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Attitudes and Opinions About Computers and Computer Games, Inside and Outside the Classroom

■ **This article reports on a pilot study investigating the attitudes of elementary school students toward computers on a personal (pleasure) and academic (school-related) level. A Computer Use and Attitude Survey was administered to 25 boys and 24 girls attending an after-school program in different communities. (Pseudonyms have been used by the researcher for parents, students, and for place names.) Results illustrate that elementary school students, and girls in particular, have a positive attitude toward computers.**

Introduction

Tens of millions of parents all across our nation have watched their children play every kind of video game from Mortal Kombat and Primal Rage to Killer Instinct and Super Streetfighter. (President Bill Clinton, 1995)

We know that computer use in the schools and at home is increasing dramatically (see Williams, 2000, pp. 1-3), and the fears of parents are reflected in President Clinton's speech cited above. Such a statement usually is greeted by affirmative nods and responses, from parents and teachers alike, including:

It's the best way I know how to punish him, just take it away. (Martinez, 2000, personal communication)

He just sits and sits and plays and plays. If I call him, he doesn't hear me.…He does like those ones (violent computer games), but we don't buy them, so he sometimes goes to a friends' house. (Calvin, 2000, personal communication)

Oh, you know how he is. He is always on the computer. Right now it is hard for him because he can't use the Internet at school and we don't have it at home. (Sanchez, 2000, personal communication)

Two underlying ideas are typical to these comments; the first, though seen in a small sample here, is that even though all these parents have daughters, when the talk is about computer technology and their children, they mention only the boys. The second notion is that children are much more likely to enjoy computer games such as Mortal Kombat and Super Streetfighter than more educational programs, such as Zoombinis Logical Journey. As a reading of Papert (1987) would suggest, this preconception could not be further from the truth. Thus, as more elementary schools direct their budgets toward the implementation of computer technology, it is time to look closely at how children themselves feel about their technology options. The intent of this paper is to assess what is attracting children to computer technology—both inside and outside the classroom, on both a personal and academic level.

Review of the Literature

The preponderance of research shows that when students are exposed to computer technology and activities, their attitudes and behaviors toward them *do* change. Two camps address this issue. On the positive end of the spectrum, the literature clearly exemplifies the following:

1. Computers encourage students on an academic and personal level (Brett, 1996; Bruder, 1990; Cox, 1997; Gonzalez-Edfelt, 1990; Knezek & Miyashita, 1993; O'Hara, 1998; Swanson, 1995);

2. Computers bring about positive attitudes toward school and academics (Cognition and Technology Group at Vanderbilt, 1996; D'Souza, 1988; Johnstone, 1987; Justen, Adams, & Waldrop, 1988; Knezek & Miyashita, 1991, 1993; Levin, Reil, Rowe, & Boruta, 1985; Martin, Heller, & Mahmoud, 1992; Roybler, 1989);

3. Computers increase students' prospects for employment in the workforce (Sakamoto, Zhao, & Sakamoto, 1993; Scheetz & Gratz, 1998; Thomas & Knezek, 2000);

4. There are no significant gender differences in attitudes toward computers (Knezek & Miyashita, 1993; Martin, Heller, & Mahmoud, 1992);

5. Computer use can aid in increasing students' potential learning abilities (American Council on Education, 1995; Kern, 1995; Kramsch, 1999; Sheldon, 1996).

However, there is also research that pointedly attests to contrary perspectives:

6. Increased computer interaction and access can lead to a decrease in positive attitudes toward computers and computer use (Liu, Macmillan, & Timmons, 1998; Proctor & Burnett, 1996);

7. Upon increased exposure to computers and increased access, attitudes toward computers resemble those attributed to pocket calculators (McKinnon, Nolan, & Sinclair, 2000);

8. As students get older, there is a decline in interest in computers (Coley, Crandler, & Engle, 1997; Cuban, 1986; Knezek & Miyashita, 1993);

9. Unequal attitudes by gender persist, in favor of males in junior high, high school, and college (Barrier & Margavio, 1993; Collis & Williams, 1987; Kay, 1992; Ory, Bullock, & Burnaska, 1997; Wilder, Mackie, & Cooper, 1985).

Given such different findings under the rubric of "attitude," it is important to consider, as Kay points out, that attitudes toward computers have been defined at least 14 different ways, including "affect," "cognition," "training," "stereotypes," etc., with little consistency in terminology (1992, p. 160). Instead of looking at adult attitudes to the computer complex, I asked children themselves how they perceive different aspects of their experiences with computers, how computers influence their attitudes, and in what context. In keeping with Kay's (1992) notion of consistency of terminology, this study defines "attitude" along the affective continuum only: Do students like computers? And where do they use computers for pleasure or academic work—inside or outside the classroom?

Another problem in the vast body of attitudinal research lies in generalizing findings across the K-12 grade levels (Luchetta, 2000). Thus, this exploratory paper confines itself to investigating elementary school-aged (K-6) children's affective attitudes (affective = liking, enjoying, or disliking) toward computers and using computer technology across diverse learning environments (school, community center, and home). Research using methods comparable to mine with a comparable school population found that:

1. Increased computer use over time does not discourage positive attitudes toward computers (Knezek & Miyashita, 1993; Martin, Heller, & Mahmoud, 1992);

2. Any of several different kinds of educationally based computer experience improves attitudes toward using computer technology (Knezek & Miyashita, 1993; Martin, Heller, & Mahmoud, 1992; O'Hara, 1998);

3. Though mixed, research trends point to no significant gender differences in attitudes toward computers for K-6 grade-level students (Knezek & Miyashita, 1993; Martin, Heller, & Mahmoud, 1992; O'Hara, 1998).

Method

Participants

The students participating in this study were in grades K-5 and attended Fifth Dimension (5D) after-school programs in community centers and schools around the US. (The program is described in Cole, 1996.) 5D is a multicultural, multigenerational link between school and community. Undergraduate college students volunteer as facilitators in this after-school "computer club," where chil-

dren have free access to electronic games and activities, spanning drill and skill, free-form story composing, and Internet use. All participants in the study have been attending 5D sites for a period of 6 months to 3 years. Their breakdown by grade, gender, and ethnicity is detailed in Table 1.

Table 1
Grade, Gender, Ethnicity

Characteristics	*# of students*
Grade	
K	1
1	5
2	1
3	7
4	20
5	14
Gender	
Boys	25
Girls	24
Ethnicity	
Hispanic	28
Anglo/European	21

Measures

The instrument developed for this study was an attitude assessment measure, the Computer Use and Attitude Survey (see Appendix A for the full survey), which includes items that pertain to children's perceptions of their own ability and degree of use, and open-ended questions about what games they like, what computer programs they use both inside and outside the classroom environment, and why they liked the programs they chose. (A list of the software accessible by students appears in Appendix B.)

The attitude survey consists of 14 items, 4 of which used a 4-point Likert scale: *strongly agree* (4), *agree* (3), *disagree* (2), *strongly disagree* (1). Participants were asked to indicate their level of agreement or disagreement to statements using graphics, rather than words, for responses (copyright considerations do not permit the graphics to be reproduced here). Of the remaining 10 items, 4 items pertain to the subjects' access to computers in the classroom and at home, and 6 were open-ended questions pertaining to what kinds of computer games they liked to play and why, with follow-up questions where necessary to clarify responses.

Results

Data analysis

An ANOVA was conducted using Gender (Male, Female), Ethnicity (Hispanic, Anglo-European), and Grade Level (K-5), with attitude toward

computer use and access to computers serving as the dependent variables. The analysis did not yield significance for either main effect (p>.05), or for interaction of gender, ethnicity, or grade level (p>.05). Results were more informative on the qualitative aspects of the attitude survey. Students' written comments, cited below, are used to illustrate aspects of their attitudes toward computer activities and the use of computer technology. Comments from the survey are here grouped according to themes.

The attitude survey

The analysis of the questionnaire is summarized below in Table 2, including the breakdown according to gender where there were fairly large numbers of similar responses (number responding is in parentheses).

Table 2
Computer Use and Ability According to Gender

Statement	Strongly agree % (n)	Agree % (n)	Disagree % (n)	Strongly disagree % (n)
I like computers	79.6% (39) F 75% M 84%	14.3% (7) F 20.6% M 16%	0	6.1% (3)
I am good at computers	53.1% (26) F 54% M 52%	34.7% (17) F 37.5% M 32%	8.2% (4)	4.1% (2)
I like to use computers to write my classwork	51% (26) F 54.2% M 48%	12.7% (6) F 16.7% M 8%	6.1% (2)	30.6%(15) F 20.8% M 40%
I like it when my teacher asks me to use the computer	67.3% (33) F 70.8% M 64%	20.4% (10) F 20.8% M 20%	6.1% (2)	6.1% (2)

These results are consistent with findings from other researchers who looked at elementary school-age students' attitudes toward computers and computer use (Knezek & Miyashita, 1993; Martin, Heller, & Mahmoud, 1992; Sakamoto, Zhao, & Sakamoto, 1993).

As previously mentioned, other statements in the survey pertain to computer use and access at home and school. These responses suggest the steadily growing availability of computers in children's lives:

Is there a computer in your classroom?
Yes—89%   (48)   No—2%   (1)

Do you have a computer at home?
Yes—53.1% (26)   No—46.9% (23)

The next 2 items applied to the use of the computer in the classroom. Though these findings need to be further investigated for confirmation, results seem to substantiate that, despite recent trends toward computer-integrated curricula, having the computer physically present in the classroom is not enough (see Tables 3 and 4):

Table 3
Amount of Computer Use in Class

Statement	Not at all % (n)	1x per week % (n)	2x per week % (n)	3x per week % (n)	4x per week % (n)	Every day % (n)
I use the computer in class	28.6% (14)	36.7% (18)	8.2% (4)	14.3% (7)	2.0 (1)	10.2 (5)

Table 4
Purpose of Classroom Computer Use

Statement (Students are asked to circle all that apply)	Only for special assignments	Only to play, when I finish my classwork	To do my daily classwork	For extra help in whatever subject I need extra help in
I use the computer in my classroom	48.7% (22)	24.5% (12)	4.1% (2)	(No responses)

Open-ended questions

The open-ended questions on the survey can be seen below. Results raise questions about the favored adult notion that children would rather play noneducational computer games than use the computer with a more educational focus. Responses to questions dealing with favorite programs, categorized according to theme, rendered the following results (see Tables 5 and 6). (Note that for reasons of space in this paper all programs with fewer than two votes were not included.)

Table 5
Computer Activities or Games Performed in the Classroom

Thematic content	Specific computer program with # of students citing it	Reasons given by students
Math	Math Blaster (19) Talking Number Maze (5) Number Muncher (5)	• I like it because you can do math in the computer • Because I know math • Because I like learning my time tables

Keyboarding	ClarisWorks (4) Read, Write, & Type (2) Slamdunk (7)	• I like it because you can type your essay • Because I am learning to type • Because I want to be a writer and I have to type fast
Logic, problem solving	Museum Madness (6) Zoombinis Logical Journey (2) Odell Down Under (3)	• Because it's fun and challenging • It's an adventure • Because you can choose what fish to be
Reading, spelling	Spellavator (4) JumpStart (4)	[No responses]
Art	Kid Pix (10)	• Because I can click on goodies [term used in the application] and color pictures • Because you don't [have to] know [anything] to play

Table 6
Students' Favorite Games [Computer Activities] in General

Thematic content	*Specific computer game name (n)*	*Reason*
Math	Math Blaster (5) Talking Number Maze (2) Number Muncher (2)	• Because I like to do math • Because you learn stuff • It's cool traveling through the castle
Art	Kid Pix (4) Kid Works (2)	• Because I like • It's fun
Logic, problem solving	Gizmos and Gadgets (2) Museum Madness (2) Zoombinis Logical Journey (2) Midnight Rescue (2)	• Because it's cool • Because it challenges you to free the Zoombinis conquered by the other creatures and help them get home • Because it's fun and teaches you a lot of stuff
Writing	Storybook Weaver (4)	• Because I want to become a writer someday and I have a good imagination • I get to make cards with beautiful artwork • Because you get to write things and make something up

Interestingly enough, there were only two instances in which students indicated games that would be construed as possibly violent and noneducational. These games were Wormaggeden (1) and Legacy of Kain (1). Another surprise was that only one student mentioned the Internet as a favorite computer activity. There is full Internet access at both sites, and based on anecdotal observation, access is not restricted by rules or availability.

Discussion

Because of the limited scope of this study, only tentative claims regarding the implications of the research can be made. As the literature demonstrates, research looking at students' attitudes toward computers and computer technology needs to be better operationalized, and as such, it needs to consider those findings that are based on similar populations, especially in the areas of age, gender, and the context in which the computer technology is situated. This study also raises the question as to whether it is the computer activity that generates positive attitudes toward classroom subjects or vice versa.

Other research, in light of recent curricular reform to integrate technology, has made a case for the computer's potential for children's *cognitive* development. This study specifically looked at elementary-aged schoolchildrens' *affective* attitudes toward computer technology use inside and outside the classroom environment. Children seem to perceive computer technology as a tool that both helps their learning and makes learning fun. However, the use of computer technology as a tool for learning is subject to the decision-makers in schools and classrooms (Liu & Reed, 1994; Moran & Selfe, 1999; Norris, 1994; Roybler, 1989). I hope in this study to have made the case that children do not perceive technology the way adults do; for children, computers are not only for play, but also a resource that enhances and encourages learning and the enjoyment of learning.

Based on those items in the survey pertaining to classroom curriculum and computer technology integration, classroom observations should be considered to further substantiate these initial findings. What needs to be considered additionally is the question of how grade level and gender might influence the type of classroom computer activities offered to younger students.

Conclusion

Technology is playing an increasingly larger role in children's personal and academic lives, beyond simply improved test scores and ability to "surf the Web." What needs to be better understood is how technology may or may not sustain learning and provide those skills that will motivate and strengthen children's abilities to continue learning and achieving, be it academically or personally. Only when we know how to best use computer technology, both in an academic setting and beyond the classroom, will we find consistent, positive results and thus better understand the true impact of technology on children's lives.

Author

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References

Barrier, T. B., & Margavio, T. M. (1993). Pretest-posttest measure of introductory computer students' attitudes toward computers. *Journal of Information Systems Education*, *5*(3). Retrieved March 2, 2003, from http://gise.org/JISE/Vol1-5/PRETEST.htm

Brett, P. (1996). Using multimedia: An investigation of learners' attitudes. *Computer Assisted Language Learning*, *9*(2-3), 191-212.

Bruder, I. (1990). School interest grows as televised classroom news battles heat up. *Electronic Learning*, *9*(4), 10-13.

Clinton, W. (1995, September 21). Remarks by the president on education technology and connecting classrooms. The Rotunda of the Exploratorium, San Francisco, CA.

Cognition and Technology Group at Vanderbilt. (1996). Looking at technology in context: A framework for understanding technology and education research. In D. C. Berliner & R. C. Calfee (Eds.), *Handbook of Educational Psychology* (pp. 807-840). New York: Macmillan.

Cole, M. (1996). *Cultural psychology: A once and future discipline*. Cambridge, MA: Harvard University Press.

Coley, R. J., Crandler, J., & Engle, P. (1997). *Computers and classrooms: The status of technology in US schools*. Princeton, NJ: Educational Testing Service, Policy Information Center.

Collis, B. A., & Williams, R. L. (1987). Cross-cultural comparison of gender differences in adolescents' attitudes toward computers and selected school subjects. *The Journal of Educational Research*, *81*(1), 17-27.

Cox, M. (1997). *The effects of information technology on students' motivation: Final report*. Coventry, England: NCTE and King's College London.

Cuban, L. (1986). *Teachers and machines: The classroom use of technology since 1920*. New York: Teachers College Press.

D'Souza, P. V. (1988). A CAI approach to teaching in an office technology course. *Journal of Educational Technology Systems*, *17*(2), 135-140.

Gonzalez-Edfelt, N. (1990). Oral interaction and collaboration at the computer: Learning English as a second language with the help of your peers. *Computers in the Schools*, 7(1-2), 53-89.

Johnstone, V. (1987). Attitudes toward microcomputers in learning: Pupils' software for language and development. *Educational Research*, *29*(1), 47-55.

Justen, J. E., III, Adams, T. M., II, & Waldrop, P. B. (1988). Effects of small group versus individual computer-assisted instruction on student achievement. *Educational Technology*, *2,* 50-52.

Kay, R. H. (1992). Understanding gender differences in computer attitudes, aptitudes, and use: An invitation to building theory. *Journal of Research on Computing in Education*, *25*(2), 159-171.

Knezek, G., & Miyashita, K. (1993, April 12-16). *Learner dispositions related to primary school computing in three nations: 1992 Results.* Paper presented at the Annual Meeting of the American Educational Research Association, Atlanta, GA.

Knezek, G., & Miyashita, K. (1991). Computer-related attitudes of primary school students in Japan and the U.S.A. *Educational Technology Research*, *14,* 17-43.

Kramsch, C. (1999). Teaching text and context through multimedia. *Language Learning and Technology*, *2*(2), 31-42

Levin, J. A., Reil, M. M., Rowe, R. D., & Boruta, M. J. (1985). Maktuk meets Jacuzzi: Computer networks and elementary school writers. In S. W. Freedman (Ed.), *The acquisition of written language* (pp. 160-171). Norwood, NJ: Ablex.

Luchetta, T. (2000, April). *Gender and computing: Toolbox or toystore? Gender differences and similarities among children, youth, and college students concerning attitudes and use.* Paper presented at the Wisconsin Association of Academic Librarians Conference, Fond du Lac.

Liu, X., Macmillan, R., & Timmons, V. (1998). Integration of computers into the curriculum: How teachers may hinder students' uses of the computer. *McGill Journal of Education*, *33*(1), 69-80.

Liu, M., & Reed, W. M. (1994). The relationship between the learning strategies and learning styles in a hypermedia environment. *Computers in Human Behavior, 10*(4), 419-434.

Martin, D., Heller, R., & Mahmoud, E. (1992). American and Soviet children's attitudes toward computers and school. *Journal of Educational Computing Research*, *8*(2), 155-185.

McKinnon, D. H., Nolan, C. J., & Sinclair, K. E. (2000). A longitudinal study of student attitudes toward computers: Resolving an attitude decay paradox. *Journal of Research on Computing in Education*, *32*(3), 320-331.

O'Hara, S. (1998). *A case study of attitudinal effects of Internet use in a middle school integrated science curriculum.* (ERIC Document Reproduction Service No. ED417978)

Ory, J. C., Bullock, C., & Burnaska, K. (1997). Gender similarity in the use of and attitudes about ALN in a university setting. *Journal of Asynchronous Learning Networks*, *1*(1). Retrieved on March 2, 2003, from http://www.aln.org/alnweb/journal/issue1/ory.htm

Papert, S. (1987). Computer criticism vs. technocentric thinking. *Educational Researcher*, *16*(1), 22-30.

Proctor, R., & Burnett, P. (1996). Computer attitude and classroom computers. *Computers in the Schools*, *12*(3), 33-41.

Roybler, M. D. (1989). *The impact of microcomputer-based instruction on teaching and learning: A review of recent research.* (ERIC Document Reproduction Service No. ED315063)

Sakamoto, T., Zhao, L., & Sakamoto, A. (1993). *Psychological impact of computers on children. The ITEC Project: Information Technology in Education and Children, Final Report: Phase 1.* Paris: UNESCO.

Scheetz, P., & Gratza, R. (1998). The job market offers good news for the class of 1998. *The Black Collegian Online.* Retrieved on February 12, 2003, from http://www.black-collegian.com/issues/1998-03/industry.shtml

Swanson, C. (1995). How technology in the chemistry classroom affects students' attitudes and motivation. *Teaching and Change*, *3*(1), 63-75.

Thomas, L. G., & Knezek, D. G. (2000). Technology literacy for the nation and for its citizens. Retrieved on August 26, 2000, from http://www.iste.org/Research/Reports/TechLiteracy.html

Wilder, G., Mackie, D., & Cooper, J. (1985). Gender and computers: Two surveys of computer-related attitudes. *Sex Roles*, *13*(3-4), 215-228.

Williams, C. (2000). *Internet access in US public schools and classrooms: 1994-99* (NCES 2000-086). US Department of Education. Washington, DC: National Center for Education Statistics.

Appendix A
Computer Use and Attitude Survey

Likert scale items:
1. I like computers.
2. I am good at computers.
3. I like to use computers to write my classwork.
4. I like it when my teacher asks me to use the computer.

Single response items:
5. Is there a computer in your classroom?   Yes   No
6. Do you have a computer at home?   Yes   No
7. I use the computer in my classroom (circle one):
   Every day   3 times a week   2 times a week   Once a week   Not at all
8. I use the computer in my classroom (circle all that apply):
   A. Only when we do a special assignment or special activity in class
   B. Only to play, when I finish my classwork
   C. To do my daily classwork
   D. For extra help in my reading, writing, social studies, keyboarding, or whatever subject I need a little extra help in

Open-ended response items:
9. What kind of computer activities or games do you do in the classroom?
10. What is your most favorite computer game in your classroom?
11. Why do you like this game?
12. What is your most favorite computer game in general?

13. Why do you like this game?
14. Name 3 other computer games that you like:

Appendix B
Software Mentioned in This Study

ClarisWorks (Version 4.0) [Computer software]. (1995). Cupertino, CA: Apple Computer.

Gizmos and Gadgets [Computer Software]. (1999). Novato, CA: The Learning Company.

JumpStart (2nd grade). (1997). New York: Vivendi Universal Publishing.

Kid Pix. [Computer software]. (1997). Novato, CA: Brøderbund Software.

Kid Works 2. [Computer software]. (1995). New York: Davidson & Associates/Vivendi Universal/Knowledge Adventure. Web site: http://www.vugames.com/vug/corporate_overview.do

Killer Instinct Gold [Video game]. (1997). Redmond, WA: Nintendo of America.

Math Blaster: In Search of Spot [Computer software]. (1998). New York: Davidson & Associates/Vivendi Universal/Knowledge Adventure.

Midnight Rescue! [Computer software]. (1995). Novato, CA: The Learning Company.

Mortal Kombat [Video game]. (1997). Chicago: Midway Amusement Games.

Museum Madness [Computer software]. (1994). Knoxville, TN: MECC.

Number Muncher [Computer software]. (1990). Novato, CA: The Learning Company.

Odell Down Under [Computer software]. (1996). Novato, CA: MECC/The Learning Company.

Primal Rage [Video game]. (1995). New York: Time-Warner Interactive.

Read, Write, & Type! Learning System [Computer software]. (2000). San Rafael, CA: Talking Fingers.

Slamdunk Typing [Computer software]. (1993). Redwood City, CA: Creative Wonders.

Spellavator [Computer software]. (1996). Novato, CA: MECC/The Learning Company.

Storybook Weaver (Version 1.1) [Computer software]. (1992). Knoxville, TN: MECC.

Super Streetfighter 2 Turbo [Video game]. (1995). Sunnyvale, CA: GameTek/CapCom Entertainment.

Talking Number Maze (Version 2.0.3) [Computer software]. (1994). Number Wave Software (no longer available).

The Legacy of Kain: Soul Reaver [Video game]. (1995-98). Menlo Park, CA: Crystal Developers.

Wormaggedon [Video game]. (1995). West Yorkshire, England: Team 17 Software.

Zoombinis Logical Journey. [Computer software]. (1997). Novato, CA: Brøderbund Software.