)

**Figure 5 – Hours per Week each Student uses the Classroom Computers in WRITING**
Figure 6 – Hours per Week each Student uses the Classroom Computers in MATH

Figure 7 – Hours per Week each Student uses the Classroom Computers in READING

Figure 8 – Hours per Week each Student uses the Classroom Computers in SCIENCE

7) Hours per Week each student spends working on ART, and REWARD/LEISURE related activities, using Classroom Computers (Figures 9 and 10): As shown in
Figures 9 and 10, the largest proportion of classrooms surveyed reported using their classroom computers **None or Less than 1 hour per week per student** working on Art and Reward/Leisure related activities.

![Figure 9](image1)

**Figure 9 – Hours per Week each Student uses the Classroom in ART**

![Figure 10](image2)

**Figure 10 – Hours per Week each Student uses the Classroom as REWARD/LEISURE**

8) **Perceived NEED FOR ADDITIONAL TRAINING** for classroom teachers on computer technologies and applications, as delineated in the National Educational Technology Standards (NETS) for teachers (Figure 12): The largest number of responses to this question indicated a perceived need for either **Some** (50%), or **Much** (26%) additional training on the application of computer technology in the classroom. Only a small number (16%) felt that to be unnecessary. Considering the consistently
indications of low utilization of classroom computers contained in this survey, it should be interesting to further investigate the reasons why the respondents felt this way.

![Figure 11 – Perceived need for additional training in classroom computer technologies.](image)

9) **Source of funding for the classroom computers, PUBLIC or PRIVATE** (Figure 11):

The largest source of funding for more than half of the classroom computers in the survey was declared to be PRIVATE (43%). A lower proportion (31%) was attributed to PUBLIC funding. This is perhaps one area in need of further investigation, since it might provide better indications about who is leading the expansion of the use of computer technology in the classroom, and why.

![Figure 12 – Sources of funding for MORE THAN HALF of the computers in the classroom.](image)
ANALYSIS

For the most part, the information gathered through the survey seems to confirm the general results reported in the 2002 California State Technology Survey (CDE-CTAP), particularly in relation to number of computers in classrooms. Due to lack of functionality, the average number of competent computers in the region’s classroom is of between 2 and 3. This low availability, combined with their low utilization in curricular activities (less than one hour per week), undoubtedly leaves the children almost void of any curricular oriented exposure to computers in the classroom. Even with the addition of 1 hour per week to computers and applications in a central lab, it seems clear that today, the influence of classroom computers on the academic improvement of children is minimal.

Confirmation of this conclusion is not difficult to obtain, when elementary classrooms in the region are toured, and direct comments from the teachers received. These facts also seem to be behind most teachers choosing, or being forced to rely instead on other traditional, non-computer based options for delivery of curricular content.

For the purposes of defining the proper preparation of teachers, it seems important for them to first, become aware of the real circumstances, and second, become better prepared for such circumstances. What knowledge and skills will be needed for new teachers to be able to use whatever is available competently? How can new teachers become more effective in identifying and requesting, promoting whatever technologies can potentially be helpful in support of the academic success of the students?
The National Education Technology Standards (ISTE-NETS) for teachers has established six areas of relevance for teacher training: 1.- Technology Operations and Concepts, 2.- Planning and Designing Learning Environments and Experiences, 3.- Teaching, Learning, and the Curriculum, 4.- Assessment and Evaluation, 5.- Productivity and Professional Practice, and 6.- Social, Ethical, Legal, and Human Issues. Of these, areas 2 and 3 refer specifically to the design, implementation, and monitoring of curriculum related student interventions: (2) “The ability to design, implement developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners”, and (3) “The ability to implement curriculum plans that include methods and strategies for applying technology to maximize student learning.”

Considering that in teacher preparation programs in educational technology in states such as California, normally consist of two courses, one preliminary, and one follow-up, each with an approximate duration of about 40-hours, there will be some 80 net hours combined of instruction to be managed to introduce the content specified by the NETS standards. The question is: Which topics could be included, when, and how, so as to help teachers become more successful through the use of classroom computers?

Furthermore, and as current research has not yet proven conclusive about the positive effects of computer assisted instruction (Cuban, 1986; Kozma, 2003; Clark, 2005; Welsh, 2006), teacher education students should be made aware of that issue, as they consider incorporating any available computer tools, together with other modes of instruction. Students in the teacher education program should therefore become skilled in identifying, locating, and selecting
appropriate, useful resources, in the context of all resources available and helpful in the different areas of the curricula they will be addressing.

Teachers should also be able to properly manage the computers, accessories, and activities available in the classroom, including the selection, setup, and utilization of hardware, software, and computer projection facilities, as part of effective, and efficient learning environments. As the availability of more accessible and powerful computer images, animation, video and interactivity resources for the classroom continues to grow, the importance for teachers to become “technologically literate” also will grow.

CONCLUSION
An initial result of the present survey and analysis has been the immediate revision of corresponding educational technology courses of the teacher education at a local university program. The ability to identify and set up productive arrangements of limited equipment and resources, while advocating expansion and growth, where promising, has now been included.

REFERENCES
CDE-CTAP (September, 2002). Summary of Statewide Results From the 2002 California School Technology Survey. California Department of Education. California Technology Assistance Project.
ISTE (October, 2006). *National Educational Technology Standards for Teachers (NETS) Project*. International Society for Technology in Education. Eugene, OR


