The Effects of Gender, Ethnicity and Race, Primary Home Language, Socioeconomic Status, Number of Computers in the Home and Where They Are Located, Internet Access at Home, Computer Activities at Home, Social Capital, and Cultural Capital on Mathematics Achievement of K-4 Children from Manoa Elementary School

Patrick Chevalier

Hawaii Pacific University

Master of Science in Information Systems

Spring 2006

Abstract

The purpose of this paper was to investigate the effects of home computers on mathematics achievement from kindergarteners to fourth graders. The correlation between mathematics achievement and key elements or factors that described the children's families' backgrounds was measured. Four hundred parents, who had K-4 children from Manoa Elementary School, received the survey. 122 parents participated in this study with an overall survey return rate of 30.5%. This research was based on a non-experimental, ex-post facto/correlation study. Results indicated that social capital had an important effect in mathematics achievement. Especially, the father's computer experiences, the child's leisure time at home, and family structure were the best predictors of mathematics achievement of K-4 children.

Sample Certification Page

The professional paper submitted by this student has been reviewed and deemed to have met the Professional Paper (IS 7200) requirements for Hawaii Pacific University's Graduate Program.

Student Name: Patrick Chevalier

Title of Professional Paper: The Effects of Gender, Ethnicity and Race, Primary Home Language, Socioeconomic Status, Number of Computers in the Home and Where They Are Located, Internet Access at Home, Computer Activities at Home, Social Capital, and Cultural Capital on Mathematics Achievement of K-4 Children from Manoa Elementary School

Kenneth G. Rossi, Ed.D. Date

Assistant Professor of Information Systems

Table of Contents

List of Tables

List of Figures

Acknowledgement

I would first like to thank my family for supporting and encouraging me to complete this professional paper. I would also like to thank my professor, Dr. Kenneth G. Rossi, who has kindly given help and supported me to accomplish this study. Finally, I would like to thank the superintendent Patricia Hamamoto, the Manoa Elementary School principal Susan Imamura, the analyst of the Department of Education Owen Yamasaki, the IRB chair Dr. Mary S. Sheridan, and all parents who participated in the survey. Without their help, this study could not be completed.

Chapter 1 - Introduction

Background

In the global digital economy, computer technology has fundamentally changed how people live and work. Now, we need to harness educational technology to benefit our nation's schools, communities and, most importantly, children. Education technology can help equalize opportunity for all children, regardless of gender, geographic location, race, ethnicity, and socioeconomic status (SES) (CEO Forum, 2001). Conversely, the lack of technology has limited the possibility for education to improve the K-4 graders' disparities, including mathematics achievement (Hedges, Konstantopoulis, & Thoreson, 2003). Johnson (2000) said that politicians were spending billions of tax dollars on expanding access to computers in schools in order to bridge a so-called "digital divide." The U. S. Department of Commerce [USDC] (1999) defined the term digital divide as barriers that have permitted only some students to use computers and have access to the Internet. The U.S. government spent more than $300 billion on technology to improve public K-12 education in 1999 (CEO Forum, 2001). Consequently, from 1994 to 2002, the percentage of public schools with access to the Internet increased from 35 percent to 99 percent (U. S. Department of Education [USDE], 2003). Although substantial gains have been made in the United States, the disparities of K-4 graders in mathematics achievement between classes have remained largely unchanged (California Department of Education, 2005). Attewell & Battle (1999) explained that since personal computers spread rapidly into American homes, the young children from low-income families who lacked access to home computing might become disadvantaged in mathematics performance. However, the majority of studies in the literature showed that home computer availability without assistance had no effects on young children's mathematics achievement (Attewell & Battle, 1999; Jacobs & Bleeker, 2004; Kafai, Fishman, Bruckman, & Rockman, 2002; Clark, 2001; Jacobs & Bleeker, 2004; Ba et al., 2002). Therefore, K-4 children's mathematics achievement should be measured along with detailed information on students' family backgrounds. Each key element or factor present in a domestic computing environment that can potentially influence the mathematics performance including: gender, ethnicity and race, socioeconomic status, primary home language, the number of computers in the home and where they are located, Internet access at home, computer activities at home, social capital, and cultural capital. Social capital has been a term that was used by Coleman (1988) to describe the complexity of the home computer environment. It referred to a list of social resources and supportive activities provided by parents and community members. Cultural capital has been a term that was used by Bourdieu and Passeron (1977), who suggested that some cultural knowledge, such as classic music, history or fine art, literature, drama, as well as certain forms of speech, was privileged in a society (see chapter 2 for more information about home environment factors).

Purpose

The purpose of this paper was to investigate the effects of home computers on mathematics achievement from kindergarten to fourth grade children. The correlation between mathematics achievement and key elements or factors that described children's family backgrounds was measured. Each factor present in the domestic computing environment that could potentially influence the mathematics performance was: gender, ethnicity and race, socioeconomic status, primary home language, the number of computers in the home and where they are located, Internet access at home, computer activities at home, social capital, and cultural capital.

Importance of Study

The use of computer-assisted instruction (CAI) in school has become an important topic among researchers in the last two decades. Many meta-analysis and longitudinal studies indicated that CAI in schools was more effective than conventional instructions for increasing students' mathematics achievement. On the other hand, relatively few studies focused on mathematics achievement and the complexity of home computer environments. Also, when researchers studied the effects of using technology at home and mathematics achievement, they focused their studies on children aged nine to seventeen years old that have access to more Internet and academic programs and applications. However, the National Center for Education Statistics (NCES) generated a report from a weighted sample that represented 58.3 million children, age three and older, in nursery school through 12th grade in October 2003. The results showed that 80 percent of U.S. children from kindergarten used computers, and 32 percent accessed the Internet. Also, NCES reported that 91 percent of U.S. children from first to fifth grades used computers, and 50 percent access the Internet (USDE, 2005). For this reason, it was very important to study the effects of home computers on K-4 children's mathematics achievement.

Statement of the Problem

Although substantial gains have been made in the United States, the disparities of K-4 students in mathematics achievement between classes have remained largely unchanged (California Department of Education, 2005). Attewell & Battle (1999) explained that since personal computers have spread rapidly into American homes, the young children from low-income families who lacked access to home computing might become disadvantaged in mathematics performance. The problem of the mathematics achievement disparities among K-4 children included not only the presence of the computers, but also the family background and assistance for the children. One possible solution of the problem was to verify whether home computer environments could affect the K-4 children's mathematics achievement in Fall 2005. This study was to focus on how the independent variables (factors) that have described the home computer environment affect the young children's mathematics performance. Each factor present in the domestic computing environment that can potentially influence the mathematics achievement was associated with a sub-problem. Therefore, the following nine sub-problems were introduced.

Sub-problem 1. The first sub-problem was the possible relationship between gender and the mathematics achievement of children from kindergarten to fourth grades.

Sub-problem 2. The second sub-problem was the possible relationship between ethnicity/race and the mathematics achievement of children from kindergarten to fourth grades.

Sub-problem 3. The third sub-problem was the possible relationship between primary home language and the mathematics achievement of children from kindergarten to fourth grades.

Sub-problem 4. The fourth sub-problem was the possible relationship between socioeconomic status (SES) and the mathematics achievement of children from kindergarten to fourth grades.

Sub-problem 5. The fifth sub-problem was the possible relationship between the number of computers in the home and where they are located, and the mathematics achievement of children from kindergarten to fourth grades.

Sub-problem 6. The sixth sub-problem was the possible relationship between Internet access at home and the mathematics achievement of children from kindergarten to fourth grades.

Sub-problem 7. The seventh sub-problem was the possible relationship between computer activities at home and the mathematics achievement of children from kindergarten to fourth grades.

Sub-problem 8. The eighth sub-problem was the possible relationship between social capital and the mathematics achievement of children from kindergarten to fourth grades.

Sub-problem 9. The ninth sub-problem was the possible relationship between cultural capital and the mathematics achievement of children from kindergarten to fourth grades.

Theoretical Framework

Through Davis' (1989) work, updated by Spears and Spears (1999) and additional factors that have described the home computer environment, we can determine the correlational factors concerning mathematics achievement. Figure 1 shows the conceptual framework of this study. The home computer use, in the highest level of the hierarchy, was associated with the independent variables (factors), in the second level of hierarchy. Each association between factors present in home computer environments and mathematics achievement, in the last level of hierarchy, has a hypothesis.

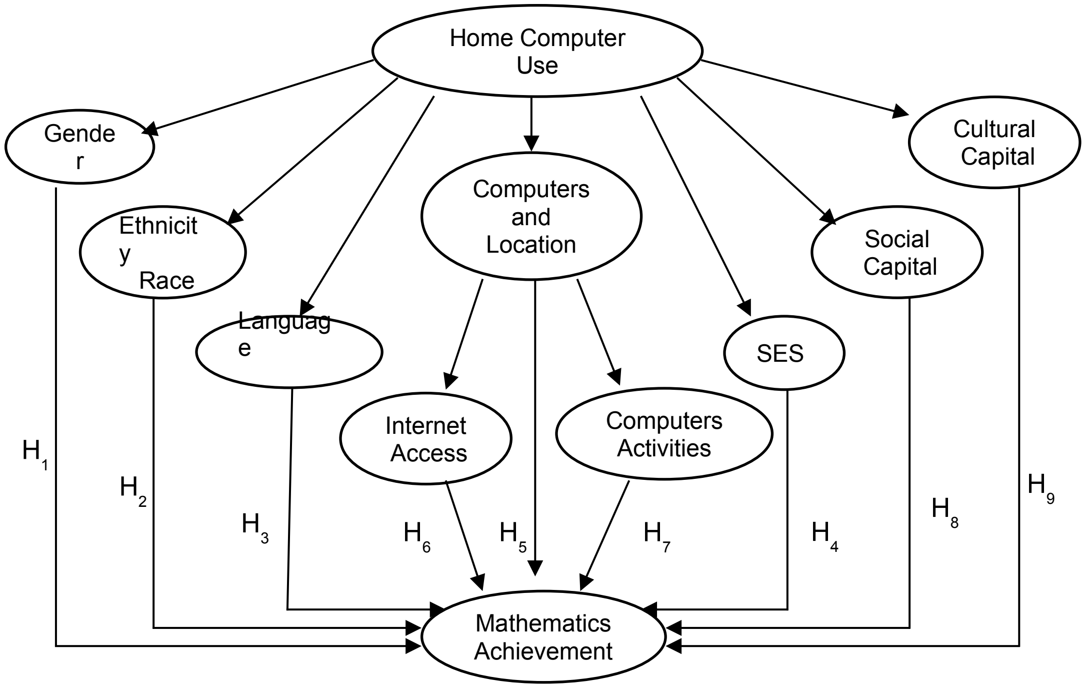

Figure 1. Conceptual Framework Depicting the Relationship between Independent and Dependent Variables of the Study.

Research Questions and Hypotheses

All of the following research questions and hypotheses for this study were drawn based on the conceptual framework shown above as Figure 1.

Research Question 1. Is there a relationship between the gender of K-4 children and mathematics achievement?

Hypothesis 1. There is a relationship between the gender of K-4 children and mathematics achievement.

Research Question 2. Is there a relationship between the ethnicity/race of K-4 children and mathematics achievement?

Hypothesis 2. There is a relationship between the ethnicity/race of K-4 children and mathematics achievement.

Research Question 3. Is there a relationship between the primary home language of K-4 children and mathematics achievement?

Hypothesis 3. There is a relationship between the primary home language of K-4 children and mathematics achievement.

Research Question 4. Is there a relationship between the socioeconomic status of K-4 children and mathematics achievement?

Hypothesis 4. There is a relationship between the socioeconomic status of K-4 children and mathematics achievement.

Research Question 5. Is there a relationship between the number of computers in the home (and where they are located) of K-4 children and mathematics achievement?

Hypothesis 5. There is a relationship between the number of computers in the home (and where they are located) of K-4 children and mathematics achievement.

Research Question 6. Is there a relationship between Internet access at home of K-4 children and mathematics achievement?

Hypothesis 6. There is a relationship between Internet access at home of K-4 children and mathematics achievement.

Research Question 7. Is there a relationship between computer activities at home of K-4 children and mathematics achievement?

Hypothesis 7. There is a relationship between computer activities at home of K-4 children and mathematics achievement.

Research Question 8. Is there a relationship between the social capital of K-4 children and mathematics achievement?

Hypothesis 8. There is a relationship between the social capital of K-4 children and mathematics achievement.

Research Question 9. Is there a relationship between the cultural capital of K-4 children and mathematics achievement?

Hypothesis 9. There is a relationship between the cultural capital of K-4 children and mathematics achievement.

Method of Inquiry

This study was based on a non-experimental research design because it did not provide adequate control for confounding. Therefore, each factor that described the home computer environment was uncontrolled and might affect the mathematics achievement of children. Also, this study compared the mathematics performance among children from five to nine years old in Spring 2006. Consequently, it was characterized as a cross-sectional design and ex post facto. Initially, a letter was sent to the principal of a school to explain the purpose of the study, and ask permission to survey parents or tutors to access their children's scores. Also, either parents or tutors received a letter and an Informed Consent, to explain the purpose of the study, and ask for parents' assistance in completing a questionnaire. The parents were assured that all information would be confidential.

Assumptions

This study assumed that all parents or tutors, who participated in the survey, knew about the home computer environment and the mathematics achievement of their children.

Limitations

The first limitation was the time to accomplish this research. The maximum time to complete this research was two semesters (approximately six months). The second limitation was the budget because the researcher had no sponsor to support research costs.

Delimitations

Due to the time and budget limitation of the research, the population was restricted to the mathematics achievement of children from kindergarten to fourth grade at Manoa Elementary School.

Alternatives

Based on the literature review, the relationship between using a computer at home and student achievement in mathematics can be statistically insignificant to kindergarten to second graders, but substantial to third and fourth graders. Also, the majority of the children would use computers, but only one third would access the Internet. In terms of gender, boys would have practically the same mathematics scores than girls. In terms of ethnicity and race, Asians and whites would have the best mathematics achievement. In terms of SES, the affluent children would have better mathematics scores than children from lower-income families. In terms of home computer environment, children from highly educated parents, children from parents with computer experience, children who accessed the Internet and used the computer as an academic tool would have the best mathematics performance. In addition, there would be a strong relationship between the social capital of K-4 children and mathematics achievement, but there would be a weak relationship between the cultural capital of K-4 children and mathematics achievement.

Paper Organization

The professional paper proposal for the Master of Science in Information Systems (MSIS) consists of five chapters.

Chapter one provides the introduction of this research. Also, the reader will know how important the home computer environment is and the participation of parents and the community to implement the educational technology at home. This chapter includes the background, purpose, statement of the problem, conceptual framework of the study, assumptions, limitations, delimitations, and alternatives.

Chapter two introduces the literature review, which is related to the previous studies about home computer and mathematics achievement from young children. Also, each key element or factor of the home computer environment can potentially influence the mathematics achievement from the children aged from kindergarten to fourth grade.

Chapter three describes the research methodology of this study, as well as a discussion of the method of inquiry, population and sample, and instruments and experimental procedures used to gather the data.

Chapter four provides the outcome of the response rate and reliability of the instrument used to gather the data. This chapter includes the population and sample, method of inquiry, and instruments and procedures used to collect the data, as well as the results of analysis of data.

Chapter five provides the main result of the study, including the conclusions and recommendations for future researches and use of the results.

Chapter 2 - Review of Related Literature

Purpose

The purpose of this paper was to investigate the effects of home computers on mathematics achievement from kindergarten to fourth grade children. The correlation between mathematics achievement and key elements or factors that described children's family backgrounds was measured. Each factor present in the domestic computing environment that could potentially influence the mathematics performance was: gender, ethnicity and race, socioeconomic status, primary home language, the number of computers in the home and where they are located, Internet access at home, computer activities at home, social capital, and cultural capital.

Purpose of chapter

The purpose of Chapter Two is to review the previous studies in chronological order about the influence of the key elements or factors that described the home environment on young children's mathematics achievement. Also, each independent variable was identified and discussed.

Chapter organization

Chapter Two introduces the literature review, which is related to the previous studies about home computers and mathematics achievement of young children. Also, each key element or factor of home computer environments can potentially influence the mathematics achievement from the children aged from kindergarten to fourth grade. Results based on the literature review showed that in the 1990s, the correlation between home computer use and mathematics achievement was statistically insignificant. However, more recently, some studies showed a positive relationship to implement the technology at young children's homes.

Background

In the middle 1980s, personal computers started gaining popularity, and have since spread rapidly into American homes, provoking concerns that those children who lack access to home computing may become disadvantaged in mathematics performance (Attewell & Battle, 1999). Since the beginning, the personal computer was used as a tool to reinforce the mathematics skills of third graders. For instance, an ex-post-facto, quasi-experimental design was used to evaluate the results of using personal computers to manage instruction for 92 third-grade students. This treatment group was selected among three groups with similar mathematics skills. After two years, the gains achieved of the three fifth-grade mathematics scores were compared. The results showed that the treatment group who received teacher-delivered computer-managed instruction outperformed the two control groups (Borton, 1989).

In 1988, the Corporation for Educational Technology (CET), a nonprofit organization of Indiana, launched the Buddy Project that benefited more than 6,000 Indiana families. Each fourth grader took home a computer, printer, modem, and a variety of software. The computer stuff was used for the children until the end of fifth grade. Parents and children were trained in software tools and basic computer skills. Teachers also received the computers, and were trained to act like coaches to provide activities and assistance for the entire family. Alan Hill, the CET President, said that the project did not provide access to the Internet because of fears of potential liability should students use it inappropriately. In 1995, an extensive evaluation of the Buddy Project by Rockman et al., a San Francisco research firm, concluded that Buddy students enjoyed math more and were better motivated, but the researchers saw no quantitative differences in the mathematics performance, compared with other students of a control group (Trotter, 1996).

The most important sampling about what American students know and can do has been generated by the National Assessment of Educational Progress (NAEP), commonly known as the "Nation's Report Card." The 1996 NAEP generated a national report that compared the mathematics performance of 6,227 fourth graders and 7,146 eighth graders with computer use at home. The data included some population subgroups such as gender, race/ethnicity, parents' highest education level, frequency of use of computer at home, and others (Shaughnessy, Nelson, & Norris, 1997). In 1998, Harold Wenglinsky, an associate research scientist with the Education Testing Service, published a major study on computers and academic achievement in mathematics, using data from the 1996 NAEP data file. Wenglinsky (1998) said that the size of the relationship between using computers at home and student achievement in mathematics was negligible for fourth graders, but substantial for eighth graders (p. 32). He explained that "perhaps" eighth graders are more likely to use computers as tools for doing their homework (p. 32). Also, the author informed that due to lack of other data that clarified how home computers were used at home, it was only possible to speculate some interpretation about the results (p. 32). In the article "Home Computer and School Performance," Attewell (1999) explained the importance of defining independent variables to control the home computer environment. For instance, the EDC Center for Children and Technology and Computers for Youth (CFY) had completed a one-year study of using home computers in low-and- middle class families. To compare the digital literacy skill between the two groups, it was necessary to define several independent variables to control the home environment complexity. The circumstantial factors around home computer use were: the family's ability to purchase stable Internet connectivity; the number of computers in the home and where they are located (bedroom or public area); the length of time children had a computer at home; children's leisure time at home; the computing habits of children's peers; parents' own experience and skills with computers; parents' attitudes toward computer use; the technical expertise of friends, relatives, and neighbors; and the direct instruction provided by teachers in the classroom and homework assignments (Ba, Tally, & Tsikalas, 2002).

In a recent longitudinal study, Borzekowski and Robinson (2005) compared different household media environments and mathematics achievement. An ethnically diverse sample of third grade students and parents from six northern California public elementary schools was selected, and data was collected through classroom surveys and telephone interviews. The mathematics achievement scores of the selected students were derived from the Stanford Achievement Test (SAT). The researchers said that they fitted linear regression models to determine the associations between variations in household media and performance on the standardized tests, adjusting for demographic and media use variables. The results showed that the household media was significantly associated with student's mathematics performance. The regression models predicted that having a bedroom television set access was significantly and negatively associated with students' mathematics scores. On the other hand, the presence of the home computer improved mathematics scores up to 24 % in these children.

Section Summary

In the middle 1980s, personal computers started gaining popularity, and have since spread rapidly into American homes, provoking concerns that those children who lack access to home computing may become disadvantaged in mathematics performance (Attewell & Battle, 1999). The results based on the literature review showed that in the 1990s, the correlation between home computer use and mathematics achievement was statistically insignificant.

However, more recently, some studies showed a positive relationship to implement the technology in young children's homes.

The influence of the factors (independent variables)

The majority of studies on the literature showed that home computer availability without assistance had no effects on young children's mathematics achievement (Attewell & Battle, 1999; Jacobs & Bleeker, 2004; Kafai, Fishman, Bruckman, & Rockman, 2002; Clark, 2001; & Ba et al., 2002). Therefore, K-4 children's mathematics achievement should be measured along with detailed information on students' family backgrounds. Each key element or factor present in domestic computing environments that can potentially influence the mathematics performance will be identified and discussed.

Gender. Men and boys had a higher computer self-efficacy and more attitudes towards computers than women and girls (Attewell & Battle, 1999; Burns & Ungerleider, 2003; Jacobs & Bleeker, 2004; Johnson, 2000; Kafai et al., 2002; & O'Brien, Friedman-Nimz, Lacey, & Denson, 2005). Also, a meta-analysis of studies of gender differences in computer attitudes and behavior concluded that males exhibited higher computer self-efficacy, greater sex-role stereotyping of computers, and more positive attitudes towards computers than females (Whitley, 1997). However, the National Center for Education Statistics (NCES) reported that in contrast to the 1990s, when boys were more likely to use computers and the Internet than girls were, overall computer and internet use for boys and girls was about the same in 2001 (USDE, 2003). More recently, Kafai et al. (2002) said that where one computer is shared by multiple siblings, girls and young children may have less access. Also, similar effects of gender occurred in mathematics achievement. For example, Jacobs and Bleeker (2004) said that in the first grade, boys had a more positive view of their mathematics abilities than girls, but many of these differences disappear in the twelfth grade. On the 1998 SAT, young boys scored in mathematics higher than young girls. More recently, Johnson (2000) reported that in the NAEP 2004, there was no difference between the average mathematics scores of male and female children at age nine. In account for these differences, the analysis was included a variable for gender.

Ethnicity/race. Substantial differences exist between ethnic and racial groups on many measures of home computer use. For example, black and Hispanic fourth graders were more likely than white and Asians to report almost daily use of computers in 1996 (Coley, Cradler, & Engel, 1997; & Attewell & Battle, 1999). Another example was that the U.S. Department of Education [USDE] (2003) reported that ethnicity and race among children who used computers at home were: 40.6 % Hispanic, 41.0 % African-American 75.7 % Asian, and 76.9 % white in 2001. Also, strong differences exist between ethnic and racial groups on many measures of mathematics achievement. Attewell and Battle (1999) said that Asians had the highest mathematics scores, and American-Africans and Hispanics had lower mathematics scores than whites. Perie and Moran (2005) reported that according to NAEP, the differences between white and African-American students in mathematics achievement scores at all ages decreased from 1973 to 2004. In account for these differences, the analysis was included a variable for ethnicity/race. African-American, Asian, Hispanic, white, Japanese, Chinese, Korean, Filipino, Hispanic or Latino were contrasted with the reference category, native (Hawaiian).

Primary home language. The primary home language can be a significant factor to measure children's mathematics achievement. Huang (2000) said that in the United States, the children whose primary home language was non-English had a lower mathematics score rate than those whose primary home language was English. Also, the National Center for Education Statistics reported that there were 1.8 million children whose primary home language was

Spanish in K-12 American schools in 2001. Also, it reported that 50.5 % of the children whose primary home language was Spanish used computers at home, against 78.6 % whose primary home language was not Spanish (USDE, 2003). In account for these differences, the analysis was included a variable for primary home language. The category non-English was contrasted with the reference category English.

Socioeconomic status (SES). SES was the highest factor correlated between home computer use and mathematics achievement. Attewell and Battle (1999) said that when correlating home computer effects with mathematics achievement, it was important to control children's SES because home computer effects on mathematics scores were markedly smaller after controlling for SES. Also, they said that children with lower SES obtain less of an educational effect from using a home computer. Clark (2001) reported that the 2000 General Social Survey (GSS) managed by Statistics Canada interviewed six million parents with children ages five to eighteen about home computers and the Internet. Clark reported that in 2000, 26 % of children from lower-income families in Canada used home computers, against 65 % of children from higher-income families. On the other hand, 69 % of children from lower-income families in Canada used school computers, against 74 % of children from higher-income families. Also, he concluded that children from lower-income families had substantial disadvantages to access technology at home (Clark, 2001). In the United States, the Department of Education (2003) reported that 31.2 % of children from families with annual incomes less than $20,000 used computers at home, and 89.3 % of children from families with annual incomes over $75,000 used computers at home. On the other hand, 75.3 % of children from families with annual incomes less than $20,000 used computers at school, and 85.4 % of children from families with annual incomes over $75,000 used computers at school (Department of Education, 2003). The same effects related in Canada occurred in the United States. Home computers have been a barrier to mitigate the disparity between poor and affluent children to access technology (Abrami, 2001; CEO Forum, 2001; Downes, 2002; Howland, Laffey, & Espinosa, 1997; Judge, Puckett, & Cabuk, 2004; & Subrahmanyam, Greenfield, Kraut, & Gross, 2001). Similar effects of SES occurred in mathematics achievement. For example, in a cross-sectional study, Jacobs and Bleeker (2004) reported the percent of lower SES children scoring at proficient or above was increasing at a greater rate than high SES children. The gap in the mathematics achievement between these two socioeconomic groups of children has decreased from 2001 to 2005. In account for these differences, the analysis was included a variable for SES.

The number of computers in the home and where they are located. This variable will be strongly affected by the SES of the family and computer assistance. For instance, Ba et al. (2002) explained that families with lower SES usually have only one computer in a public area. As a result, the children's activities were more likely to be shared with the family, and supervised so as to encourage them to use their computers for educational purposes. On the other hand, families with higher SES have more than one computer and the children have their own computers in their bedrooms. As a result, the children were more likely to access the Internet and play games. In account for these differences, the analysis was included a variable for the number of computers in the home and another for computer location.

Internet access at home. In the last few years, more and more young children have had access to the Internet. For example, the U. S. Department of Education interviewed 56,000 households in 2001 about the use of the Internet. Children from five to seven years old accessed the Internet 53.3 % at school, and 72.0 % at home (USDE, 2003, p. 23). Also, the National Education Technology Standard (NETS) lists the Internet as one of the ten performance indicators at the preK-2 level (Judge et al., 2004, p. 386). In account for these differences, the analysis was included a variable for Internet access at home.

Computer activities at home. Computer use can be a significant factor to measure children's mathematics achievement. This variable will have six possibilities: games (for fun), educational programs (drill and practice, math learning games), applications and tools (Word, worksheet, etc.), e-mails, research and no computer. Ba et al. (2002) explained that the parents needed to separate computers for fun and for work, set limits on chatting and game playing, get involved in finding good software and web sites, and teach students to manage their time (p. 17). Some studies concluded a negative correlation between playing games on home computers and mathematics achievement (Bensley & van Eenwyk, 2001; "Computers 'can harm learning' – study," 2005; & Holden, 1998). However, other studies concluded a positive correlation between playing games on home computers and mathematics achievement (Aguilera & Mendiz, 2003; Gee, 2005; Harris, 2001; Margoulis, 1988; Messerly, 2004; Salonius-Pastermak, 2005; & Williamsom & Facer, 2004). In terms of educational programs, Burns and Ungerleider (2003) classified the software into two kinds: drills and practice and higher-level conceptual programs. In review papers from Liao (1992), a positive correlation was found between Computer Assistance Instructions (CAI) on mathematic achievement (p. 43). In contrast, Wenglinsky (1998) said that drills and practice programs had a negative affect on the mathematics achievements of fourth graders. For higher-level conceptual programs, Wenglinsky said that these programs had no significant effects on the mathematics achievements of fourth graders. Also, Attewell and Battle (1999) said that home computers were academic tools that supplement or reinforce school learning. Finally, The U. S. Department of Education reported that in 2001, the statistics about home computer activities for children aged from five to seven were: 54.0 %

played games (for fun), 9.4 % for Word processing, zero percent for spreadsheet, and 9.5 % for e-mail, and others (USDE, 2003).

Social capital. This term was used by Coleman (1988) to describe the complexity of the home computer environment. It referred to a list of social resources and supportive activities provided by parents and community members. When family and community members supervise, monitor, and provide leadership for children, the computer environment has a strong social capital, and the home computer becomes a tool that can have a positive correlation with mathematics achievement. Conversely, where this social structure is weak, the young children cannot benefit from technology effectively to reinforce the mathematics skills. Therefore, this derivative variable will have nine key elements: parents' education, parents' attitudes toward computer use, parents' own experience and skills with computers, children's leisure time at home, the computing habits of children's peers, the technical expertise of friends, relatives, and neighbors, the direct instruction teachers provide in the classroom, family structure, and family size. In the literature, many examples highlighted the power of the social capital. Johnson (2000) said that the educational attainment of a child's parents was a good predictor to improve academic achievement. For example, college-educated parents can be better equipped to help their children with explanations about concepts and exercises than a high school educated parent. Ba et al. (2002) said that parents with computer skills from their jobs and schooling were able to show rich and varied uses of computers, and engaged their children in critical talks about the Internet. They also said that children from high SES families had more leisure time at home to develop skills and use their computers for varied purposes. On the other hand, children from low SES families had less leisure time at home because of their schools' extended-day schedule, and used their computers primarily for homework (p. 33). Family structure was used by Attewell and

Battle (1999); I defined this variable with four key elements: both parents, only mother, only father, and no parents. When one or both parents were not present, the social capital was weaker than when they were present. Ba et al. (2002) said that the computing habits of children's peers could influence home computer use. Children's online communication usually depended on what their peers were doing. For example, peers from low-income families used the Internet less to send e-mails. On the other hand, peers from high-income families used the Internet more to use Instant Messenger (IM).

Cultural capital. Bourdieu and Passeron (1977) used the term cultural capital that suggests some cultural knowledge, such as classic music, history or fine art, literature, drama, as well as certain forms of speech, was privileged in society. Also, Attewell and Battle (1999) said that ordinary educational institutions incorporate cultural capital in their activities as something that pupils were expected to have already. Besides, they said that children from families with substantial cultural capital had more academic advantages than children that did not have cultural capital (p. 5). Therefore, children from families with high cultural capital found school education easier than others from families with low cultural capital. In account for these differences, the analysis will include a variable for cultural capital. Three key elements can be used to measure the cultural capital: cultural class, when children attended music, dance, or art classes; cultural action, when the parents visited science or history museums with their children; and educational objects or educational places, when domestic environments had a dictionary, encyclopedia, daily newspapers, magazines, calculators, study room, or personal library.

Section Summary

The relationship between each factor that describes the home computer environment and mathematics achievement are presented in the following.

Gender. Men and boys had a higher computer self-efficacy and more attitudes towards computers than women and girls. In the 1998 SAT, young boys scored higher in mathematics than young girls. More recently, Johnson (2000) reported in the NAEP 2004 that there was no difference between the average mathematics scores of male and female children at age nine.

Ethnicity/race. Substantial differences exist between ethnic and racial groups on many measures of home computer use. For example, black and Hispanic fourth graders were more likely than white and Asians to report almost daily use of computers. On the other hand, Attewell and Battle (1999) said that Asians had the highest mathematics scores, and Africans-American and Hispanics had lower mathematics scores than whites.

Primary home language. The primary home language can be a significant factor to measure children's mathematics achievement. Huang (2000) said that in the United States, the children whose primary home language was non-English had a lower mathematics score rate than those whose primary home language was English.

Socioeconomic status (SES). SES was the highest factor correlated between home computer use and mathematics achievement. The children with lower SES obtain less of an educational effect from using home computers.

The number of computers in the home and where they are located. This variable was strongly affected by the SES of the family and computer assistance.

Internet access at home. In the last years, more and more young children have access to the Internet. For example, the U. S. Department of Education interviewed 56,000 households in 2001 about the use of the Internet. Children from five to seven years old accessed the Internet 53.3 % at school, and 72.0 % at home (USDE, 2003,p. 23)

Computer activities at home. Computer use can be a significant factor to measure children's mathematics achievement. This variable will have six possibilities: games (for fun), educational programs (drill and practice, math learning games), applications and tools (Word, worksheet, etc.), e-mails, and research.

Social capital. This term was used by Coleman (1988) to describe the complexity of the home computer environment. It referred to a list of social resources and supportive activities provided by parents and community members.

Cultural capital. Bourdieu and Passeron (1977) used the term cultural capital that suggests some cultural knowledge, such as classic music, history or fine art, literature, drama, as well as certain forms of speech, was privileged in society.

Summary

The results based on the literature review showed that in the 1990s, the correlation between home computer use and mathematics achievement was statistically insignificant. However, more recently, some studies showed a positive relationship to implement the technology in young children's homes. The relationship between each factor that describes the home computer environment and mathematics achievement are presented in the following.

Gender. Men and boys had a higher computer self-efficacy and more attitudes towards computers than women and girls. In the 1998 SAT, young boys scored higher in mathematics than young girls. More recently, Johnson (2000) reported in the NAEP 2004 that there was no difference between the average mathematics scores of male and female children at age nine.

Ethnicity/race. Substantial differences exist between ethnic and racial groups on many measures of home computer use. For example, black and Hispanic fourth graders were more likely than white and Asians to report almost daily use of computers. On the other hand, Attewell and Battle (1999) said that Asians had the highest mathematics scores, and Africans-American and Hispanics had lower mathematics scores than whites.

Primary home language. The primary home language can be a significant factor to measure children's mathematics achievement. Huang (2000) said that in the United States, the children whose primary home language was non-English had a lower mathematics score rate than those whose primary home language was English.

Socioeconomic status (SES). SES was the highest factor correlated between home computer use and mathematics achievement. The children with lower SES obtain less of an educational effect from using home computers.

The number of computers in the home and where they are located. This variable was strongly affected by the SES of the family and computer assistance.

Internet access at home. In the last years, more and more young children have access to the Internet. For example, the U. S. Department of Education interviewed 56,000 households in 2001 about the use of the Internet. Children from five to seven years old accessed the Internet 53.3 % at school, and 72.0 % at home (USDE, 2003,p. 23)

Computer activities at home. Computer use can be a significant factor to measure children's mathematics achievement. This variable will have six possibilities: games (for fun), educational programs (drill and practice, math learning games), applications and tools (Word, worksheet, etc.), e-mails, and research.

Social capital. This term was used by Coleman (1988) to describe the complexity of the home computer environment. It referred to a list of social resources and supportive activities provided by parents and community members.

Cultural capital. Bourdieu and Passeron (1977) used the term cultural capital that suggests some cultural knowledge, such as classic music, history or fine art, literature, drama, as well as certain forms of speech, was privileged in society.

In sum, the recent results based on the literature review showed a positive relationship to implement the technology in young children's homes. Probably, the young children are putting away toys, and exploring the world through educational technology.

Chapter three describes the research methodology of this study, as well as a discussion of the method of inquiry, population and sample, and instruments and experimental procedures used to gather the data.

Chapter 3 - Methodology

Purpose

The purpose of this paper was to verify the effects of home computers on mathematics achievement from kindergarten to fourth grade children. The correlation between mathematics achievement and key elements or factors that described children's family backgrounds was measured. Each factor present in the domestic computing environment that can potentially influence the mathematics performance was: gender, ethnicity and race, socioeconomic status, primary home language, the number of computers in the home and where they are located, Internet access at home, computer activities at home, social capital, and cultural capital.

Purpose of chapter

Chapter Three describes the research methodology used in this study. This chapter explains the detailed method of inquiry, population and sample, measurement and instrumentation, data collection procedures, research hypotheses, and strengths and weaknesses of the research relevant with this study. In sum, this chapter consists of the method of inquiry, the population sampling, and the processes of data gathering. Also, the chapter describes in detail the instruments used to collect data and documents to send to the principal and parents of Manoa Elementary School.

Chapter organization

Chapter Three is divided into six different sections: (1) Method of Inquiry, (2) Population and Sampling Techniques, (3) Measurement and Instrumentation, (4) Research Hypotheses, (5) Strengths and Weaknesses, and (6) Summary.

Section 1, Method of Inquiry, explains that this research is a non-experimental design, which collected all the data through a survey.

Section 2, Population and Sampling, uses the population of parents who have K-4 children at Manoa Elementary School, located in Honolulu, Hawaii. Also, the mathematics achievement was provided through the official status report, a Department of Education standard in the State of Hawaii.

Section 3, Measurement and Instrumentation, explains that the instrumentation that was used in this study to evaluate the children's performance was the Manoa Elementary School Status report, a letter to the Manoa Elementary School principal, a letter of intent, an informed consent, and a questionnaire.

Section 4, Research Hypotheses, explains the conceptual framework and a discussion about how the data was related with each hypothesis.

Section 5, Strengths and Weaknesses, explains that Manoa Elementary School is located in a middle-and-high SES area, a perfect place to analyze the effects of home computer environment on mathematics achievement. However, the sample of this study was too small.

Section 6, Summary, summarizes the chapter and provides the transition to chapter four.

Method of Inquiry

This research is a non-experimental design, which collects all the data through a survey. Also, this research is correlational because the researcher is attempting to discover relationships between the designed variables. Gall, Borg, and Gall (1996) defined the term correlational as a kind of investigation that makes it possible to discover the direction and magnitude of the relationship among the variables through the use of correlational statistics (p. 756). Also, this research is called ex-post-facto because the causes are studied after they presumably have exerted their effects on another variable.

Population and Sample

Population

The population was the parents who had K-4 children from Manoa Elementary School. Also, the mathematics achievement was provided through the official status report, a Department of Education standard, in the State of Hawaii. Table 1 shows the number of students from kindergarten to fourth grade. The size of the population was approximately 390.

Sample

Gay (1996) said that about 50% of the population size should be sampled when the population size was approximately 400. However, it was not realistic to plan to sample about 200 parents because I estimated that only 120 parents (30% of the population) would have enough time to complete the survey.

Convenient sampling was selected for this study. Manoa Elementary School is located in a middle-and-high SES area, where the home computer is used relatively more than in a low SES area.

Measurement and Instrumentation

The instrumentation that was used in this study to evaluate the children's performance was the Manoa Elementary School Status report, a questionnaire (see appendix A), a letter to the Manoa Elementary School principal (see Appendix B), a letter of intent (see appendix C), and an Informed Consent (see appendix D). The questionnaire, the letter to the Manoa Elementary School principal, the letter of intent, and the informed consent are instruments based on Williams (2002).

The Manoa Elementary School Status report has been designed to inform the student's progress toward achieving the Hawaii Content and Performance Standards (Manoa Elementary

School, 2005). To measure the mathematics achievement (dependent variable), the Manoa Elementary School Status Report was used. This report has a section called mathematics that is composed of five mathematics subjects and their associative values for achievement grades.

The mathematics subjects are:

(1) Numbers and operations

(2) Measurement

(3) Geometry and spatial sense

(4) Patterns, functions, and probability

(5) Data, analysis, statistics and probability

The achievement grades and its associative value are:

(0) No progress

(1) Little progress

(2) Adequate progress

(3) More than adequate progress

(4) Not Applicable

To measure the mathematics achievement, each subject received a number from 0 to 4, as shown above. If a subject was not applicable (number 4), it was discarded. Otherwise, the applicable subject received a number from 0 to 3. The maximum points of this sum divided the sum of points of the all-applicable subjects, and the results multiplied by 100. Consequently, through the Manoa Elementary School status report, each child's mathematics achievement was presented as a simple percentage from 0 to 100. MATH_TOT (mathematics total) is a numeric variable that was coded from 0 to 100.

The parents' questionnaire was used to measure the factors (independent variables) that described the child's computer environment. The parents answered thirty-six questions about their children's computing environment. Each question was associated with a factor, and its alternatives were placed strategically in order to increase gradually the intensity of the factor. This strategy was important to interpret the direction of the correlations. In the following, each factor was associated with a variable of the database, and a question of the questionnaire.

Gender

GENDER is a nominal variable that was coded 1 for male and 2 for female (question 2).

Ethnicity/race

ETHNIC (ethnicity/race) is a nominal variable that was coded for 1 for white, 2 for African American, 3 for Japanese, 4 for Chinese, 5 for Korean, 6 for Filipino, 7 for Hispanic or Latino, 8 for native (Hawaiian), and 9 for Other (question 3).

Primary home language

LANGUAGE (primary home language) is a nominal variable that was coded 1 for English and 2 for non-English (question 4).

Number of computers in the home and where they are located

NUM_COMP (number of computers) is an ordinal variable that was coded 0 for those with no computer at home, 1 for one, 2 for two, 3 for three, and 4 for four or more (question 5).

LOCATION (child's computer location) is a nominal variable that was coded 0 for those with no computer at home, 1 for public area, and 2 for child's bedroom (question 6).

Access Internet

INTERNET (access to the Internet) is an ordinal variable that was coded 1 for rarely, almost never; 2 for a few times per month; 3 for once per week; 4 for few times per week; and 5 for everyday (question 7).

Computer Activities

GAMES is an ordinal variable that was coded 1 for rarely, almost never; 2 for a few times per month; 3 for once per week; 4 for few times per week; and 5 for everyday (question 8).

EDU_PROG (educational programs) is an ordinal variable that was coded 1 for rarely, almost never; 2 for a few times per month; 3 for once per week; 4 for few times per week; and 5 for everyday (question 9).

APPLICS (applications and tools) is an ordinal variable that was coded 1 for rarely, almost never; 2 for a few times per month; 3 for once per week; 4 for few times per week; and 5 for everyday (question 10).

E-MAIL is an ordinal variable that was coded 1 for rarely, almost never; 2 for a few times per month; 3 for once per week; 4 for few times per week; and 5 for everyday (question 11).

RESEARCH (child's uses a home computer for research) is an ordinal variable that was coded 1 for rarely, almost never; 2 for a few times per month; 3 for once per week; 4 for few times per week; and 5 for everyday (question 12).

The child's computer activities are composed by five factors (independent variables): games, educational programs, applications and tools, e-mails, and research.

Social capital

FATHERED (father's education) is an ordinal variable that was coded 1 for elementary school; 2 for middle school; 3 for high school; 4 for college, university or professional school; and 5 for graduate school (question 13).

MOTHERED (mother's education) is an ordinal variable that was coded 1 for elementary school; 2 for middle school; 3 for high school; 4 for college, university or professional school; and 5 for graduate school (question 14).

FATHERUS (father's use of home computers) is an ordinal variable that was coded 1 for rarely, almost never; 2 for few times per month; 3 for once per week; 4 for few times per week; and 5 for everyday (question 15).

MOTHERUS (mother's use of home computers) is an ordinal variable that was coded 1 for rarely, almost never; 2 for few times per month; 3 for once per week; 4 for few times per week; and 5 for everyday (question 16).

FATHEREX (father's computer experiences and skills) is an ordinal variable that was coded 1 for the father does not live with the child, 2 for poor, 3 for medium, 4 for good, and 5 for excellent (question 17).

MOTHEREX (mother's computer experiences and skills) is an ordinal variable that was coded 1 for the mother does not live with the child, 2 for poor, 3 for medium, 4 for good, and 5 for excellent (question 18).

SOMEONEX (Someone else's (siblings, relatives, neighbors, etc.) computer experiences and skills) is an ordinal variable that was coded 1 for there are not someone else; 2 for poor; 3 for medium; 4 for good; and 5 for excellent (question 19).

LEISURE (child's leisure time) is an ordinal variable that was coded 1 for rarely, almost never; 2 for few times per month; 3 for once per week; 4 for few times per week; and 5 for everyday (question 20).

HAB_PEER (primary computing habits of children's peers) is an ordinal variable that was coded 1 for "I don't know", 2 games, 3 for e-mail, 4 for educative programs or applications (drill and practice, Word, etc.), 5 for Internet for research (question 21).

INSTRUCT (children receiving computer instruction from teachers in the classroom) is an ordinal variable that was coded 1 for rarely, almost never; 2 for few times per month; 3 for once per week; 4 for few times per week; and 5 for everyday (question 22).

FAMSTRUC (family structure) is an ordinal variable that was coded 1 for no parents, 2 for only father, 3 for only mother, and 4 for mother with step father or father with step mother, 5 for both parents (question 23).

FAMSIZE (family size) is an ordinal variable that was coded 1 for 7 or more people, 2 for 5 or 6 people, 3 for 4 people, and 4 for 3 people, and 5 for 2 people (question 24).

The social capital was composed of twelve independent variables: the father's education, the mother's education, the father's use of home computers, the mother's use of home computers, the father's computer experiences and skills, the mother's computer experiences and skills, someone else's computer experiences and skills, the child's leisure time at home, primary computing habits of children's peers, children receiving computer instruction from teachers in the classroom, family structure, and family size.

Cultural capital

MUSEUM (the child visits a museum) is an ordinal variable that was coded 1 for rarely, almost never; 2 for once per year; 3 for once each three month; 4 once per month; and 5 for every week (question 25).

AQUA_ZOO (the child visits a zoo or an aquarium) is an ordinal variable that was coded 1 for rarely, almost never; 2 for once per year; 3 for once each three month; 4 once per month; and 5 for every week (question 26).

LIBRARY (visits a public library) is an ordinal variable that was coded 1 for rarely, almost never; 2 for few times a month; 3 for once per week; 4 for few times per week; and 5 for everyday (question 27).

DANCE (the child goes to a dance class) is an ordinal variable that was coded 1 for rarely, almost never; 2 for once per week; 3 for twice per week; 4 for three times or more per week; and 5 for everyday (question 28).

MUSIC (the child goes to a music class) is an ordinal variable that was coded 1 for rarely, almost never; 2 for once per week; 3 for twice per week; 4 for three times or more per week; and 5 for everyday (question 29).

MART_ART (the child goes to a martial arts class) is an ordinal variable that was coded 1 for rarely, almost never; 2 for once per week; 3 for twice per week; 4 for three times or more per week; and 5 for everyday (question 30).

The cultural capital was composed of six independent variables: the child visits a museum, the child visits a zoo or an aquarium, the child visits a public library, the child goes to a dance class, the child goes to a music class, and the child goes to a martial arts class.

Socioeconomic status

SES (socioeconomic status) is an ordinal variable that was coded 1 for 0 to $15,000 or below, 2 for $15,001 to $30,000, 3 for $30,001 to $45,000, 4 for $45,001 to $60,000, and 5 for $60,001 + (question 36).

Data Collection Procedures

Procedures

Data collection. Initially, I send a letter to the Manoa Elementary School principal requesting permission to collect data from kindergarten to fourth grade students. Also, I send the parents a letter of intent, an informed consent, and a questionnaire to explain the purpose of the study and ask for parents' assistance in completing the parent's questionnaire.

Follow-up. The data was collected from the Manoa Elementary School in the end of Spring 2006.

Research Hypotheses

This section is divided into two parts: conceptual framework and each hypothesis related with questions from the questionnaire.

Conceptual Framework. Through Davis' (1989) work, updated by Spears and Spears (1999) and additional factors that described the home computer environment, we can determine the correlational factors concerning mathematics achievement. Figure 1 shows the conceptual framework of this study. The home computer use, in the highest level of the hierarchy, was associated with the independent variables (factors) in the second level of hierarchy. Each association between factors present in home computer environments and mathematics achievement, in the last level of hierarchy, has a hypothesis.

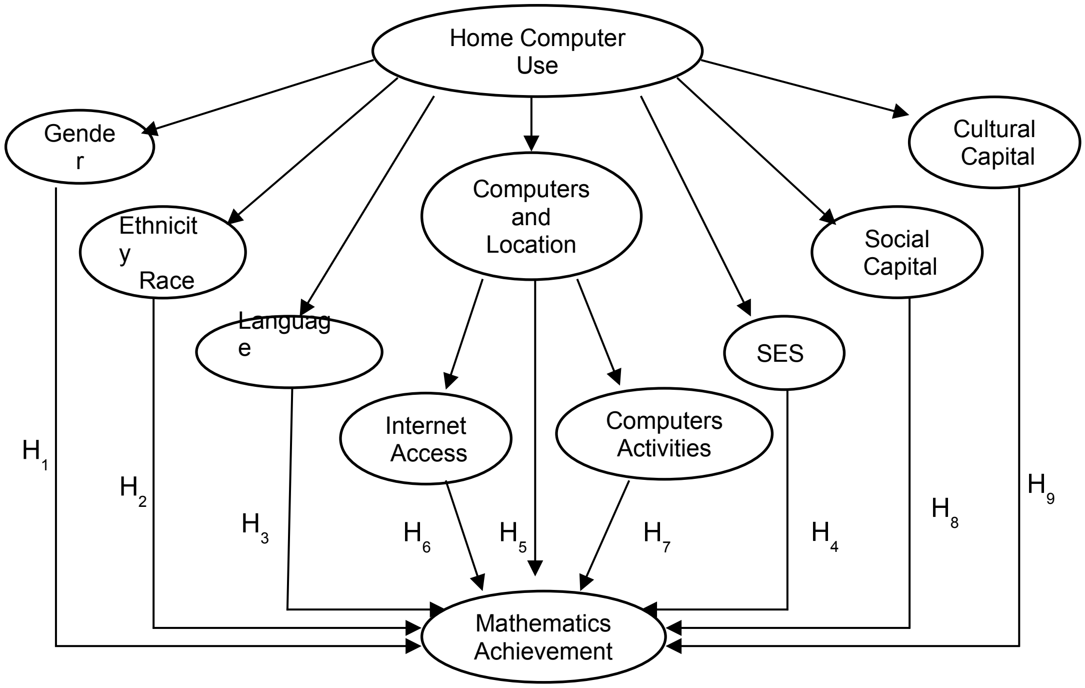

Figure 1. Conceptual Framework Depicting the Relationship between Independent and Dependent Variables of the Study.

The nine research questions for this study are associated with one or more questions from the questionnaire, and one or more statistical techniques to test their hypothesis.

Gender

Research Question 1. Is there a relationship between the gender of K-4 children and mathematics achievement?

Justification for the hypothesis 1. Jacobs and Bleeker (2004) said that in the first grade, boys had a more positive view of their mathematics abilities than girls, but many of these differences disappear in the twelfth grade. On the 1998 SAT, young boys scored in mathematics higher than young girls. More recently, Johnson (2000) reported that in the NAEP 2004, there was no difference between the average mathematics scores of male and female children at age nine.

Hypothesis 1. There is a relationship between the gender of K-4 children and mathematics achievement.

Analysis of Hypothesis 1. GENDER is a nominal variable, and the data comes from the questionnaire (question 2). This hypothesis was tested using the t-test. The .05 level of significance was used for this procedure.

Ethnicity/race

Research Question 2. Is there a relationship between the ethnicity/race of K-4 children and mathematics achievement?

Justification of hypothesis 2. Attewell and Battle (1999) said that Asians had the highest mathematics scores, and American-Africans and Hispanics had lower mathematics scores than whites. Perie and Moran (2005) reported that according to NAEP, the differences between white and African-American students in mathematics achievement scores at all ages decreased from 1973 to 2004.

Hypothesis 2. There is a relationship between the ethnicity/race of K-4 children and mathematics achievement.

Analysis of Hypothesis 2. ETHNIC (ethnicity/race) is a nominal variable, and the data comes from the questionnaire (question 3). This hypothesis was tested using the One-way ANOVA. The .05 level of significance was used for this procedure.

Primary home language

Research Question 3. Is there a relationship between the primary home language of K-4 children and mathematics achievement?

Justification for the hypothesis 3. The primary home language can be a significant factor to measure children's mathematics achievement. Huang (2000) said that in the United States, the children whose primary home language was non-English had a lower mathematics score rate than those whose primary home language was English.

Hypothesis 3. There is a relationship between the primary home language of K-4 children and mathematics achievement.

Analysis of Hypothesis 3. LANGUAGE (primary home language) is a nominal variable, and the data comes from the questionnaire (question 4). This hypothesis was tested using the t-test. The .05 level of significance was used for this procedure.

Socioeconomic status

Research Question 4. Is there a relationship between the socioeconomic status of K-4 children and mathematics achievement?

Justification for the hypothesis 4. SES was the highest factor correlated between home computer use and mathematics achievement. Attewell and Battle (1999) said that when correlating home computer effects with mathematics achievement, it was important to control children's SES because home computer effects on mathematics scores were markedly smaller after controlling for SES. Also, they said that children with lower SES obtain less of an educational effect from using a home computer.

Hypothesis 4. There is a relationship between the socioeconomic status of K-4 children and mathematics achievement.

Analysis of Hypothesis 4. SES (socioeconomic status) is an ordinal variable, and the data comes from the questionnaire (question 36). This hypothesis was tested using the correlation test. The .05 level of significance was used for this procedure.

Number of computers in the home and where they are located

Research Question 5. Is there a relationship between the number of computers in the home and where they are located for K-4 children and mathematics achievement?

Justification for the hypothesis 5. This variable can be strongly affected by the SES of the family and computer assistance. For instance, Ba et al. (2002) explained that families with lower SES usually have only one computer in a public area. As a result, the children's activities were more likely to be shared with the family, and supervised so as to encourage them to use their computers for educational purposes. On the other hand, families with higher SES have more than one computer and the children have their own computers in their bedrooms. As a result, the children were more likely to access the Internet and play games.

Hypothesis 5. There is a relationship between the number of computers in the home (and where they are located) of K-4 children and mathematics achievement.

Analysis of Hypothesis 5. NUM_COMP (number of computers) is an ordinal variable, and the data comes from the questionnaire (question 5). LOCATION (child's computer location) is a nominal variable, and the data comes from the questionnaire (question 6). This hypothesis was tested using the factorial ANOVA. The .05 level of significance was used for this procedure.

A*ccess Internet*

Research Question 6. Is there a relationship between Internet access in homes of K-4 children and mathematics achievement?

Justification for the hypothesis 6. In the last few years, more and more young children have had access to the Internet. For example, the U. S. Department of Education interviewed 56,000 households in 2001 about the use of the Internet. Children from five to seven years old accessed the Internet 53.3 % at school, and 72.0 % at home (USDE, 2003, p. 23). Also, the National Education Technology Standard (NETS) lists the Internet as one of the ten performance indicators at the preK-2 level (Judge et al., 2004, p. 386).

Hypothesis 6. There is a relationship between Internet access at home of K-4 children and mathematics achievement.

Analysis of Hypothesis 6. INTERNET (access to the Internet) is an ordinal variable, and the data comes from the questionnaire (question 7). This hypothesis was tested using the One-way ANOVA. The .05 level of significance was used for this procedure.

Computer Activities

Research Question 7. Is there a relationship between computer activities in homes of K-4 children and mathematics achievement?

Justification for the hypothesis 7. Computer use can be a significant factor to measure children's mathematics achievement. This variable will have six possibilities: games (for fun), educational programs (drill and practice, math learning games), applications and tools (Word, worksheet, etc.), e-mails, research and no computer. Ba et al. (2002) explained that the parents needed to separate computers for fun and for work, set limits on chatting and game playing, get involved in finding good software and web sites, and teach students to manage their time (p. 17). Some studies concluded a negative correlation between playing games on home computers and mathematics achievement (Bensley & van Eenwyk, 2001; "Computers 'can harm learning' – study," 2005; & Holden, 1998). However, other studies concluded a positive correlation between playing games on home computers and mathematics achievement (Aguilera & Mendiz, 2003; Gee, 2005; Harris, 2001; Margoulis, 1988; Messerly, 2004; Salonius-Pastermak, 2005; & Williamsom & Facer, 2004).

Hypothesis 7. There is a relationship between computer activities at home of K-4 children and mathematics achievement.

Analysis of Hypothesis 7. GAMES is an ordinal variable, and the data comes from the questionnaire (question 8). EDU_PROG (educational programs) is an ordinal variable, and the data comes from the questionnaire (question 9). APPLICS (applications and tools) is an ordinal variable, and the data comes from the questionnaire (question 10). E-MAIL is an ordinal variable, and the data comes from the questionnaire (question 11). RESEARCH (child's uses a home computer for research) is an ordinal variable, and the data comes from the questionnaire (question 12). The child's computer activities are composed by five independent variables: games, educational programs, applications and tools, e-mails, and research. The appropriate statistical technique to test this relationship between the mathematics score (dependent variable) and child's computer activities was the regression analysis. The .05 level of significance was used for this procedure.

Social capital

Research Question 8. Is there a relationship between the social capital of K-4 children and mathematics achievement?

Justification for the hypothesis 8. When family and community members supervise, monitor, and provide leadership for children, the computer environment has a strong social capital, and the home computer becomes a tool that can have a positive correlation with mathematics achievement. Conversely, where this social structure is weak, the young children cannot benefit from technology effectively to reinforce the mathematics skills. In the literature, many examples highlighted the power of the social capital. Johnson (2000) said that the educational attainment of a child's parents was a good predictor to improve academic achievement. For example, college-educated parents can be better equipped to help their children with explanations about concepts and exercises than a high school educated parent. Ba et al.

(2002) said that parents with computer skills from their jobs and schooling were able to show rich and varied uses of computers, and engaged their children in critical talks about the Internet. They also said that children from high SES families had more leisure time at home to develop skills and use their computers for varied purposes. On the other hand, children from low SES families had less leisure time at home because of their schools' extended-day schedule, and used their computers primarily for homework (p. 33). Family structure was used by Attewell and Battle (1999); I defined this variable with four key elements: both parents, only mother, only father, and no parents. When one or both parents were not present, the social capital was weaker than when they were present. Ba et al. (2002) said that the computing habits of the child's peers could influence home computer use. Children's online communication usually depended on what their peers were doing. For example, peers from low-income families used the Internet less to send e-mails. On the other hand, peers from high-income families used the Internet more to use Instant Messenger (IM).

Hypothesis 8. There is a relationship between the social capital of K-4 children and mathematics achievement.

Analysis of Hypothesis 8. FATHERED (father's education) is a variable, and the data comes from the questionnaire (question 13). MOTHERED (mother's education) is an ordinal variable, and the data comes from the questionnaire (question 14). FATHERUS (father's use of home computers) is an ordinal variable, and the data comes from the questionnaire (question 15). MOTHERUS (mother's use of home computers) is an ordinal variable, and the data comes from the questionnaire (question 16). FATHEREX (father's computer experiences and skills) is an ordinal variable, and the data comes from the questionnaire (question 17). MOTHEREX (mother's computer experiences and skills) is an ordinal variable, and the data comes from the questionnaire (question 18). SOMEONEX (Someone else's - siblings, relatives, neighbors, etc.) computer experiences and skills) is an ordinal variable, and the data comes from the questionnaire (question 19). LEISURE (child's leisure time) is an ordinal variable, and the data comes from the questionnaire (question 20). HAB_PEER (primary computing habits of children's peers) is an ordinal variable, and the data comes from the questionnaire (question 21). INSTRUCT (children receiving computer instruction from teachers in the classroom) is an ordinal variable, and the data comes from the questionnaire (question 22). FAMSTRUC (family structure) is an ordinal variable, and the data comes from the questionnaire (question 23). FAMSIZE (family size) is an ordinal variable, and the data comes from the questionnaire (question 24). The social capital was composed of twelve independent variables: the father's education, the mother's education, the father's use of home computers, the mother's use of home computers, the father's computer experiences and skills, the mother's computer experiences and skills, someone else's computer experiences and skills, the child's leisure time at home, primary computing habits of the child's peers, children receiving computer instruction from teachers in the classroom, family structure, and family size. The appropriate statistical technique to test this relationship between the mathematics score (dependent variable) and social capital (independent variables) was the multiple regression analysis. The .05 level of significance was used for this procedure.

Cultural capital

Research Question 9. Is there a relationship between the cultural capital of K-4 children and mathematics achievement?

Justification for the hypothesis 9. Attewell and Battle (1999) said that ordinary educational institutions incorporate cultural capital in their activities as something that pupils were expected to have already. Besides, they said that children from families with substantial cultural capital had more academic advantages than children that did not have cultural capital. Therefore, children from families with high cultural capital found school education easier than others from families with low cultural capital.

Hypothesis 9. There is a relationship between the cultural capital of K-4 children and mathematics achievement.

Analysis of Hypothesis 9. MUSEUM (the child visits a museum) is an ordinal variable, and the data comes from the questionnaire (question 25). AQUA_ZOO (the child visits a zoo or an aquarium) is an ordinal variable, and the data comes from the questionnaire (question 26). LIBRARY (the child visits a public library) is an ordinal variable, and the data comes from the questionnaire (question 27). DANCE (the child goes to a dance class) is an ordinal variable, and the data comes from the questionnaire (question 28). MUSIC (the child goes to a music class) is an ordinal variable, and the data comes from the questionnaire (question 29). MART_ART (the child goes to a martial arts class) is an ordinal variable, and the data comes from the questionnaire (question 30). The cultural capital was composed of six independent variables: the child visits a museum, the child visits a zoo or an aquarium, the child visits a public library, the child goes to a dance class, the child goes to a music class, and the child goes to a martial arts class. The appropriate statistical technique to test this relationship between the mathematics score (dependent variable) and cultural capital (independent variables) was the regression analysis. The .05 level of significance was used for this procedure.

Finally, a general regression analysis between the dependent variable mathematics achievement and child's computer activities, social capital, cultural capital, and SES are used. For child's computer activities, social capital, and cultural capital are used only for the significant factors, which were selected in the previous regression. The .05 level of significance was used for this procedure.

Strengths and Weaknesses

Strengths

Manoa Elementary School is located in a middle-and-high SES area, where the home computer is used relatively more than a low SES area. Therefore, it was a convenient school for the purpose of this paper.

Weaknesses

The sample of this study was too small. If I had more time and money to complete this project, I would send a letter to other DOE schools to increase the sample size.

Summary

This research is a non-experimental design, which collects all the data through a survey. The population was taken from parents who have K-4 children at Manoa Elementary School, located in Honolulu, Hawaii. Also, the mathematics achievement was provided through the official status report, a Department of Education standard, in the State of Hawaii. Also, the instrumentation that was used in this study to evaluate the children's performance was the Manoa Elementary School Status report, a letter to the Manoa Elementary School principal, a letter of intent, an informed consent, and a questionnaire.

Another important aspect of the methodology was the conceptual framework and a discussion about how the data was related to each hypothesis.

Manoa Elementary School is located in a middle-and-high SES area, where the home computer is used relatively more than in a low SES area. Therefore, it was a convenient school for the purpose of this paper.

According to Gay (1996), about 50% of the population size should be sampled when the population size was approximately 400. However, it was not realistic to plan to sample about 200 parents because I estimated that only 120 parents (30% of the population) would have enough time to complete the survey.

Convenient sampling was selected for this study. Manoa Elementary School is located in a middle-and-high SES area, where the home computer is used relatively more than in a low SES area. In particular, the school was close to my residence; consequently, I was not spending time and money on transportation; important factors to complete this study.

Chapter four provides the outcome of the response rate and reliability of the instrument used to gather the data. Also, it includes the population and sample, method of inquiry, and instruments and procedures used to collect the data, as well as the results of analysis of data.

Chapter 4 – Analysis

Purpose

The purpose of this paper was to investigate the effects of home computers on mathematics achievement from kindergarten to fourth grade children. The correlation between mathematics achievement and key elements or factors that described children's family backgrounds was measured. Each factor present in the domestic computing environment that could potentially influence the mathematics performance was: gender, ethnicity and race, socioeconomic status, primary home language, the number of computers in the home and where they are located, Internet access at home, computer activities at home, social capital, and cultural capital.

Purpose of chapter

The purpose of Chapter Four is to present a detailed analysis of the data collected in the survey. The descriptive statistics about the results from the parents' questionnaire were analyzed. The reliability of the instrument developed for this research was evaluated. Nine research questions were tested through several statistical methods in order to determine the relationships between the mathematics achievement (dependent variable) and the factors (independent variables) that described children's family backgrounds. The research questions investigated in this study included the following:

Research Question 1. Is there a relationship between the gender of K-4 children and mathematics achievement?

Research Question 2. Is there a relationship between the ethnicity/race of K-4 children and mathematics achievement?

Research Question 3. Is there a relationship between the primary home language of K-4 children and mathematics achievement?

Research Question 4. Is there a relationship between the socioeconomic status of K-4 children and mathematics achievement?

Research Question 5. Is there a relationship between the number of computers in the home (and where they are located) of K-4 children and mathematics achievement?

Research Question 6. Is there a relationship between Internet access at home of K-4 children and mathematics achievement?

Research Question 7. Is there a relationship between computer activities at home of K-4 children and mathematics achievement?

Research Question 8. Is there a relationship between the social capital of K-4 children and mathematics achievement?

Research Question 9. Is there a relationship between the cultural capital of K-4 children and mathematics achievement?

In short, the purpose of this chapter was to work as a foundation from which conclusions regarding the research questions were drawn in the final chapter.

Chapter organization

Chapter Four was organized into three main sections: Preliminary Analysis, Research Questions Analysis, and a Summary.

The first section, Preliminary Analysis, consists of two subsections: descriptive statistics, and reliability analysis. The descriptive statistics subsection presents the results of the parents' survey. The frequency of the answers of the thirty-six questions about the children's computing environment and mathematics achievements were shown. The reliability analysis subsection tests the reliability of the instrument, in other words, the internal consistency of the collected data.

The second section, Research Questions Analysis, analyzes the nine research questions.

The third section provides a brief summary of Chapter Four that concludes the analysis and transitions to Chapter Five.

Preliminary Analysis

The preliminary analysis consisted of two subsections: descriptive statistics and reliability analysis. The descriptive statistics subsection presents the results of the parents' survey. The frequency of the answers of the thirty-six questions about the children's computing environment and mathematics achievements were shown. The reliability analysis subsection examines the reliability of the measurement instrument used to collect the data. Four hundred parents, who had K-4 children from Manoa Elementary School, received a letter of intent, an informed consent, and a questionnaire. The overall survey return rate was 30.5%, and the number of parents who participated in this study was 122. In the next subsection, the descriptive statistics present the results of the parents' answers of the thirty-six questions about the children's computing environment and mathematics achievements.

Descriptive Statistics

The frequencies, percentages, and Ns of each of the categorical (independent) variables are indicated in Tables 1 to 31. The frequencies, percentages, and Ns of each of the mathematics subjects are indicated in Tables 32 to 36. The mean, standard deviation, frequencies, percentages, and Ns of the dependent variable are presented in Tables 37 to 38.

Table 1

Frequencies of the Independent Variable Grade

	Frequency	Percentage	Cumulative Percent
Kindergarteners	29	23.8	23.8
First Graders	36	29.5	53.3
Second Graders	23	18.9	72.1
Third Graders	15	12.3	84.4
Fourth Graders	19	15.6	100.0
Total	122	100.0	

Notes: N = 122

Table 2

Frequencies of the Independent Variable Gender

	Frequency	Percentage	Cumulative Percent
Female	53	43.4	43.4
Male	69	56.6	100.0
Total	122	100.0	43.4

Notes: N = 122

Table 3

Frequencies of the Independent Variable Ethnicity/Race

	Frequency	Percentage	Cumulative Percent
White	24	19.7	19.7
Japanese	51	41.8	61.5
Chinese	20	16.4	77.9
Korean	8	6.6	84.4
Others	19	15.6	100.0
Total	122	100.0	

Notes: N = 122

Table 4

Frequencies of the Independent Variable Primary Home Language

Primary Home Language	Frequency	Percentage	Cumulative Percent
English	102	83.6	83.6
Non-English	20	16.4	100.0
Total	122	100.0	

Notes: N = 122

Table 5

Frequencies of the Independent Variable Number of Computers

Number of Computers	Frequency	Percentage	Cumulative Percent
Have no computer at home	5	4.1	4.1
One computer	53	43.4	47.5
Two computers	43	35.2	82.8
Three computers	16	13.1	95.9
Four or more computers	5	4.1	100.0
Total	122	100.0	

Notes: N = 122

Table 6

Frequencies of the Independent Variable Child's Computer Location

Computer Location	Frequency	Percentage	Cumulative Percent
Have no computer at home	5	4.1	4.1
Public area	94	77.0	81.1
Child's bedroom	23	18.9	100.0
Total	122	100.0	

Notes: N = 122

Table 7

Frequencies of the Independent Variable Access to Internet per Graders

Access to Internet	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Rarely, almost never	16	55.2	17	47.2	10	43.5	3	20.0	9	47.4	55	45.1
A few times for month	4	13.8	9	25.0	7	30.4	7	46.7	5	26.3	32	26.2
Once per week	4	13.8	1	2.8	2	8.7	3	20.0	0	0.0	10	8.2
A few times per week	4	13.8	8	22.2	4	17.4	2	13.3	4	21.1	22	18.0
Everyday	1	3.4	1	2.8	0	0.0	0	0.0	1	5.3	3	2.5
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 8

Frequencies of the Independent Variable Games per Graders

Games	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Rarely, almost never	9	31.0	11	30.6	8	34.8	1	6.7	4	21.1	33	27.0
A few times for month	11	37.9	6	16.7	7	30.4	7	46.7	6	31.6	37	30.3
Once per week	4	13.8	3	8.3	2	8.7	2	13.3	3	15.8	14	11.5
A few times per week	5	17.2	14	38.9	5	21.7	5	33.3	4	21.1	33	27.0
Everyday	0	0.0	2	5.6	1	4.3	0	0.0	2	10.5	5	4.1
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 9

Frequencies of the Independent Variable Educational Programs per Graders

Educational Programs	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Rarely, almost never	10	34.5	10	27.8	9	39.1	7	46.7	7	36.8	43	35.2
A few times for month	11	37.9	11	30.6	10	43.5	3	20.0	6	31.6	41	33.6
Once per week	5	17.2	7	19.4	1	4.3	2	13.3	4	21.1	19	15.6
A few times per week	3	10.3	5	13.9	2	8.7	3	20.0	2	10.5	15	12.3
Everyday	0	0.0	3	8.3	1	4.3	0	0.0	0	0.0	4	3.3
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 10

Frequencies of the Independent Variable Applications and Tools per Graders

Applications and Tools	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Rarely, almost never	29	100.0	34	94.4	22	95.7	13	86.7	11	57.9	109	89.3
A few times for month	0	0.0	1	2.8	0	0.0	2	13.3	6	31.6	9	7.4
Once per week	0	0.0	0	0.0	0	0.0	0	0.0	1	5.3	1	0.8
A few times per week	0	0.0	1	2.8	0	0.0	0	0.0	0	0.0	1	0.8
Everyday	0	0.0	0	0.0	1	4.3	0	0.0	1	5.3	2	1.6
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 11

Frequencies of the Independent Variable E-mail per Graders

E-mail	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Rarely, almost never	27	93.1	35	97.2	20	87.0	13	86.7	17	89.5	112	91.8
A few times for month	2	6.9	0	0.0	3	13.0	2	13.3	1	5.3	8	6.6
Once per week	0	0.0	1	2.8	0	0.0	0	0.0	0	0.0	1	0.8
A few times per week	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Everyday	0	0.0	0	0.0	0	0.0	0	0.0	1	5.3	1	0.8
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 12

Frequencies of the Independent Variable Research per Graders

Research	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Rarely, almost never	24	82.8	27	75.0	18	78.3	4	26.7	5	26.3	78	63.9
A few times for month	3	10.3	5	13.9	5	21.7	9	60.0	12	63.2	34	27.9
Once per week	1	3.4	3	8.3	0	0.0	0	0.0	1	5.3	5	4.1
A few times per week	1	3.4	1	2.8	0	0.0	2	13.3	1	5.3	5	4.1
Everyday	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 13

Frequencies of the Independent Variable Father's Education per Graders

Father's Education	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Elementary school	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Middle school	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
High school	3	10.3	5	13.9	2	8.7	0	0.0	2	10.5	12	9.8
College, university, or professional school	14	48.3	21	58.3	12	52.2	10	66.7	12	63.2	69	56.6
Graduate school	12	41.4	10	27.8	9	39.1	5	33.3	5	26.3	41	33.6
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 14

Frequencies of the Independent Variable Mother's Education per Graders

Mother's Education	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Elementary school	0	0.0	1	2.8	0	0.0	0	0.0	0	0.0	1	0.8
Middle school	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
High school	0	0.0	4	11.1	1	4.3	2	13.3	1	5.3	8	6.6
College, university, or professional school	22	75.9	25	69.4	15	65.2	10	66.7	13	68.4	85	69.7
Graduate school	7	24.1	6	16.7	7	30.4	3	20.0	5	26.3	28	23.0
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 15

Frequencies of the Independent Variable Father's Use of Home computer per Graders

Father's Use of Home computer	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Rarely, almost never	1	3.4	4	11.1	5	21.7	0	0.0	4	21.1	14	11.5
A few times for month	1	3.4	0	0.0	2	8.7	0	0.0	2	10.5	5	4.1
Once per week	0	0.0	1	2.8	0	0.0	1	6.7	2	10.5	4	3.3
A few times per week	7	24.1	14	38.9	1	4.3	3	20.0	3	15.8	28	23.0
Everyday	20	69.0	17	47.2	15	65.2	11	73.3	8	42.1	71	58.2
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 16

Frequencies of the Independent Variable Mother's Use of Home computer per Graders

Mother's Use of Home computer	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Rarely, almost never	2	6.9	2	5.6	4	17.4	1	6.7	2	10.5	11	9.0
A few times for month	1	3.4	4	11.1	4	17.4	2	13.3	2	10.5	13	10.7
Once per week	2	6.9	0	0.0	0	0.0	0	0.0	1	5.3	3	2.5
A few times per week	8	27.6	11	30.6	6	26.1	2	13.3	5	26.3	32	26.2
Everyday	16	55.2	19	52.8	9	39.1	10	66.7	9	47.4	63	51.6
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 17

Frequencies of the Independent Variable Father's Computer Experiences and Skills per Graders

Father's Computer Experiences and Skills	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
The father does not live with the child	2	6.9	2	5.6	0	0.0	0	0.0	1	5.3	5	4.1
Poor	1	3.4	2	5.6	2	8.7	1	6.7	1	5.3	7	5.7
Medium	4	13.8	4	11.1	2	8.7	2	13.3	7	36.8	19	15.6
Good	11	37.9	13	36.1	7	30.4	7	46.7	6	31.6	44	36.1
Excellent	11	37.9	15	41.7	12	52.2	5	33.3	4	21.1	47	38.5
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 18

Frequencies of the Independent Variable Mother's Computer Experiences and Skills per Graders

Mother's Computer Experiences and Skills	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
The mother does not live with the child	0	0.0	1	2.8	1	4.3	0	0.0	0	0.0	2	1.6
Poor	0	0.0	2	5.6	4	17.4	1	6.7	0	0.0	7	5.7
Medium	8	27.6	8	22.2	7	30.4	4	26.7	5	26.3	32	26.2
Good	12	41.4	15	41.7	5	21.7	8	53.3	12	63.2	52	42.6
Excellent	9	31.0	10	27.8	6	26.1	2	13.3	2	10.5	29	23.8
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 19

Frequencies of the Independent Variable Someone Else's Computer Experiences and Skills per Graders

Someone Else's Computer Experiences and Skills	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
No, there is not	15	51.7	17	47.2	14	60.9	5	33.3	10	52.6	61	50.0
Yes, and his/her experiences are poor	0	0.0	2	5.6	1	4.3	0	0.0	1	5.3	4	3.3
Yes, and his/her experiences are medium	3	10.3	4	11.1	2	8.7	2	13.3	2	10.5	13	10.7
Yes, and his/her experiences are good	8	27.6	11	30.6	5	21.7	6	40.0	4	21.1	34	27.9
Yes, and his/her experiences are excellent	3	10.3	2	5.6	1	4.3	2	13.3	2	10.5	10	8.2
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 20

Frequencies of the Independent Variable Child's Leisure Time per Graders

Child's Leisure Time	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Rarely, almost never	1	3.4	2	5.6	1	4.3	1	6.7	0	0.0	5	4.1
A few times for month	1	3.4	1	2.8	1	4.3	1	6.7	3	15.8	7	5.7
Once per week	2	6.9	2	5.6	0	0.0	0	0.0	2	10.5	6	4.9
A few times per week	9	31.0	18	50.0	6	26.1	6	40.0	8	42.1	47	38.5
Everyday	16	55.2	13	36.1	15	65.2	7	46.7	6	31.6	57	46.7
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 21

Frequencies of the Independent Variable Primary Computing Habits of Children's Peers per Graders

Variable Primary Computing Habits of Children's Peers	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
I don't know	18	62.1	23	63.9	19	82.6	7	46.7	12	63.2	79	64.8
Games	7	24.1	7	19.4	4	17.4	3	20.0	4	21.1	25	20.5
E-mail	0	0.0	1	2.8	0	0.0	1	6.7	0	0.0	2	1.6
Educative programs or applications	1	3.4	3	8.3	0	0.0	1	6.7	1	5.3	6	4.9
Internet for research	3	10.3	2	5.6	0	0.0	3	20.0	2	10.5	10	8.2
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 22

Frequencies of the Independent Variable Children Receiving Computer Instructions in the Classroom per Graders

Children Receiving Computer Instructions in the Classroom	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Rarely, almost never	4	13.8	5	13.9	1	4.3	2	13.3	5	26.3	17	13.9
A few times for month	18	62.1	12	33.3	12	52.2	9	60.0	5	26.3	56	45.9
Once per week	7	24.1	15	41.7	6	26.1	2	13.3	6	31.6	36	29.5
A few times per week	0	0.0	3	8.3	2	8.7	1	6.7	2	10.5	8	6.6
Everyday	0	0.0	1	2.8	2	8.7	1	6.7	1	5.3	5	4.1
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 23

Frequencies of the Independent Variable Family Structure per Graders

Family Structure	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
No parents	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Only father	0	0.0	1	2.8	1	4.3	1	6.7	0	0.0	3	2.5
Only mother	2	6.9	1	2.8	0	0.0	1	6.7	0	0.0	4	3.3
Mother with step father or father with step mother	0	0.0	0	0.0	1	4.3	1	6.7	1	5.3	3	2.5
Both parents	27	93.1	34	94.4	21	91.3	12	80.0	18	94.7	112	91.8
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 24

Frequencies of the Independent Variable Family Size per Graders

Family Size	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
7 or more people	0	0.0	4	11.1	0	0.0	0	0.0	0	0.0	4	3.3
5 or 6 people	10	34.5	8	22.2	8	34.8	6	40.0	5	26.3	37	30.3
4 people	12	41.4	19	52.8	11	47.8	5	33.3	9	47.4	56	45.9
3 people	4	13.8	5	13.9	3	13.0	4	26.7	5	26.3	21	17.2
2 people	3	10.3	0	0.0	1	4.3	0	0.0	0	0.0	4	3.3
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 25

Frequencies of the Independent Variable the Child Visits a Museum per Graders

Museum	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Rarely, almost never	5	17.2	8	22.2	5	21.7	1	6.7	7	36.8	26	21.3
A few times for month	12	41.4	16	44.4	10	43.5	11	73.3	6	31.6	55	45.1
Once per week	7	24.1	11	30.6	5	21.7	3	20.0	5	26.3	31	25.4
A few times per week	4	13.8	1	2.8	3	13.0	0	0.0	1	5.3	9	7.4
Everyday	1	3.4	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 26

Frequencies of the Independent Variable the Child visits a Zoo or Aquarium per Graders

Zoo or Aquarium	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Rarely, almost never	2	6.9	2	5.6	1	4.3	0	0.0	1	5.3	6	4.9
A few times for month	15	51.7	21	58.3	16	69.6	12	80.0	14	73.7	78	63.9
Once per week	10	34.5	12	33.3	4	17.4	3	20.0	3	15.8	32	26.2
A few times per week	1	3.4	1	2.8	2	8.7	0	0.0	1	5.3	5	4.1
Everyday	1	3.4	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 27

Frequencies of the Independent Variable the Child visits a Public Library per Graders

Public Library	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Rarely, almost never	12	41.4	16	44.4	6	26.1	6	40.0	7	36.8	47	38.5
A few times for month	13	44.8	17	47.2	14	60.9	6	40.0	10	52.6	60	49.2
Once per week	4	13.8	2	5.6	2	8.7	3	20.0	2	10.5	13	10.7
A few times per week	0	0.0	1	2.8	1	4.3	0	0.0	0	0.0	2	1.6
Everyday	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 28

Frequencies of the Independent Variable the Child Goes to a Dance Class per Graders

Dance Class	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Rarely, almost never	18	62.1	27	75.0	20	87.0	10	66.7	16	84.2	91	74.6
A few times for month	9	31.0	9	25.0	2	8.7	4	26.7	1	5.3	25	20.5
Once per week	2	6.9	0	0.0	1	4.3	0	0.0	2	10.5	5	4.1
A few times per week	0	0.0	0	0.0	0	0.0	1	6.7	0	0.0	1	0.8
Everyday	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 29

Frequencies of the Independent Variable the Child Goes to a Music Class per Graders

Music Class	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Rarely, almost never	19	65.5	27	75.0	15	65.2	7	46.7	12	63.2	80	65.6
A few times for month	8	27.6	6	16.7	8	34.8	6	40.0	4	21.1	32	26.2
Once per week	1	3.4	1	2.8	0	0.0	1	6.7	2	10.5	5	4.1
A few times per week	1	3.4	1	2.8	0	0.0	1	6.7	0	0.0	3	2.5
Everyday	0	0.0	1	2.8	0	0.0	0	0.0	1	5.3	2	1.6
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 30

Frequencies of the Independent Variable the Child Goes to a Martial Arts Class per Graders

Martial Arts Class	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Rarely, almost never	24	82.8	28	77.8	20	87.0	10	66.7	19	100.0	101	82.8
A few times for month	0	0.0	3	8.3	1	4.3	2	13.3	0	0.0	6	4.9
Once per week	2	6.9	2	5.6	1	4.3	2	13.3	0	0.0	7	5.7
A few times per week	3	10.3	3	8.3	1	4.3	1	6.7	0	0.0	8	6.6
Everyday	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 31

Frequencies of the Independent Variable SES per Graders

SES	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
$0 to $15,000	2	6.9	1	2.8	1	4.3	1	6.7	0	0.0	5	4.1
$15,001 to $30,000	1	3.4	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8
$30,001 to $45,000	1	3.4	2	5.6	2	8.7	1	6.7	2	10.5	8	6.6
$45,001 to $60,000	4	13.8	6	16.7	3	13.0	3	20.0	2	10.5	18	14.8
$60,001+	21	72.4	27	75.0	17	73.9	10	66.7	15	78.9	90	73.8
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 32

Frequencies of the Dependent Variable Numbers and Operations in Mathematics Achievements per Graders

Numbers and Operations	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
No progress	1	3.4	2	5.6	1	4.3	2	13.3	1	5.3	7	5.7
Little progress	9	31.0	22	61.1	15	65.2	8	53.3	10	52.6	64	52.5
Adequate progress	6	20.7	10	27.8	7	30.4	5	33.3	8	42.1	36	29.5
More than adequate progress	13	44.8	1	2.8	0	0.0	0	0.0	0	0.0	14	11.5
Not applicable	0	0.0	1	2.8	0	0.0	0	0.0	0	0.0	1	0.8
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 33

Frequencies of the Dependent Variable Measurement in Mathematics Achievements per Graders

Measurement	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
No progress	1	3.4	0	0.0	1	4.3	0	0.0	0	0.0	2	1.6
Little progress	2	6.9	3	8.3	1	4.3	0	0.0	2	10.5	8	6.6
Adequate progress	9	31.0	19	52.8	9	39.1	6	40.0	10	52.6	53	43.4
More than adequate progress	3	10.3	4	11.1	5	21.7	4	26.7	5	26.3	21	17.2
Not applicable	14	48.3	10	27.8	7	30.4	5	33.3	2	10.5	38	31.1
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 34

Frequencies of the Dependent Variable Geometry and Spatial Sense in Mathematics Achievements per Graders

Geometry and Spatial Sense	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
No progress	2	6.9	1	2.8	0	0.0	0	0.0	0	0.0	3	2.5
Little progress	1	3.4	1	2.8	1	4.3	2	13.3	3	15.8	8	6.6
Adequate progress	16	55.2	17	47.2	11	47.8	5	33.3	9	47.4	58	47.5
More than adequate progress	5	17.2	7	19.4	2	8.7	3	20.0	5	26.3	22	18.0
Not applicable	5	17.2	10	27.8	9	39.1	5	33.3	2	10.5	31	25.4
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 35

Frequencies of the Dependent Variable Patterns, Functions, and Algebra in Mathematics Achievements per Graders

Patterns, Functions, and Algebra	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
No progress	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Little progress	1	3.4	4	11.1	0	0.0	0	0.0	1	5.3	6	4.9
Adequate progress	12	41.4	20	55.6	14	60.9	6	40.0	12	63.2	64	52.5
More than adequate progress	11	37.9	8	22.2	5	21.7	4	26.7	3	15.8	31	25.4
Not applicable	5	17.2	4	11.1	4	17.4	5	33.3	3	15.8	21	17.2
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 36

Frequencies of the Dependent Variable Data, Analysis, Statistics, and Probability in Mathematics Achievements per Graders

Variable Data, Analysis, Statistics, and Probability	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
No progress	1	3.4	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8
Little progress	1	3.4	2	5.6	1	4.3	0	0.0	3	15.8	7	5.7
Adequate progress	12	41.4	18	50.0	7	30.4	5	33.3	8	42.1	50	41.0
More than adequate progress	8	27.6	4	11.1	3	13.0	4	26.7	4	21.1	23	18.9
Not applicable	7	24.1	12	33.3	12	52.2	6	40.0	4	21.1	41	33.6
Total	29	100.0	36	100.0	23	100.0	15	100.0	19	100.0	122	100.0

Notes: N = 122

Table 37

Descriptive Statistics of mathematics Achievement

	N	Minimum	Maximum	Mean	Std. Deviation
Mathematics Achievement	122	41.7	100.0	79.194	13.6529
Valid N (listwise)	122				

Table 38

Frequencies of the Dependent Variable Mathematics Achievements per Graders

Mathematics Achievements	School Grades											
	Kindergarten		First Grade		Second Grade		Third Grade		Forth Grade		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
41.7	1	3.4	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8
45.0	1	3.4	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8
50.0	1	3.4	2	5.6	1	4.3	2	13.3	1	5.3	7	5.7
60.0	0	0.0	0	0.0	1	4.3	0	0.0	0	0.0	1	0.8
62.5	0	0.0	1	2.8	0	0.0	0	0.0	0	0.0	1	0.8
65.0	1	3.4	1	2.8	0	0.0	0	0.0	1	5.3	3	2.5
68.8	0	0.0	0	0.0	0	0.0	1	6.7	0	0.0	1	0.8
70.0	0	0.0	0	0.0	1	4.3	0	0.0	2	10.5	3	2.5
75.0	11	37.9	19	52.8	14	60.9	6	40.0	7	36.8	57	46.7
80.0	0	0.0	3	8.3	0	0.0	1	6.7	1	5.3	5	4.1
81.1	1	3.4	0	0.0	0	0.0	0	0.0	0	0.0	1	0.8
81.3	1	3.4	1	2.8	0	0.0	0	0.0	0	0.0	2	1.6
83.3	3	10.3	0	0.0	0	0.0	0	0.0	0	0.0	3	2.5
85.0	0	0.0	1	2.8	0	0.0	1	6.7	2	10.5	4	3.3
87.5	0	0.0	0	0.0	1	4.3	0	0.0	1	5.3	2	1.6
91.7	2	6.9	1	2.8	0	0.0	0	0.0	0	0.0	3	2.5
95.0	0	0.0	2	5.6	3	13.0	0	0.0	1	5.3	6	4.9

Table 38 (continue)

100.0	7	24.1	5	13.9	2	8.7	4	26.7	3	15.8	21	17.2
Total	29	100	36	100	23	100	15	100	19	100	122	100

Notes: N = 122

Reliability

The reliability of the instrument developed for this research was evaluated. The data collected from the parents' survey was tested for internal consistency by computing Chronbach's coefficient alpha. The coefficient alpha for the thirty-six measures of mathematics achievement and home computer environment was 0.6102. This indicated that the parents' survey data shows relatively moderate internal consistency (see Tables 130 and 131, Appendix E).

Research Questions Analysis

Research Question 1

The first question posed by this study was: Is there a relationship between the gender of K-4 children and mathematics achievement? The hypothesis number one was there is a relationship between the gender of K-4 children and mathematics achievement. Question 1 was investigated using a t-test with the 0.05 level of significance.

Results. The results of the t-test are indicated in Tables 39 to 40. The mean score for females on mathematics achievement was 80.335 and the mean score for males was 78.317. The Levene's test indicated that the assumption of equality of variances was not violated. The results of the t-test indicated that there were no significant differences between males and females ($p = 0.421$); therefore, the hypothesis that there is a relationship between the gender of K-4 children and mathematics achievement was not supported by the results.

Table 39

Group Statistics of Gender and Mathematics Achievement

Mathematics Achievement

Gender	N	Mean	SD	SE of Mean
Female	53	80.335	12.2495	1.6826
Male	69	78.317	14.6679	1.7658

Table 40

Results of the t-tests for Independent Samples of Gender and Mathematics Achievement

Levene's Test for Equality of Variances: F = 0.540 P = 0.464

	t-test for Equality of Means						
						95% CI for Diff	
Variances	t-value	df	Sig (2-Tail)	Mean Diff	SE of Diff	Lower	Upper
Equal	.808	120	.421	2.018	2.4973	-2.9265	6.9624

Research Question 2

The second question posed by this study was: Is there a relationship between the ethnicity/race of K-4 children and mathematics achievement? The hypothesis number two was there is a relationship between the ethnicity/race of K-4 children and mathematics achievement. Question 2 was investigated using the One-way ANOVA with the 0.05 level of significance.

Results. The results of the one-way ANOVA are presented in Tables 41 to 43. Table 41, Levene's Test for Equality of Variances, indicates that the assumption of equality of variances was violated (p = 0.044), which required the alternative method of computing the statistics to be employed. As shown in Table 42, The White and Japanese had better mathematics achievement means than Chinese, Korean, and the others. However, Table 43, mathematics achievement between groups, indicates that mathematics achievement and ethnicity/race of K-4 children was not significant (P > 0.05). Therefore, the hypothesis that there is a relationship between the ethnicity/race of K-4 children and mathematics achievement was not supported.

Table 41

Levene's Test for Equality of Variances for Ethnicity/Race

Levene Statistic	df1	df2	Sig.
2.536	4	117	.044*

Table 42

One-Way Analysis of Variance for Ethnicity/Race

Mathematics Achievement

	N	Mean	Std. Deviation	Std. Error	95% CI for Mean		Minimum	Maximum
					Lower	Upper		
White	24	82.000	14.7484	3.0105	75.772	88.228	50.0	100.0
Japanese	51	79.029	14.4565	2.0243	74.963	83.095	41.7	100.0
Chinese	20	78.750	15.2069	3.4004	71.633	85.867	45.0	100.0
Korean	8	77.350	15.4423	5.4597	64.440	90.260	50.0	100.0
Others	19	77.335	6.4642	1.4830	74.220	80.451	70.0	100.0
Total	122	79.194	13.6529	1.2361	76.747	81.641	41.7	100.0

Table 43

Mathematics Achievement Between Groups for Ethnicity/Race

Mathematics Achievement

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	287.128	4	71.782	0.377	0.825
Within Groups	22267.574	117	190.321		
Total	22554.702	121			

Research Question 3

The third question posed by this study was: Is there a relationship between the primary home language of K-4 children and mathematics achievement? The hypothesis number three was there is a relationship between the primary home language of K-4 children and mathematics achievement. Question 3 was investigated using a t-test with the 0.05 level of significance.

Results. The results of the t-test are indicated in Tables 44 and 45. The mathematics achievement mean for children, whose primary home language was English, was 81.086, and the mathematics achievement mean for children, whose primary home language was non-English, was 75.357. The Levene's test indicated that the assumption of equality of variances was not violated. The results of the t-test indicated that there were no significant differences between the primary home language groups ($p = 0.119$); therefore, the hypothesis that there is a relationship between the primary home language of K-4 children and mathematics achievement was not supported by the results.

Table 44

Group Statistics of Primary Home Language and Mathematics Achievement

Mathematics Achievement

Primary Home Language	N	Mean	SD	SE of Mean
English	102	80.049	13.0949	1.2966
Non-English	20	74.835	15.8631	3.5471

Table 45

Results of the t-tests for Independent Samples of Primary Home Language and Mathematics Achievement

Levene's Test for Equality of Variances: F = 0.000 P = 0.995

	t-test for Equality of Means						
						95% CI for Diff	
Variances	t-value	df	Sig (2-Tail)	Mean Diff	SE of Diff	Lower	Upper
Equal	1.571	120	.119	5.214	3.3187	-1.357	11.7846

Research Question 4

The fourth question posed by this study was: Is there a relationship between the socioeconomic status of K-4 children and mathematics achievement? The hypothesis number four was there is a relationship between the socioeconomic status of K-4 children and mathematics achievement. Question 4 was investigated using a correlation test with the 0.05 level of significance.

Results. The results of the PPMC are presented in Tables 46 to 47. Table 46 shows that the mathematics achievement mean for the 122 K-4 children from Manoa Elementary School was 79.194 and family income mean was 4.53 in an ascendant scale from 1 to 5 that indicated a medium-high family income average. Table 47 indicates that the correlation coefficient (r) between mathematics achievement and SES was 0.100 that indicated no relationship between mathematics achievement and SES. Therefore, the hypothesis that there is a relationship between the socioeconomic status of K-4 children and mathematics achievement was not supported.

Table 46

Group Statistics of SES and Mathematics Achievement

	Mean	Std. Deviation	N
Mathematics Achievement	79.194	13.6529	122
SES	4.53	.964	122

Table 47

Correlations between Mathematics Achievement and SES

		Mathematics Achievement	SES
Mathematics Achievement	Pearson Correlation	1	.100
SES	Pearson Correlation	.100	1

Research Question 5

The fifth question posed by this study was: Is there a relationship between the number of computers in the home and where they are located for K-4 children and mathematics achievement? The hypothesis number five was there is a relationship between the number of computers in the home and where they are located for K-4 children and mathematics achievement? Question 5 was investigated using a factorial ANOVA with the 0.05 level of significance.

Results. The results of the factorial ANOVA are presented in Tables 48 to 50. As shown in Table 49, the Levene's test indicated that the assumption of equality of variances was not violated ($p > 0.05$). The R-square was 0.023, which indicated that 2.3% of the variation of mathematics achievement could be explained by numbers of computers and their location. Table

50, between-subjects factors, indicates that mathematics achievement and the number of computers in the home and where they are located for K-4 children was not significant ($p = 0.299$). Therefore, the hypothesis that there is a relationship between the number of computers in the home and where they are located for K-4 children and mathematics achievement was not supported by the results.

Table 48

Descriptive Statistics of Mathematics Achievement between numbers of Computers and their Location

Dependent Variable: Mathematics Achievement

Number of Computer	Computer Location	Mean	Std. Deviation	N
Have no computer at home	Have no computer at home	79.000	17.1937	5
	Total	79.000	17.1937	5
One computer	Public area	79.326	13.8111	42
	Child's bedroom	78.073	15.2793	11
	Total	79.066	13.9841	53
Two computers	Public area	79.546	13.3072	35
	Child's bedroom	76.250	3.5355	8
	Total	78.933	12.1293	43
Three computers	Public area	76.556	15.3362	12
	Child's bedroom	87.925	10.5778	4
	Total	79.398	14.8563	16
Four or more computers	Public area	82.340	20.3686	5
	Child's bedroom	-	-	0
	Total	82.340	20.3686	5
Total	Have no computer at home	79.000	17.1937	5
	Public area	79.215	13.9993	94
	Child's bedroom	79.152	11.9579	23
	Total	79.194	13.6529	122

Table 49

Levene's Test of Equality of Error Variances for numbers of Computers and their Location

Dependent Variable: Mathematics Achievement

F	df1	df2	Sig.
1.444	7	114	.195

Table 50

Between-Subjects Factors for numbers of Computers and their Location

Dependent Variable: Mathematics Achievement

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	526.332	7	75.190	.389	.907
Intercept	278964.476	1	278964.476	1443.682	.000
Number of Computers	244.257	3	81.419	.421	.738
Location	77.306	1	77.306	.400	.528
Number of Computer * Location	472.021	2	236.010	1.221	.299
Error	22028.370	114	193.231		
Total	787701.555	122			
Corrected Total	22554.702	121			

a. R Squared = .023 (Adjusted R Squared = -.027)

Research Question 6

The sixth question posed by this study was: Is there a relationship between Internet access in homes of K-4 children and mathematics achievement? The hypothesis number six was there is a relationship between Internet access in homes of K-4 children and mathematics achievement. Question 6 was investigated for each grade using the One-way ANOVA with the 0.05 level of significance.

Kindergarten Results. The kindergarten results of the one-way ANOVA are presented in Tables 51 to 53. Table 51, Levene's Test for Equality of Variances, indicates that the assumption of equality of variances was not violated ($p = 0.349$). Table 53, between-subjects factors, indicates that mathematics achievement and Internet access in homes of kindergarteners was not significant ($P = 0.202$). Therefore, there is no relationship between Internet access in homes of the kindergarteners and mathematics achievement.

Table 51

Levene's Test for Equality of Variances for Mathematics Achievement and Internet Access of the Kindergarteners

Levene Statistic	df1	df2	Sig.
1.169	4	24	.349

Table 52

One-Way Analysis of Variance for Mathematics Achievement and Internet Access of the Kindergarteners

Mathematics Achievement

	N	Mean	Std. Deviation	Std. Error	95% CI for Mean		Minimum	Maximum
					Lower	Upper		
Rarely, almost never	16	77.023	18.1413	4.5353	67.356	86.690	41.7	100.0
A few times for month	4	81.250	12.5000	6.2500	61.360	101.140	75.0	100.0
Once per week	4	93.750	7.9902	3.9951	81.036	106.464	83.3	100.0
A few times per week	4	72.500	5.0000	2.5000	64.544	80.456	65.0	75.0
Everyday	1	100.000	.	.	.	.	100.0	100.0
Total	29	80.082	16.0368	2.9780	73.982	86.182	41.7	100.0

Table 53

Between-Subjects Factors of Kindergarteners

Mathematics Achievement

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1529.079	4	382.270	1.618	.202
Within Groups	5671.907	24	236.329		
Total	7200.986	28			

First Grade Results. The first grade results of the one-way ANOVA are presented in Tables 54 to 56. Table 54, Levene's Test for Equality of Variances, indicates that the assumption of equality of variances was not violated (p = 0.487). Table 56, between-subjects factors, indicates that mathematics achievement and Internet access in homes of first graders was not significant (p = 0.141). Therefore, there is no relationship between Internet access in homes of first graders and mathematics achievement.

Table 54

Levene's Test for Equality of Variances for Mathematics Achievement and Internet Access of First Grades

Levene Statistic	df1	df2	Sig.
.881	4	31	.487

Table 55

One-Way Analysis of Variance for Mathematics Achievement and Internet Access of First Graders

Mathematics Achievement

	N	Mean	Std. Deviation	Std. Error	95% CI for Mean		Minimum	Maximum
					Lower	Upper		
Rarely, almost never	17	79.953	10.9490	2.6555	74.323	85.582	62.5	100.0
A few times for month	9	72.922	15.3127	5.1042	61.152	84.693	50.0	100.0
Once per week	1	100.000	.	.	.	.	100.0	100.0
A few times per week	8	78.750	8.7627	3.0981	71.424	86.076	75.0	100.0
Everyday	1	95.000	.	.	.	.	95.0	95.0
Total	36	78.903	12.3941	2.0657	74.709	83.096	50.0	100.0

Table 56

Between-Subjects Factors of First Graders

Mathematics Achievement

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1045.052	4	261.263	1.870	.141
Within Groups	4331.438	31	139.724		
Total	5376.490	35			

Second Grade Results. The second grade results of the one-way ANOVA are presented in Tables 57 to 59. Table 57, Levene's Test for Equality of Variances, indicates that the assumption of equality of variances was not violated (p = 0.614). Table 59, between-subjects factors, indicates that mathematics achievement and Internet access in homes of second graders was not significant (p = 0.122). Therefore, there is no relationship between Internet access in homes of second graders and mathematics achievement.

Table 57

Levene's Test for Equality of Variances for Mathematics Achievement and Internet Access of Second Graders

Levene Statistic	df1	df2	Sig.
.614	3	19	.614

Table 58

One-Way Analysis of Variance for Mathematics Achievement and Internet Access of Second Graders

Mathematics Achievement

	N	Mean	Std. Deviation	Std. Error	95% CI for Mean		Minimum	Maximum
					Lower	Upper		
Rarely, almost never	10	74.750	13.4603	4.2565	65.121	84.379	50.0	100.0
A few times for month	7	77.143	8.0917	3.0584	69.659	84.626	70.0	95.0
Once per week	2	75.000	.0000	.0000	75.000	75.000	75.0	75.0
A few times per week	4	91.250	11.0868	5.5434	73.608	108.892	75.0	100.0
Everyday	0	-	-	-	-	-	-	-
Total	23	78.370	12.0983	2.5227	73.138	83.601	50.0	100.0

Table 59

Between-Subjects Factors of Second Graders

Mathematics Achievement

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	827.877	3	275.959	2.192	.122
Within Groups	2392.232	19	125.907		
Total	3220.109	22			

Third Grade Results. The third grade results of the one-way ANOVA are presented in Tables 60 to 62. Table 60, Levene's Test for Equality of Variances, indicates that the assumption of equality of variances was not violated (p = 0.967). Table 62, between-subjects factors, indicates that mathematics achievement and Internet access in homes of third graders was not significant (p = 0.508). Therefore, there is no relationship between Internet access in homes of third graders and mathematics achievement.

Table 60

Levene's Test for Equality of Variances for Mathematics Achievement and Internet Access of Third Graders

Levene Statistic	df1	df2	Sig.
.085	3	11	.967

Table 61

One-Way Analysis of Variance for Mathematics Achievement and Internet Access of Third Graders

Mathematics Achievement

	N	Mean	Std. Deviation	Std. Error	95% CI for Mean		Minimum	Maximum
					Lower	Upper		
Rarely, almost never	3	81.267	16.5171	9.5361	40.236	122.297	68.8	100.0
A few times for month	7	80.000	17.3205	6.5465	63.981	96.019	50.0	100.0
Once per week	3	85.000	13.2288	7.6376	52.138	117.862	75.0	100.0
A few times per week	2	62.500	17.6777	12.5000	-96.328	221.328	50.0	75.0
Everyday	0	-	-	-	-	-	-	-
Total	15	78.920	16.2194	4.1878	69.938	87.902	50.0	100.0

Table 62

Between-Subjects Factors of Third Graders

Mathematics Achievement

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	674.817	3	224.939	.823	.508
Within Groups	3008.127	11	273.466		
Total	3682.944	14			

Fourth Grade Results. The fourth grade results of the one-way ANOVA are presented in Tables 63 to 65. Table 63, Levene's Test for Equality of Variances, indicates that the assumption of equality of variances was not violated ($p = 0.606$). Table 65, between-subjects factors, indicates that mathematics achievement and Internet access in homes of fourth graders was not significant ($p = 0.911$). Therefore, there is no relationship between Internet access in homes of fourth graders and mathematics achievement.

Table 63

Levene's Test for Equality of Variances for Mathematics Achievement and Internet Access of Fourth Graders

Levene Statistic	df1	df2	Sig.
.631	3	15	.606

Table 64

One-Way Analysis of Variance for Mathematics Achievement and Internet Access of Fourth Graders

Mathematics Achievement

	N	Mean	Std. Deviation	Std. Error	95% CI for Mean		Minimum	Maximum
					Lower	Upper		
Rarely, almost never	9	77.778	15.6347	5.2116	65.760	89.796	50.0	100.0
A few times for month	5	81.500	11.6726	5.2202	67.007	95.993	65.0	95.0
Once per week	0	-	-	-	-	-	-	-
A few times per week	4	82.500	11.9024	5.9512	63.561	101.439	75.0	100.0
Everyday	1	75.000	-	-	-	-	75.0	75.0
Total	19	79.605	12.9707	2.9757	73.354	85.857	50.0	100.0

Table 65

Between-Subjects Factors of Fourth Graders

Mathematics Achievement

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	102.734	3	34.245	.176	.911
Within Groups	2925.556	15	195.037		
Total	3028.289	18			

In sum, the results indicated that there was no relationship between Internet access in homes of K-4 children and mathematics achievement. Therefore, the hypothesis that there is a relationship between Internet access in homes of K-4 children and mathematics achievement was not supported by the results.

Research Question 7

The seventh question posed by this study was: Is there a relationship between computer activities in homes of K-4 children and mathematics achievement? The hypothesis number seven was there is a relationship between computer activities at home of K-4 children and mathematics achievement. Question 7 was investigated for each grade using the regression (backward method) with the 0.05 level of significance.

Kindergarten Results. The kindergarten results of the regression are presented in Tables 66 to 69. Table 66 shows that the mathematics achievement mean of kindergarteners was 80.082. The computer activity means show that kindergarteners use computers more for games and educational programs than for applications and tools, e-mail, or computer research. Table 67 indicates that computer research, e-mail, educational programs, computer games entered in the model, and educational programs, computer research, and computer games were removed (significance of $F >= 0.100$). In Table 68, the R Square was used to describe the goodness-of-fit or the amount of variance explained by a given set of predictable variables. In this case, the R Square of the last model was 0.118, which indicated that 11.8% of the variance in the mathematics achievement was explained by applications and tools and e-mail activities. Finally, Table 69 shows that the e-mail activity in the last model was not significant ($p > 0.05$). In short, the results of the kindergarteners indicated that e-mail activity was not a good predictor of mathematics achievement.

Table 66

Descriptive Statistics for Computer Activities of Kindergarteners

Mathematics Achievement

	Mean	Root Mean Square	N
Mathematics Achievement	80.082	16.0368	29
Computer Games	2.17	1.071	29
Educational Programs	2.03	.981	29
E-mail	1.00	.000	29
Computer for Research	1.07	.258	29

Table 67

Variables Entered/Removed for Computer Activities of Kindergarteners

Model	Variables Entered	Variables Removed	Method
1	Computer Research Educational Programs E-mail Computer Games	.	Enter
2	.	Computer Games	Backward (Sig. F>= 0.1)
3	.	Computer Research	Backward (Sig. F>= 0.1)
4	.	Educational Programs	Backward (Sig. F>= 0.1)

a. All requested variables entered.
b. Dependent Variable: Mathematics Achievement

Table 68

Model Summary for Computer Activities of Kindergarteners

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.441	.194	.060	15.5490
2	.427	.182	.084	15.3480
3	.409	.167	.103	15.1861
4	.344	.118	.086	15.3342

Table 69 (Summary)

Coefficients for Computer Activities of Kindergarteners

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	51.126	13.348		3.830	.001
	Computer Games	-2.155	3.603	-.144	-.598	.555
	Educational Programs	4.344	3.816	.266	1.138	.266
	E-mail	19.143	12.185	.308	1.571	.129
	Computer Research	3.398	4.457	.149	.762	.453
2	(Constant)	51.330	13.171		3.897	.001
	Educational Programs	3.144	3.204	.192	.981	.336
	E-mail	17.431	11.690	.280	1.491	.148
	Computer Research	2.917	4.328	.128	.674	.506
3	(Constant)	53.732	12.546		4.283	.000
	Educational Programs	3.759	3.039	.230	1.237	.227
	E-mail	17.495	11.567	.281	1.513	.142
4	(Constant)	57.213	12.345		4.634	.000
	E-mail	21.394	11.237	.344	1.904	.068

a. Dependent Variable: Mathematics Achievement

First Grade Results. The first grade results of the regression are presented in Tables 70 to 73. Table 70 shows that the mathematics achievement mean of first graders was 78.903. The computer activity means show that first graders use computers more for games and educational programs than for application and tools, e-mail, or computer research. Table 71 indicates that of all the computer activities entered in the model, educational programs, computer research, and computer games were removed (significance of F>=0.100). In Table 72, The R Square was used to describe the goodness-of-fit or the amount of variance explained by a given set of predictable variables. In this case, the R Square of the last model was 0.087, which indicated that 8.7% of the variance in the mathematics achievement was explained by applications and tools and e-mail activities. Finally, Table 73 shows that applications and tools and e-mail activities were not significant ($p>0.05$). In short, the results of the first graders indicated that applications and tools and e-mail activities at home were good predictors of mathematics achievement.

Table 70

Descriptive Statistics for Computer Activities of First Graders

Mathematics Achievement

	Mean	Root Mean Square	N
Mathematics Achievement	78.903	12.3941	36
Computer Games	2.72	1.406	36
Educational Programs	2.44	1.275	36
Applications and Tools	1.11	.523	36
E-mail	1.06	.333	36
Computer Research	1.39	.766	36

Table 71

Variables Entered/Removed for Computer Activities of First Graders

Model	Variables Entered	Variables Removed	Method
1	Computer Research Educational Programs Applications and Tools Computer Games E-mail	-	Enter
2	-	Educational Programs	Backward (Sig. F>= 0.1)
3	-	Computer Research	Backward (Sig. F>= 0.1)
4	-	Computer Games	Backward (Sig. F>= 0.1)

a. All requested variables entered.
b. Dependent Variable: Mathematics Achievement

Table 72

Model Summary for Computer Activities of First Graders

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.307	.094	-.057	12.7397
2	.307	.094	-.022	12.5325
3	.307	.094	.009	12.3370
4	.295	.087	.032	12.1947

Table 73

Coefficients for Computer Activities of First Graders

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	93.292	10.568		8.827	.000
	Computer Games	-.749	1.973	-.085	-.380	.707
	Educational Programs	0.0237	2.079	.002	.011	.991
	Applications and Tools	23.271	13.691	.981	1.700	.100
	E-mail	-35.865	21.629	-.965	-1.658	.108
	Computer Research	-.292	3.105	-.018	-.094	.926
2	(Constant)	93.298	10.381		8.987	.000
	Computer Games	-.737	1.635	-.084	-.451	.655
	Applications and Tools	23.257	13.414	.980	1.734	.093
	E-mail	-35.834	21.106	-.964	-1.698	.100
	Computer Research	-.291	3.054	-.018	-.095	.925
3	(Constant)	93.306	10.219		9.131	.000
	Computer Games	-.773	1.566	-.088	-.493	.625
	Applications and Tools	23.444	13.062	.988	1.795	.082
	E-mail	-36.331	20.134	-.977	-1.804	.081
4	(Constant)	90.897	8.873		10.244	.000
	Applications and Tools	21.603	12.373	.911	1.746	.090
	E-mail	-34.103	19.395	-.917	-1.758	.088

Second Grade Results. The second grade results of the regression are presented in Tables 74 to 77. Table 74 shows that the mathematics achievement mean of second graders was 78.370. The computer activity means show that second graders use computers more for games and educational programs than for application and tools, e-mail, or computer research. Table 75 indicates that of all the computer activities entered in the model, computer research, application and tools, and e-mail were removed (significance of F >= 0.100). In Table 76, The R Square of the last model was 0.246, which indicated that 24.6% of the variance in the mathematics achievement was explained by computer games and educational programs. Finally, Table 77 shows that computer games and educational programs were not significant ($p >= 0.05$). In short, the results of the second graders indicated that computer games were not good predictors of mathematics achievement.

Table 74

Descriptive Statistics for Computer Activities of Second Graders

Mathematics Achievement

	Mean	Root Mean Square	N
Mathematics Achievement	78.370	12.0983	23
Computer Games	2.30	1.295	23
Educational Programs	1.96	1.107	23
Applications and Tools	1.17	.834	23
E-mail	1.13	.344	23
Computer Research	1.22	.422	23

Table 75

Variables Entered/Removed for Computer Activities of Second Graders

Model	Variables Entered	Variables Removed	Method
1	Computer Research Educational Programs Applications and Tools Computer Games E-mail	-	Enter
2	.	Computer Research	Backward (Sig. F>= 0.1)
3	.	Applications and Tools	Backward (Sig. F>= 0.1)
4	.	E-mail	Backward (Sig. F>= 0.1)

a. All requested variables entered.
b. Dependent Variable: Mathematics Achievement

Table 76

Model Summary for Computer Activities of Second Graders

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.512	.262	.045	11.8249
2	.512	.262	.098	11.4921
3	.510	.261	.144	11.1951
4	.496	.246	.171	11.0175

Table 77

Coefficients for Computer Activities of Second Graders

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	82.362	11.799		6.980	.000
	Computer Games	5.251	3.628	.562	1.447	.166
	Educational Programs	-5.085	3.767	-.465	-1.350	.195
	Applications and Tools	.815	4.706	.056	.173	.865
	E-mail	-5.985	9.964	-.170	-.601	.556
	Computer Research	-.273	7.684	-.010	-.036	.972
2	(Constant)	82.138	9.704		8.464	.000
	Computer Games	5.186	3.040	.555	1.706	.105
	Educational Programs	-5.037	3.412	-.461	-1.476	.157
	Applications and Tools	.769	4.402	.053	.175	.863
	E-mail	-5.986	9.683	-.170	-.618	.544
3	(Constant)	82.294	9.413		8.743	.000
	Computer Games	4.897	2.485	.524	1.970	.064
	Educational Programs	-4.603	2.279	-.421	-2.020	.058
	E-mail	-5.487	9.014	-.156	-.609	.550
4	(Constant)	77.789	5.724		13.591	.000
	Computer Games	3.930	1.881	.420	2.089	.050
	Educational Programs	-4.332	2.200	-.396	-1.969	.063

∈ Dependent Variable: Mathematics Achievement

Third Grade Results. The third grade results of the regression are presented in Tables 78 to 81. Table 78 shows that the mathematics achievement mean of third graders was 78.920. The computer activity means show that third graders use computer more games, educational programs, or computer research than for application and tools or e-mail. Table 79 indicates that of all the computer activities entered in the model, educational programs and computer games were removed (significance of F >= 0.100). In Table 80, The R Square of the last model was 0.455, which indicated that 45.5% of the variance in the mathematics achievement was explained by application and tools, e-mail, and computer research. Finally, Table 81 shows that only application and tools was significant ($p < 0.05$). In short, the third grade results indicated that application and tools was a good predictor of mathematics achievement.

Table 78

Descriptive Statistics for Computer Activities of Third Graders

Mathematics Achievement

	Mean	Root Mean Square	N
Mathematics Achievement	78.920	16.2194	15
Computer Games	2.73	1.033	15
Educational Programs	2.07	1.223	15
Applications and Tools	1.13	.352	15
E-mail	1.13	.352	15
Computer Research	2.00	.926	15

Table 79

Variables Entered/Removed for Computer Activities of Third Graders

Model	Variables Entered	Variables Removed	Method
1	Computer for Research E-mail Educational Programs Applications and Tools Computer Games	.	Enter
2	.	Educational Programs	Backward (Sig. F>= 0.1)
3	.	Computer Games	Backward (Sig. F>= 0.1)

a. All requested variables entered.
b. Dependent Variable: Mathematics Achievement

Table 80

Model Summary for Computer Activities of Third Graders

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.691	.477	.187	14.6264
2	.691	.477	.268	13.8768
3	.674	.455	.306	13.5117

Table 81

Coefficients for Computer Activities of Third Graders

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	45.958	21.426		2.145	.061
	Computer Games	-2.667	5.161	-.170	-.517	.618
	Educational Programs	-.134	3.810	-.010	-.035	.973
	Applications and Tools	28.481	12.918	.618	2.205	.055
	E-mail	22.322	13.047	.484	1.711	.121
	Computer for Research	-8.525	4.952	-.487	-1.722	.119
2	(Constant)	45.676	18.846		2.424	.036
	Computer Games	-2.759	4.213	-.176	-.655	.527
	Applications and Tools	28.493	12.252	.618	2.326	.042*
	E-mail	22.493	11.483	.488	1.959	.079
	Computer for Research	-8.499	4.648	-.485	-1.829	.097
3	(Constant)	45.051	18.326		2.458	.032
	Applications and Tools	26.592	11.591	.577	2.294	.042*
	E-mail	19.760	10.417	.429	1.897	.084
	Computer Research	-9.332	4.353	-.533	-2.144	.055

a. Dependent Variable: Mathematics Achievement

Fourth Grade Results. The fourth grade results of the regression are presented in Tables 82 to 85. Table 82 shows that the mathematics achievement mean of fourth graders was 79.605. The computer activity means show that fourth graders used computers more for games and educational programs than for application and tools, e-mail, and computer research. Table 83 indicates that of all the computer activities entered in the model, e-mail, computer games, educational programs, and computer research were removed (significance of F>=0.100). In Table 84, The R Square of the last model was 0.187, which indicated that 18.7% of the variance in the mathematics achievement was explained by application and tools activity. Finally, Table

85 shows that application and tools was not significant ($p > 0.05$). In short, the fourth grade results indicated that all activities at home were not good predictors of mathematics achievement.

Table 82

Descriptive Statistics for Computer Activities of Fourth Graders

Mathematics Achievement

	Mean	Root Mean Square	N
Mathematics Achievement	79.605	12.9707	19
Computer Games	2.68	1.336	19
Educational Programs	2.05	1.026	19
Applications and Tools	1.63	1.012	19
E-mail	1.26	.933	19
Computer for Research	1.89	.737	19

Table 83

Variables Entered/Removed for Computer Activities of Fourth Graders

Model	Variables Entered	Variables Removed	Method
1	Computer for Research Educational Programs E-mail Computer Games Applications and Tools	.	Enter
2	.	E-mail	Backward (Sig. F>= 0.1)
3	.	Computer Games	Backward (Sig. F>= 0.1)
4	.	Educational Programs	Backward (Sig. F>= 0.1)
5		Computer Research	Backward (Sig. F>= 0.1)

a. All requested variables entered.
b. Dependent Variable: Mathematics Achievement

Table 84

Model Summary for Computer Activities of Fourth Graders

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.643	.414	.188	11.6879
2	.623	.388	.213	11.5031
3	.567	.322	.186	11.6991
4	.531	.282	.192	11.6611
5	.433	.187	.140	12.0315

Table 85

Coefficients for Computer Activities of Fourth Graders

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	79.013	9.277		8.517	.000
	Computer Games	-3.995	2.944	-.411	-1.357	.198
	Educational Programs	4.767	3.595	.377	1.326	.208
	Applications and Tools	12.268	6.890	.957	1.781	.098
	E-mail	-4.111	5.489	-.296	-.749	.467
	Computer for Research	-7.017	4.996	-.399	-1.405	.184
2	(Constant)	77.105	8.779		8.783	.000
	Computer Games	-3.461	2.811	-.356	-1.231	.239
	Educational Programs	4.586	3.530	.363	1.299	.215
	Applications and Tools	8.348	4.410	.651	1.893	.079
	Computer for Research	-5.935	4.706	-.337	-1.261	.228
3	(Constant)	74.523	8.670		8.595	.000
	Educational Programs	3.228	3.410	.255	.947	.359
	Applications and Tools	6.392	4.184	.499	1.528	.147
	Computer for Research	-6.319	4.776	-.359	-1.323	.206
4	(Constant)	78.512	7.552		10.396	.000
	Applications and Tools	8.621	3.447	.672	2.501	.024*
	Computer for Research	-6.847	4.728	-.389	-1.448	.167

Table 85 (continued)

5	(Constant)	70.550	5.342		13.206	.000
	Applications and Tools	5.550	2.803	.433	1.980	.064

a. Dependent Variable: Mathematics Achievement

In sum, the results indicated that only applications and tools of third graders was a good predictor of mathematics achievement. Therefore, the hypothesis that there was a relationship between computer activities at home of K-4 children and mathematics achievement was not supported by the results.

Research Question 8

The eighth question posed by this study was: Is there a relationship between the social capital of K-4 children and mathematics achievement? The hypothesis number eight was there is a relationship between the social capital of K-4 children and mathematics achievement. Question 8 was investigated per grade using the multiple regression analysis with the 0.05 level of significance.

Kindergarten Results. The kindergarten results of the regression are presented in Tables 86 to 89. Table 86 shows that the mathematics achievement mean of kindergarteners was 80.082. The means of the social variables was a number from 1 to 5 that was directly proportional to intensity of the factor over the children. Therefore, Table 86 indicates that the strong factors of kindergarteners were the father's education, the mother's education, the father's uses home computer, the mother's uses home computer, the father's computer experiences, the mother's computer experiences, the child's leisure time at home, and family structure (factor mean > 4). On the other hand, computer habits of the child's peers were the weak factor (factor mean < 2). Table 87 indicates that of all the social factors entered in the model, computer instructions in the classroom, the father's computer experiences, the mother's computer experiences, computer habits of the child's peers, the mother's uses home computer, the child's leisure time at home, the father's education, family size, and someone else's experiences were removed (significance of F >= 0.100). In Table 88, The R Square of the last model was 0.752, which indicated that 75.2% of the variance in the mathematics achievement was explained by the father's uses home computer, the mother's computer experiences, someone else's computer experiences, the child's leisure time at home, and computer instructions in the classroom. Finally, a summary of the regression coefficients in Table 89 shows that the five social factors remaining were significant ($p < 0.05$).

Table 86

Descriptive Statistics for Social Capital of Kindergarteners

Mathematics Achievement

Variables	Mean	Root Mean Square	N
Mathematics Achievement	80.082	16.0368	29
Father's Education	4.31	.660	29
Mother's Education	4.24	.435	29
Father's Uses Home computer	4.52	.949	29
Mother's Uses Home computer	4.21	1.177	29
Father's computer experiences	3.97	1.149	29
Mother's computer experiences	4.03	.778	29
Someone's Computer Experiences	2.45	1.594	29
Child's Leisure Time at Home	4.31	1.004	29
Computer Habits of the Child's Peers	1.76	1.300	29
Table 86 (continued)			
Computer Instructions in the Classroom	2.10	.618	29
Family Structure	4.86	.516	29
Family Size	3.00	.964	29

Table 87

Variables Entered/Removed for Social Capital of Kindergarteners

Model	Variables Entered	Variables Removed	Method
1	Family Size		

	Computer instructions in the Classroom		
	Computer Habits of Child's Peers		
	Someone's Computer Experiences		
	Father's Uses Home computer		
	Father's Education		Enter
	Mother's Education		
	Child's Leisure Time at Home		
	Father's Computer Experiences		
	Mother's Uses Home computer		
	Family Structure		
	Mother's Uses Home computer		
2		Father's Computer Experiences	Backward
3		Family Structure	Backward
4		Mother's Education	Backward

Table 87 (continued)

5	Family Size	Backward
6	Computer Habits of Child's Peers	Backward
7	Father's Uses Home computer	Backward
8	Mother's Uses Home computer	Backward

Table 88

Model Summary for Social Capital of Kindergarteners

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.884	.781	.617	9.9283
2	.883	.780	.638	9.6454
3	.883	.780	.658	9.3794
4	.883	.779	.675	9.1424
5	.882	.779	.690	8.9248
6	.876	.768	.691	8.9208
7	.873	.761	.696	8.8394
8	.867	.752	.698	8.8104

Table 89

Coefficients for the Regression of Social Capital of Kindergarteners

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-50.633	58.019		-.873	.396
	Father's Education	6.664	5.383	.274	1.238	.234
	Mother's Education	-1.324	6.123	-.036	-.216	.831
	Father's Uses Home computer	-1.853	3.067	-.110	-.604	.554
	Mother's Uses Home computer	3.004	2.789	.220	1.077	.297
	Father's Computer Experiences	-.742	3.492	-.053	-.213	.834
	Mother's Computer Experiences	11.474	5.351	.557	2.144	.048*
	Someone's Computer Experiences	-3.432	1.390	-.341	-2.468	.025*
	Child's Leisure Time at Home	9.066	2.899	.567	3.127	.007*
	Computer Habits of Child's Peers	1.554	1.843	.126	.843	.411
	Computer instructions in the Classroom	6.888	3.951	.265	1.743	.100
	Family Structure	1.944	7.728	.063	.252	.805
	Family Size	.881	2.901	.053	.304	.765
8	(Constant)	-42.989	18.238		-2.357	.027
	Father's Education	8.615	2.725	.355	3.162	.004*
	Mother's Uses Home computer	10.234	2.571	.497	3.981	.001*
	Someone's Computer Experiences	-2.878	1.102	-.286	-2.613	.016*
	Child's Leisure Time at Home	8.081	1.788	.506	4.520	.000*
	Computer instructions in the Classroom	8.016	2.875	.309	2.788	.010*

In short, the results of the kindergarteners indicated that the father's uses home computer, the mother's computer experiences, someone else's computer experiences, the child's leisure time at home, and computer instructions in the classroom were good predictors of mathematics achievement.

First Grade Results. The first grade results of the regression are presented in Tables 90 to 93. Table 90 shows that the mathematics achievement mean of first graders was 78.903. Table 90 indicates that the strong factors of first graders were the father's education, the father's uses home computer, the mother's uses home computer, the father's computer experiences, the child's leisure time at home, and family structure (factor mean>4). On the other hand, computer habits of the child's peers were the weak factor (factor mean < 2). Table 91 indicates that of all the social factors entered in the model, all social factors were removed except two factors: the father's uses home computer and computer instructions in the classroom. In Table 92, the R Square of the last model was 0.774, which indicated that 77.4% of the variance in the mathematics achievement was explained by the father's uses home computer and family structure. Finally, a summary of the regression coefficients in Table 93 shows that the father's uses home computer and family structure had a high level of statistical significance ($p < 0.05$). In short, results of the first graders indicated the father's uses home computer and family structure were good predictors of mathematics achievement.

Table 90

Descriptive Statistics for Social Capital of First graders

Mathematics Achievement

Variables	Mean	Root Mean Square	N
Mathematics Achievement	78.903	12.3941	36
Father's Education	4.14	.639	36
Mother's Education	3.97	.736	36
Father’s Uses Home computer	4.11	1.237	36
Mother’s Uses Home computer	4.14	1.222	36
Father’s computer experiences	4.03	1.134	36
Mother’s computer experiences	3.86	.990	36
Someone’s Computer Experiences	2.42	1.481	36
Child’s Leisure Time at Home	4.08	1.025	36
Computer Habits of Child's Peers	1.72	1.210	36
Computer instructions in the Classroom	2.53	.941	36
Family Structure	4.86	.593	36
Family Size	2.69	.856	36

Table 91

Variables Entered/Removed for Social Capital of First graders

Model	Variables Entered	Variables Removed	Method
1	Family Size Father's computer experiences Computer instructions in the Class. Computer Habits of Child's Peers Mother's computer experiences Child's Leisure Time at Home Father's Education Mother's Education Someone's Computer Experiences Family Structure Father's Uses Home computer Mother's Uses Home computer		Enter
2		Mother's Computer Experiences	Backward
3		Computer instructions in the Class.	Backward
4		Father's Computer Experiences	Backward
5		Mother's Education	Backward
6		Computer Habits of Child's Peers	Backward
7		Mother's Uses Home computer	Backward
8		Child's Leisure Time at Home	Backward
9		Father's Education	Backward

Table 91 (continue)

10		Family Size	Backward
11		Someone's Computer Experiences	Backward

a. Variables entered.
b. Dependent Variable: Mathematics achievement

Table 92

Mode Summary for Social Capital of First graders

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.545	.297	-.070	12.8221
2	.545	.297	-.026	12.5522
3	.544	.296	.015	12.3012
4	.543	.295	.051	12.0722
5	.541	.293	.083	11.8657
6	.539	.291	.114	11.6683
7	.536	.288	.140	11.4925

8	.535	.286	.167	11.3127
9	.521	.272	.178	11.2397
10	.505	.256	.186	11.1840
11	.451	.204	.155	11.3902

Table 93

Coefficients for Social Capital of First graders

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	89.541	32.357		2.767	.011
	Father's Education	2.942	3.942	.152	.746	.463
	Mother's Education	-1.213	4.641	-.072	-.261	.796
	Father's Uses Home computer	5.534	2.801	.552	1.975	.060
	Mother's Uses Home computer	-.803	2.520	-.079	-.319	.753
	Father's Computer Experiences	.615	3.177	.056	.194	.848
	Mother's Computer Experiences	0.04422	3.159	.004	.014	.989
	Someone's Computer Experiences	2.253	1.808	.269	1.246	.225
	Child's Leisure Time at Home	1.030	2.921	.085	.353	.727
	Computer Habits of Child's Peers	-.687	1.986	-.067	-.346	.733
	Computer instructions in the Classroom	-.260	2.670	-.020	-.097	.923
	Family Structure	-8.703	5.788	-.416	-1.504	.146
	Family Size	-2.069	2.886	-.143	-.717	.481
11	(Constant)	101.398	15.908		6.374	.000
	Father's Uses Home computer	4.159	1.677	.415	2.480	.018*
	Family Structure	-8.145	3.498	-.390	-2.328	.026*

a. Dependent Variable: Mathematics Achievement

Second Grade Results. The second grade results of the regression are presented in Tables 94 to 97. Table 94 shows that the mathematics achievement mean of second graders was 78.370. Table 94 indicates that the strong factors of second graders were the father's education, the mother's education, the father's computer experiences, the child's leisure time at home, and family structure (factor mean>4). On the other hand, computer habits of the child's peers were the weak factor (factor mean < 2). Table 95 indicates that of all the social factors entered in the model, all social factors were removed except two factors: computer instructions in the classroom and family structure. In Table 96, The R Square of the last model was 0.277, which indicated that 27.7% of the variance in the mathematics achievement was explained by computer instructions in the classroom and family structure. Finally, a summary of the regression coefficients in Table 97 shows that computer instructions had a high level of statistical significance ($p < 0.05$). In short, results of the second graders indicated that computer instruction in the classroom was a good predictor of mathematics achievement.

Table 94

Descriptive Statistics for Social Capital of Second Graders

Mathematics Achievement

Variables	Mean	Root Mean Square	N
Mathematics Achievement	78.370	12.0983	23
Father's Education	4.30	.635	23
Mother's Education	4.26	.541	23
Father’s Uses Home computer	3.83	1.749	23
Mother’s Uses Home computer	3.52	1.592	23
Father’s computer experiences	4.26	.964	23
Mother’s computer experiences	3.48	1.201	23
Someone’s Computer Experiences	2.04	1.430	23
Child’s Leisure Time at Home	4.43	1.037	23
Computer Habits of Child's Peers	1.17	.388	23
Computer Instructions in the Classroom	2.65	1.027	23
Family Structure	4.83	.650	23
Family Size	2.87	.815	23

Table 95

Variables Entered/Removed for Social Capital of Second Graders

Model	Variables Entered	Variables Removed	Method
	Father's Education Mother's Education Father’s Uses Home computer Mother’s Uses Home computer Father's Computer Experiences Mother's Computer Experiences Someone's Computer Experiences Child’s Leisure Time at Home Computer Habits of Child's Peers Computer instructions in the Classroom Family Structure Family Size		Enter
2		Computer Habits of Child's Peers	Backward
3		Father’s Uses Home computer	Backward
4		Family Size	Backward
5		Child’s Leisure Time at Home	Backward
6		Father's Education	Backward
7		Mother's Education	Backward
8		Mother’s Uses Home computer	Backward

Table 95 (continue)

9		Mother's Computer Experiences	Backward
10		Father's Computer Experiences	Backward
11		Someone's Computer Experiences	Backward

a. All requested variables entered.
b. Dependent Variable: Mathematics achievement

Table 96

Model Summary for Social Capital of Second Graders

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.685	.469	-.169	13.0789
2	.685	.469	-.062	12.4703
3	.685	.469	.026	11.9409
4	.684	.468	.100	11.4751
5	.684	.467	.163	11.0699

6	.679	.461	.209	10.7598
7	.672	.452	.246	10.5045
8	.648	.420	.250	10.4801
9	.626	.392	.257	10.4271
10	.588	.346	.243	10.5271
11	.527	.277	.205	10.7877

Table 97

Coefficients for Social Capital of Second Graders

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	86.034	43.437		1.981	.076
	Father's Education	2.624	6.844	.138	.383	.709
	Mother's Education	-3.186	9.412	-.142	-.339	.742
	Father's Uses Home computer	-.157	3.222	-.023	-.049	.962
	Mother's Uses Home computer	-1.664	3.321	-.219	-.501	.627
	Father's Computer Experiences	3.242	4.942	.258	.656	.527
	Mother's Computer Experiences	3.226	4.057	.320	.795	.445
	Someone's Computer Experiences	2.300	2.602	.272	.884	.398
	Child's Leisure Time at Home	-.654	3.889	-.056	-.168	.870
	Computer Habits of Child's Peers	-0.05387	9.994	-.002	-.005	.996
	Computer instructions in the Classroom	6.408	3.845	.544	1.667	.127
	Family Structure	-8.695	6.063	-.467	-1.434	.182
	Family Size	-.252	5.265	-.017	-.048	.963
11	(Constant)	98.208	17.310		5.674	.000
	Computer instructions in the Classroom	5.500	2.310	.467	2.381	.027*
	Family Structure	-7.133	3.648	-.383	-1.955	.065

a. Dependent Variable: Mathematics Achievement

Third Grade Results. The third grade results of the regression are presented in Tables 98 to 101. Table 98 shows that the mathematics achievement mean of third graders was 78.920. Table 98 indicates that the strong factors of third graders were the father's education, the mother's education, the father's uses home computer, the mother's uses home computer, the father's computer experiences, the child's leisure time at home, and family structure (factor mean > 4). On the other hand, there was no weak factor (factor mean < 2). Table 99 indicates that of all the social factors entered in the model, all social factors were removed except one factor: the mother's education. In Table 100, The R Square of the last model was 0.205, which indicated that 20.5% of the variance in the mathematics achievement was explained by the mother's education. Finally, a summary of the regression coefficients in Table 101 shows that the mother's education was not significant ($p>0.05$). In short, the third grade results indicated that all social factors were not good predictors of mathematics achievement.

Table 98

Descriptive Statistics for Social Capital of Third graders

Mathematics Achievement

Variables	Mean	Root Mean Square	N
Mathematics Achievement	78.920	16.2194	15
Father's Education	4.33	.488	15
Mother's Education	4.07	.594	15
Father’s Uses Home computer	4.67	.617	15
Mother’s Uses Home computer	4.20	1.373	15
Father’s computer experiences	4.07	.884	15
Mother’s computer experiences	3.73	.799	15
Someone’s Computer Experiences	3.00	1.558	15
Child’s Leisure Time at Home	4.13	1.187	15
Computer Habits of Child's Peers	2.33	1.633	15
Computer instructions in the Classroom	2.33	1.047	15
Family Structure	4.60	.910	15
Family Size	2.87	.834	15

Table 99

Variables Entered/Removed for Social Capital of Third graders

Model	Variables Entered	Variables Removed	Method
	Father's Education Mother's Education Father's Uses Home computer Mother's Uses Home computer Father's Computer Experiences Mother's Computer Experiences Someone's Computer Experiences Child's Leisure Time at Home Computer Habits of Child's Peers Computer instructions in the Classroom Family Structure Family Size		Enter
2		Computer Habits of Child's Peers	Backward
3		Father's Computer Experiences	Backward
4		Family Size	Backward
5		Child's Leisure Time at Home	Backward
6		Family Structure	Backward
7		Father's Education	Backward
8		Someone's Computer Experiences	Backward
9		Computer instructions in the Classroom	Backward

Table 99 (continue)

Model	Variables Entered	Variables Removed	Method
10		Father's Uses Home computer	Backward
11		Mother's Computer Experiences	Backward
12		Mother's Uses Home computer	Backward

a. All requested variables entered.
b. Dependent Variable: Mathematics achievement

Table 100

Model Summary for Social Capital of Third graders

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.746	.557	-2.102	28.5654
2	.746	.557	-1.068	23.3259
3	.746	.556	-.553	20.2110
4	.744	.553	-.252	18.1493

5	.740	.548	-.056	16.6637
6	.736	.542	.083	15.5291
7	.722	.522	.163	14.8414
8	.664	.440	.129	15.1332
9	.588	.345	.083	15.5287
10	.548	.300	.109	15.3115
11	.522	.273	.151	14.9404
12	.453	.205	.144	15.0044

Table 101

Coefficients for Social Capital of Third graders

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	17.130	158.409		.108	.924
	Father's Education	-5.275	22.723	-.159	-.232	.838
	Mother's Education	18.559	23.251	.679	.798	.508
	Father’s Uses Home computer	15.246	29.535	.580	.516	.657
	Mother’s Uses Home computer	7.055	11.062	.597	.638	.589
	Father's Computer Experiences	-.613	15.463	-.033	-.040	.972
	Mother's Computer Experiences	-17.570	30.606	-.865	-.574	.624
	Someone's Computer Experiences	3.340	7.971	.321	.419	.716
	Child’s Leisure Time at Home	2.054	12.798	.150	.160	.887
	Computer Habits of Child's Peers	.119	5.950	.012	.020	.986
	Computer instructions in the Classroom	-8.890	20.016	-.574	-.444	.700
	Family Structure	-3.469	19.437	-.195	-.178	.875
	Family Size	-1.955	15.321	-.101	-.128	.910
12	(Constant)	28.570	27.744		1.030	.322
	Mother's Education	12.381	6.755	.453	1.833	.090

a. Dependent Variable: Mathematics Achievement

Fourth Grade Results. The fourth grade results of the regression are presented in Tables 102 to 105. Table 102 shows that the mathematics achievement mean of fourth graders was 79.605. Table 102 indicates that the strong factors of fourth graders were the father’s education, the mother’s education, and family structure (factor mean>4). On the other hand, the computer habits of the child’s peers were the weak factor (factor mean < 2). Table 103 indicates that of all the social factors entered in the model, and computer instructions in the classroom, the mother’s education, family size, someone else's computer experiences, the father’s computer experiences, the father’s education, and family structure were removed. In Table 104, The R Square of the last model was 0.627, which indicated that 62.7% of the variance in the mathematics achievement was explained by the father’s uses home computer, the mother’s uses home computer, the mother’s computer experiences, the child’s leisure time at home, and the computer habits of the child's peers. Finally, a summary of the regression coefficients in Table 105 shows that the father's uses home computer, the mother's uses home computer, the mother's computer experiences, the child's leisure time at home, and computer habits of the child's peers were significant ($p < 0.05$). In short, results of the fourth graders indicated that the father's uses home computer, the mother's uses home computer, the mother's computer experiences, the child's leisure time at home, and computer habits of the child's peers were good predictors of mathematics achievement.

Table 102

Descriptive Statistics for Social Capital of Fourth Graders

Mathematics Achievement

Variables	Mean	Root Mean Square	N
Mathematics Achievement	79.605	12.9707	19
Father's Education	4.16	.602	19
Mother's Education	4.21	.535	19
Father’s Uses Home computer	3.47	1.645	19
Mother’s Uses Home computer	3.89	1.410	19
Father’s computer experiences	3.58	1.071	19
Mother’s computer experiences	3.84	.602	19
Someone’s Computer Experiences	2.32	1.565	19
Child’s Leisure Time at Home	3.89	1.049	19
Computer Habits of Child's Peers	1.79	1.357	19
Computer instructions in the Classroom	2.42	1.170	19
Family Structure	4.95	.229	19
Family Size	3.00	.745	19

Table 103

Variables Entered/Removed for Social Capital of Fourth Graders

Model	Variables Entered	Variables Removed	Method
1	Family Size Family Structure Someone's Computer Experiences Mother's computer experiences Child's Leisure Time at Home Father's Uses Home computer Father's Education Mother's Uses Home computer Mother's Education Father's computer experiences Computer Habits of Child's Peers Computer instructions in the Classroom		Enter
2		Computer instructions in the Classroom	Backward
3		Mother's Education	Backward
4		Family Size	Backward
5		Someone's Computer Experiences	Backward
6		Father's Computer Experiences	Backward
7		Father's Education	Backward
8		Family Structure	Backward

a. All requested variables entered.
b. Dependent Variable: Mathematics achievement

Table 104

Model Summary for Social Capital of Fourth Graders

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.887	.787	.360	10.3803
2	.885	.784	.444	9.6675
3	.882	.779	.502	9.1525
4	.878	.772	.543	8.7677
5	.872	.761	.569	8.5157
6	.860	.740	.574	8.4612
7	.831	.690	.536	8.8379
8	.792	.627	.484	9.3201

Table 105

Coefficients for Social Capital of Fourth Graders

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-149.316	130.646		-1.143	.297
	Father's Education	-10.525	10.347	-.489	-1.017	.348
	Mother's Education	4.452	9.933	.184	.448	.670
	Father’s Uses Home computer	3.193	2.848	.405	1.121	.305
	Mother’s Uses Home computer	-5.623	2.879	-.611	-1.953	.099
	Father's Computer Experiences	2.530	3.836	.209	.660	.534
	Mother's Computer Experiences	17.871	11.082	.830	1.613	.158
	Someone's Computer Experiences	-.890	2.087	-.107	-.427	.685
	Child’s Leisure Time at Home	7.558	3.501	.611	2.159	.074
	Computer Habits of Child's Peers	10.538	4.238	1.103	2.487	.047
	Computer instructions in the Classroom	-1.267	4.735	-.114	-.268	.798
	Family Structure	30.544	28.029	.540	1.090	.318
	Family Size	-2.418	5.246	-.139	-.461	.661
8	(Constant)	-9.436	26.198		-.360	.724
	Father’s Uses Home computer	4.299	1.418	.545	3.031	.010*
	Mother’s Uses Home computer	-7.341	1.974	-.798	-3.718	.003*
	Mother's Computer Experiences	18.473	5.701	.858	3.240	.006*
	Child’s Leisure Time at Home	5.060	2.255	.409	2.244	.043*
	Computer Habits of Child's Peers	6.716	2.271	.703	2.958	.011*

In sum, the results of the kindergarteners indicated that the mother’s education, the mother’s uses home computer, someone else's computer experiences, the child’s leisure time at home, and computer instructions in the classroom were good predictors of mathematics achievement. The results of the first graders indicated that the father’s uses home computer and family structure were good predictors of mathematics achievement. The results of the second graders indicated that computer instructions in the classroom were good predictors of mathematics achievement. The results of the third graders indicated that all social factors were not good predictors of mathematics achievement. Finally, the results of the fourth graders indicated that the father’s uses home computer, the mother’s uses home computer, the mother’s computer experiences, the child’s leisure time at home, and computer habits of the child’s peers were good predictors of mathematics achievement. Therefore, the hypothesis that there is a relationship between the social capital of K-4 children and mathematics achievement was supported by the results.

Research Question 9

The ninth question posed by this study was: Is there a relationship between the cultural capital of K-4 children and mathematics achievement? The hypothesis number nine was, there is a relationship between the cultural capital of K-4 children and mathematics achievement. Question 9 was investigated for each grade using the regression analysis with the 0.05 level of significance.

Kindergarten Results. The kindergarten results of the regression are presented in Tables 106 to 109. Table 106 shows that the mathematics achievement mean of kindergarteners was 80.082. The cultural factor mean was a number from 1 to 5 that was directly proportional to how often the children participated in cultural events. Table 106 also shows that kindergarteners visited more museums or zoos and aquariums than went to the library, dance class, music class, or martial arts class. Table 107 indicates that in the regression process with backward method all cultural factors entered in the model; and all factors were removed (significance of F >= 0.100). Finally, Table 109 shows that all cultural factors were not significant ($p > 0.05$). In short, the results of the kindergarteners indicated that cultural factors were not good predictors of mathematics achievement.

Table 106

Descriptive Statistics for Cultural Capital of Kindergarteners

Mathematics Achievement

Variables	Mean	Root Mean Square	N
Mathematics Achievement	80.082	16.0368	29
Museum	2.45	1.055	29

Zoo and Aquarium	2.45	.827	29
Library	1.72	.702	29
Dance Class	1.45	.632	29
Music Class	1.45	.736	29
Martial Arts Class	1.45	1.021	29

Table 107

Variables Entered/Removed for Cultural Capital of Kindergarteners

Model	Variables Entered	Variables Removed	Method
1	Martial Arts Class Music Class Library Museum Dance Class Zoo and Aquarium	.	Enter
2	.	Dance Class	Backward
3	.	Martial Arts Class	Backward
4	.	Museum	Backward
5		Library	Backward
6		Music Class	Backward
7		Zoo and Aquarium	Backward

a. All requested variables entered.
b. Dependent Variable: Mathematics Achievement

Table 108

Model Summary for Cultural Capital of Kindergarteners

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.350	.123	-.116	16.9445
2	.350	.123	-.068	16.5722
3	.348	.121	-.026	16.2405
4	.334	.111	.005	15.9992
5	.316	.100	.031	15.7879
6	.274	.075	.041	15.7078
7	.000	.000	.000	16.0368

Table 109

Coefficients for Cultural Capital of Kindergarteners

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	73.160	16.612		4.404	.000
	Museum	2.617	4.560	.172	.574	.572
	Zoo and Aquarium	-.102	5.835	-.005	-.018	.986
	Library	-2.981	4.846	-.130	-.615	.545
	Dance Class	7.035	5.869	.277	1.199	.243
	Music Class	-2.227	4.980	-.102	-.447	.659
	Martial Arts Class	-.730	3.596	-.046	-.203	.841
2	(Constant)	73.008	13.847		5.272	.000
	Museum	2.561	3.226	.169	.794	.435
	Library	-2.968	4.687	-.130	-.633	.533
	Dance Class	7.024	5.703	.277	1.231	.231
	Music Class	-2.188	4.340	-.100	-.504	.619
	Martial Arts Class	-.748	3.381	-.048	-.221	.827
3	(Constant)	71.809	12.488		5.750	.000
	Museum	2.746	3.054	.181	.899	.378
	Library	-2.768	4.506	-.121	-.614	.545
	Dance Class	6.545	5.171	.258	1.266	.218
	Music Class	-2.179	4.253	-.100	-.512	.613

Table 109 (continued)

4	(Constant)	68.951	11.007		6.264	.000
	Museum	2.543	2.983	.167	.852	.402
	Library	-2.484	4.405	-.109	-.564	.578
	Dance Class	6.344	5.080	.250	1.249	.223
5	(Constant)	65.561	9.098		7.206	.000
	Museum	2.509	2.943	.165	.853	.402
	Dance Class	5.785	4.916	.228	1.177	.250
6	(Constant)	70.021	7.405		9.456	.000
	Dance Class	6.946	4.699	.274	1.478	.151
7	(Constant)	80.082	2.978		26.892	.000

First Grade Results. The first grade results of the regression are presented in Tables 110 to 113. Table 110 shows that the mathematics achievement mean of first graders was 78.903. Table 110 also shows that children of first graders visited more museum or zoo and aquarium than went to the library, dance class, music class, or martial arts class. Table 111 indicates that in the regression process with backward method all cultural factors entered in the model, and all cultural were removed except one factor: martial arts class. In Table 112, The R Square of the last model was 0.086, which indicated that 8.6% of the variance in the mathematics achievement was explained by martial arts class. Finally, Table 113 shows that martial arts class was not significant ($p > 0.05$). In short, the results of the first graders indicated that cultural factors were not good predictors of mathematics achievement.

Table 110

Descriptive Statistics for Cultural Capital of First Graders

Mathematics Achievement

Variables	Mean	Root Mean Square	N
Mathematics Achievement	78.903	12.3941	36
Museum	2.14	.798	36
Zoo and Aquarium	2.33	.632	36

Library	1.67	.717	36
Dance Class	1.25	.439	36
Music Class	1.42	.906	36
Martial Arts Class	1.44	.939	36

Table 111

Variables Entered/Removed for Cultural Capital of First Graders

Model	Variables Entered	Variables Removed	Method
1	Martial Arts Class Zoo and Aquarium Dance Class Music Class Library Museum	.	Enter
2	.	Music Class	Backward (Sig. F>=0.100).
3	.	Museum	Backward (Sig. F>=0.100).
4	.	Library	Backward (Sig. F>=0.100).
5		Zoo and Aquarium	Backward (Sig. F>=0.100).
6		Dance Class	Backward (Sig. F>=0.100).

a. All requested variables entered.
b. Dependent Variable: Mathematics Achievement

Table 112

Model Summary for Cultural Capital of First Graders

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.413	.171	-.001	12.3989
2	.413	.171	.032	12.1911
3	.410	.168	.061	12.0118
4	.405	.164	.086	11.8492
5	.362	.131	.078	11.8979
6	.294	.086	.060	12.0190

Table 113

Coefficients for Cultural Capital of First Graders

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	85.788	11.061		7.756	.000
	Museum	-1.005	3.275	-.065	-.307	.761
	Zoo and Aquarium	4.316	3.826	.220	1.128	.269
	Library	-1.051	3.149	-.061	-.334	.741
	Dance Class	-5.675	5.169	-.201	-1.098	.281
	Music Class	.126	2.438	.009	.052	.959
	Martial Arts Class	-4.250	2.556	-.322	-1.662	.107
2	(Constant)	85.964	10.349		8.306	.000
	Museum	-.976	3.171	-.063	-.308	.760
	Zoo and Aquarium	4.314	3.762	.220	1.147	.261
	Library	-1.041	3.090	-.060	-.337	.739
	Dance Class	-5.715	5.025	-.203	-1.137	.264
	Martial Arts Class	-4.265	2.496	-.323	-1.709	.098
3	(Constant)	85.125	9.837		8.654	.000
	Zoo and Aquarium	3.773	3.277	.193	1.151	.258
	Library	-1.133	3.030	-.066	-.374	.711
	Dance Class	-5.939	4.899	-.210	-1.212	.235
	Martial Arts Class	-3.956	2.251	-.300	-1.757	.089
Table 113 (continued)						
4	(Constant)	84.010	9.248		9.085	.000
	Zoo and Aquarium	3.614	3.205	.184	1.128	.268
	Dance Class	-6.473	4.623	-.229	-1.400	.171
	Martial Arts Class	-3.773	2.167	-.286	-1.741	.091
5	(Constant)	91.471	6.488		14.099	.000
	Dance Class	-6.021	4.624	-.213	-1.302	.202
	Martial Arts Class	-3.490	2.162	-.265	-1.615	.116
6	(Constant)	84.507	3.711		22.773	.000
	Martial Arts Class	-3.880	2.163	-.294	-1.794	.082

Second Grade Results. The second grade results of the regression are presented in Tables 114 to 117. Table 114 shows that the mathematics achievement mean of second graders was 79.868. Table 114 also shows that children of second graders visited more museum or zoo and aquarium than went to the library, dance class, music class, or martial arts class. Table 115 indicates that in the regression process with backward method all cultural factors entered in the model; and all factors were removed (significance of $F>=0.100$). Finally, Table 117 shows that all cultural factors were not significant ($p > 0.05$). In short, the results of the second graders indicated that cultural factors were not good predictors of mathematics achievement.

Table 114

Descriptive Statistics for Cultural Capital of Second Graders

Mathematics Achievement

Variables	Mean	Root Mean Square	N
Mathematics Achievement	78.370	12.0983	23
Museum	2.26	.964	23
Zoo and Aquarium	2.30	.703	23
Library	1.91	.733	23
Dance Class	1.17	.491	23
Music Class	1.35	.487	23
Martial Arts Class	1.26	.752	23

Table 115

Variables Entered/Removed for Cultural Capital of Second Graders

Model	Variables Entered	Variables Removed	Method
1	Martial Arts Class Library Zoo and Aquarium Music Class Dance Class Museum	.	Enter
2	.	Dance Class	Backward
3	.	Music Class	Backward
4	.	Zoo and Aquarium	Backward
5		Martial Arts Class	Backward
6		Library	Backward
7		Museum	Backward

a. All requested variables entered.
b. Dependent Variable: Mathematics Achievement

Table 116

Model Summary for Cultural Capital of Second Graders

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.266	.071	-.277	13.6740
2	.266	.071	-.202	13.2664
3	.265	.070	-.136	12.8971
4	.260	.068	-.080	12.5709
5	.246	.061	-.033	12.2977
6	.206	.042	-.003	12.1187
7	.000	.000	.000	12.0983

Table 117

Coefficients for Cultural Capital of Second Graders

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	82.994	16.032		5.177	.000
	Museum	-2.364	4.320	-.188	-.547	.592
	Zoo and Aquarium	-1.238	6.118	-.072	-.202	.842
	Library	2.283	4.505	.138	.507	.619
	Dance Class	.284	7.398	.012	.038	.970
	Music Class	.739	6.772	.030	.109	.914
	Martial Arts Class	-1.683	4.223	-.105	-.399	.695
2	(Constant)	83.039	15.511		5.353	.000
	Museum	-2.388	4.144	-.190	-.576	.572
	Zoo and Aquarium	-1.121	5.135	-.065	-.218	.830
	Library	2.337	4.144	.142	.564	.580
	Music Class	.715	6.541	.029	.109	.914
	Martial Arts Class	-1.683	4.097	-.105	-.411	.686
3	(Constant)	83.886	13.062		6.422	.000
	Museum	-2.228	3.769	-.178	-.591	.562
	Zoo and Aquarium	-1.129	4.991	-.066	-.226	.824
	Library	2.211	3.868	.134	.572	.575
	Martial Arts Class	-1.671	3.981	-.104	-.420	.680

Table117 (continued)

4	(Constant)	81.912	9.469		8.651	.000
	Museum	-2.745	2.921	-.219	-.940	.359
	Library	2.293	3.753	.139	.611	.548
	Martial Arts Class	-1.366	3.651	-.085	-.374	.712
5	(Constant)	80.696	8.700		9.275	.000
	Museum	-2.976	2.793	-.237	-1.066	.299
	Library	2.302	3.672	.139	.627	.538
6	(Constant)	84.202	6.567		12.823	.000
	Museum	-2.580	2.681	-.206	-.962	.347
7	(Constant)	78.370	2.523		31.066	.000

Third Grade Results. The third grade results of the regression are presented in Tables 118 to 121. Table 118 shows that the mathematics achievement mean of third graders was 78.920. Table 118 also shows that children of third graders visited more museum or zoo and aquarium than went to library, dance class, music class, or martial arts class. Table 119 indicates that in the regression process with backward method all cultural factors entered in the model, and all cultural factors were removed (significance of F >= 0.100). Finally, Table 121 shows that all cultural factors were not significant ($p > 0.05$). In short, the results of the third graders indicated that cultural factors were not good predictors of mathematics achievement.

Table 118

Descriptive Statistics for Cultural Capital of Third Graders

Mathematics Achievement

Variables	Mean	Root Mean Square	N
Mathematics Achievement	78.920	16.2194	15
Museum	2.13	.516	15
Zoo and Aquarium	2.20	.414	15
Library	1.80	.775	15
Dance Class	1.47	.834	15
Music Class	1.73	.884	15
Martial Arts Class	1.60	.986	15

Table 119

Variables Entered/Removed for Cultural Capital of Third Graders

Model	Variables Entered	Variables Removed	Method
1	Martial Arts Class Library Zoo and Aquarium Dance Class Museum Music Class	.	Enter
2	.	Martial Arts Class	Backward (Sig. F>=0.100).
3	.	Dance Class	Backward (Sig. F>=0.100).
4		Zoo and Aquarium	
5	.	Library	Backward (Sig. F>=0.100).
6		Music Class	Backward (Sig. F>=0.100).
7		Museum	Backward (Sig. F>=0.100).

a. All requested variables entered.

b. Dependent Variable: Mathematics Achievement

Table 120

Model Summary for Cultural Capital of Third Graders

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.718	.515	.152	14.9400
2	.717	.514	.244	14.1051
3	.685	.469	.256	13.9874
4	.594	.353	.176	14.7224
5	.459	.211	.079	15.5631
6	.360	.129	.062	15.7060
7	.000	.000	.000	16.2194

Table 121

Coefficients for Cultural Capital of Third Graders

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	93.895	36.789		2.552	.034
	Museum	13.550	9.554	.431	1.418	.194
	Zoo and Aquarium	-13.983	11.140	-.357	-1.255	.245
	Library	-8.551	6.085	-.408	-1.405	.198
	Dance Class	-4.224	5.936	-.217	-.712	.497
	Music Class	5.627	5.172	.307	1.088	.308
	Martial Arts Class	-.802	5.385	-.049	-.149	.885
2	(Constant)	94.435	34.564		2.732	.023
	Museum	13.486	9.011	.429	1.497	.169
	Zoo and Aquarium	-14.757	9.305	-.377	-1.586	.147
	Library	-8.446	5.706	-.403	-1.480	.173
	Dance Class	-4.608	5.047	-.237	-.913	.385
	Music Class	5.851	4.671	.319	1.253	.242
3	(Constant)	77.413	28.864		2.682	.023
	Museum	16.712	8.221	.532	2.033	.069
	Zoo and Aquarium	-13.491	9.124	-.344	-1.479	.170
	Library	-9.301	5.582	-.444	-1.666	.127
	Music Class	7.083	4.435	.386	1.597	.141

Table 121 (continued)

4	(Constant)	44.034	18.932		2.326	.040
	Museum	18.073	8.598	.575	2.102	.059
	Library	-9.118	5.874	-.435	-1.552	.149
	Music Class	7.351	4.664	.401	1.576	.143
5	(Constant)	44.318	20.012		2.215	.047
	Museum	11.950	8.076	.380	1.480	.165
	Music Class	5.255	4.719	.286	1.114	.287
6	(Constant)	54.829	17.809		3.079	.009
	Museum	11.293	8.129	.360	1.389	.188
7	(Constant)	78.920	4.188		18.845	.000

Fourth Grade Results. The fourth grade results of the regression are presented in Tables 122 to 125. Table 122 shows that the mathematics achievement mean of fourth graders was 79.605. Table 122 also shows that children of fourth graders visited more museum or zoo and aquarium than went to the library, dance class, music class, or martial arts class. Table 123 indicates that in the regression process with backward method that all cultural factors entered in the model except one: martial arts class; and dance class, museum, library, and zoo and aquarium were removed (significance of F >= 0.100). In Table 124, The R Square of the last model was 0.413, which indicated that 41.3% of the variance in the mathematics achievement was explained by music class. Finally, Table 125 shows that music class was significant ($p < 0.05$). In short, the results of the fourth graders indicated that only music class was a good predictor of mathematics achievement.

Table 122

Descriptive Statistics for Cultural Capital of Fourth Graders

Mathematics Achievement

Variables	Mean	Root Mean Square	N
Mathematics Achievement	79.605	12.9707	19
Museum	2.00	.943	19
Zoo and Aquarium	2.21	.631	19

Library	1.74	.653	19
Dance Class	1.26	.653	19
Music Class	1.63	1.065	19
Martial Arts Class	1.00	.000	19

Table 123

Variables Entered/Removed for Cultural Capital of Fourth Graders

Model	Variables Entered	Variables Removed	Method
1	Music Class Dance Class Library Museum Zoo and Aquarium	.	Enter
2	.	Dance Class	Backward (Sig. F>=0.100).
3	.	Museum	Backward (Sig. F>=0.100).
4	.	Library	Backward (Sig. F>=0.100).
5		Zoo and Aquarium	Backward (Sig. F>=0.100).

a. All requested variables entered.
b. Dependent Variable: Mathematics Achievement

Table 124

Model Summary for Cultural Capital of Fourth Graders

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.684	.467	.262	11.1403
2	.683	.467	.314	10.7402
3	.678	.459	.351	10.4482
4	.653	.427	.355	10.4152
5	.642	.413	.378	10.2291

Table 125

Coefficients for Cultural Capital of Fourth Graders

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	67.179	11.813		5.687	.000
	Museum	1.454	3.311	.106	.439	.668
	Zoo and Aquarium	-5.477	5.451	-.266	-1.005	.333
	Library	4.424	4.573	.223	.967	.351
	Dance Class	.457	4.119	.023	.111	.913
	Music Class	8.190	2.517	.673	3.254	.006
2	(Constant)	67.680	10.525		6.430	.000
	Museum	1.389	3.142	.101	.442	.665
	Zoo and Aquarium	-5.358	5.153	-.260	-1.040	.316
	Library	4.395	4.402	.221	.999	.335
	Music Class	8.186	2.426	.672	3.374	.005*
3	(Constant)	68.540	10.063		6.811	.000
	Zoo and Aquarium	-4.221	4.344	-.205	-.972	.347
	Library	3.955	4.171	.199	.948	.358
	Music Class	8.290	2.349	.681	3.529	.003*
4	(Constant)	72.021	9.339		7.712	.000
	Zoo and Aquarium	-2.474	3.922	-.120	-.631	.537
	Music Class	8.001	2.322	.657	3.445	.003*

Table 125 (continued)

5	(Constant)	66.843	4.376		15.276	.000
	Music Class	7.822	2.264	.642	3.456	.003*

In sum, the results of the K-4 children indicated that only music class of the fourth graders was a good predictor of mathematics achievement. Therefore, the hypothesis that there is a relationship between cultural capital of K-4 children and mathematics achievement was not supported by the results.

Finally, a general regression analysis among the dependent variable mathematics achievement and child's computer activities, social capital, cultural capital, and SES were used with the 0.05 level of significance.

The results of the general regression are presented in Tables 126 to 129. Table 126 shows that the mathematics achievement mean of K-4 children was 79.194. Table 126 indicates that the strong factors of the general regression were the father's education, the mother's education, the father's uses home computer, the mother's uses home computer, the child's leisure time at home, family structure, and SES (factor mean>4). On the other hand, applications and tools, e-mail, computer research, the computer habits of the child's peers, library, and music class were the weak factors (factor mean < 2). Table 127 indicates that of all factors entered in the model, all factors were removed except six factors: e-mail, the father's computer experiences, the child's leisure time at home, computer instructions in the classroom, family structure, and martial arts class. In Table 128, the R Square of the last model was 0.168, which indicated that 16.8% of the variance in the mathematics achievement was explained by the six factors. Finally, a summary of the regression coefficients in Table 129 shows that the father's computer experiences, the child's leisure time at home, and family structure were significant ($p < 0.05$). In short, the results of the general regression indicated that the father's computer experiences, the child's leisure time at home, and family structure were the best predictors of mathematics achievement.

Table 126

Descriptive Statistics for general regression

Mathematics Achievement

Variables	Mean	Root Mean Square	N
Mathematics Achievement	79.194	13.6529	122
Computer Games	2.51	1.261	122
Educational Programs	2.15	1.133	122
Applications and Tools	1.18	.643	122
E-mail	1.11	.467	122
Computer Research	1.48	.763	122
Father's Education	4.24	.617	122
Mother's Education	4.14	.594	122
Father's Uses Home Computer	4.12	1.346	122
Mother's Uses Home Computer	4.01	1.339	122
Father's Computer Experiences	3.99	1.072	122
Mother's Computer Experiences	3.81	.921	122
Someone's Computer Experiences	2.41	1.520	122
Child's Leisure Time at Home	4.18	1.045	122
Computer Habits of Child's Peers	1.71	1.236	122
Computer instructions in the Classroom	2.41	.951	122
Table 126 (continued)			
Family Structure	4.84	.594	122
Family Size	2.87	.852	122
Museum	2.21	.893	122
Zoo and Aquarium	2.32	.671	122
Library	1.75	.708	122
Dance Class	1.31	.590	122
Music Class	1.48	.826	122
Martial Arts Class	1.36	.863	122
SES	4.53	.964	122

Table 127

Variables Entered/Removed for general regression

Model	Variables Entered	Variables Removed	Method
1	Computer Games		
	Educational Programs		
	Applications and Tools		
	E-mail		
	Computer Research		
	Father's Education		
	Mother's Education		
	Father’s Uses Home Computer		
	Mother’s Uses Home Computer		Enter
	Father's Computer Experiences		
	Mother's Computer Experiences		
	Someone's Computer Experiences		
	Child’s Leisure Time at Home		
	Computer Habits of Child's Peers		
	Computer instructions in the Classroom		
	Family Structure		
	Family Size		
	Museum		
	Zoo and Aquarium		
	Library		
Table 127 (continued)			
	Dance Class		
	Music Class		Enter
	Martial Arts Class		
	SES		
2		Computer Habits of Child's Peers	Backward
3		Mother's Education	Backward
4		Library	Backward
5		Family Size	Backward
6		Applications and Tools	Backward
7		Zoo and Aquarium	Backward
8		Museum	Backward
9		Father's Education	Backward
10		Educational Programs	Backward

11	Computer Games	Backward
12	Father's Uses Home Computer	Backward
13	Someone's Computer Experiences	Backward
14	Dance Class	Backward
15	Computer Research	Backward
16	SES	Backward
17	Music Class	Backward
18	Mother's Uses Home Computer	Backward
19	Mother's Computer Experiences	Backward

Table 128

Model Summary for general regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.502	.252	.067	13.1860
2	.502	.252	.077	13.1192
3	.502	.252	.086	13.0539
4	.501	.251	.094	12.9944
5	.500	.250	.102	12.9385
6	.499	.249	.110	12.8829
7	.498	.248	.117	12.8317
8	.497	.247	.124	.502
9	.496	.246	.131	.502
10	.493	.243	.136	.502
11	.491	.241	.142	.501
12	.485	.236	.144	.500
13	.480	.230	.145	.499
14	.474	.224	.147	.498
15	.466	.217	.147	.497
16	.460	.212	.149	.496
17	.449	.202	.145	.493
18	.431	.186	.136	.491
19	.410	.168	.125	.485

Table 129

Coefficients for general regression

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	60.721	17.346		3.501	.001
	Computer Games	-.993	1.403	-.092	-.707	.481

	Educational Programs	.963	1.498	.080	.643	.522
	Applications and Tools	-.879	2.749	-.041	-.320	.750
	E-mail	4.043	3.687	.138	1.096	.276
	Computer Research	2.291	2.079	.128	1.102	.273
	Father's Education	.846	2.378	.038	.356	.723
	Mother's Education	.381	2.613	.017	.146	.884
	Father's Uses Home Computer	1.068	1.112	.105	.960	.339
	Mother's Uses Home Computer	-1.966	1.111	-.193	-1.770	.080
	Father's Computer Experiences	2.351	1.505	.185	1.562	.122
	Mother's Computer Experiences	3.000	1.627	.202	1.844	.068
	Someone's Computer Experiences	.791	.888	.088	.891	.375
	Child's Leisure Time at Home	2.318	1.268	.177	1.828	.071
	Computer Habits of Child's Peers	.104	1.066	.009	.097	.923
	Computer instructions in the Classroom	2.928	1.358	.204	2.156	.034*
	Family Structure	-5.587	2.544	-.243	-2.196	.030*
	Family Size	-.565	1.600	-.035	-.353	.725
	Museum	-.611	1.788	-.040	-.342	.733
Table 129 (continue)						
	Zoo and Aquarium	.873	2.372	.043	.368	.714
	Library	-.596	1.870	-.031	-.319	.751
	Dance Class	-2.573	2.340	-.111	-1.100	.274
	Music Class	1.488	1.623	.090	.917	.361
	Martial Arts Class	-3.765	1.716	-.238	-2.194	.031*
	SES	1.322	1.518	.093	.871	.386
19	(Constant)	70.722	11.349		6.231	.000
	E-mail	4.936	2.519	.169	1.960	.052
	Father's Computer Experiences	2.511	1.154	.197	2.176	.032*
	Child's Leisure Time at Home	2.771	1.156	.212	2.397	.018*
	Computer instructions in the Classroom	2.410	1.235	.168	1.951	.054
	Family Structure	-4.316	2.117	-.188	-2.038	.044*
	Martial Arts Class	-2.627	1.366	-.166	-1.923	.057

a. Dependent Variable: Mathematics Achievement

Chapter Summary

Chapter 4 presented the statistical analysis that includes descriptive statistics, reliability test, and hypothesis testing. This research investigated the effects of home computers on mathematics achievement from kindergarteners to fourth graders. The correlation between mathematics achievement and key elements or factors that described children's family backgrounds was measured. Four hundred questionnaires were distributed to the parents of K-4 children of Manoa Elementary School, and 122 questionnaires were returned. Therefore, the percentage of return rate was 30.5%. The descriptive statistics presented the results of the parents' surveys. The frequency of the answers of the thirty-six questions about the children's computing environment and mathematics achievements were shown. The results showed that in the sample there were more male (56.6%) than female (43.4%) children. The predominant ethnic/race group was Japanese (41.8%). The parents answered that only 16.4% of primary home language was non-English. 77.9% of the parents answered that their children have access to computer in a public area, 18.9% in the child's bedroom, and only 3.3% do not have home computers. Also, 44.8% of the kindergarteners access the Internet periodically, and the mean of all grades was 54.9%. The percent of K-4 children that use the computer per activity was 73.0% play computer games, 64.8% use educational programs, 36.1% use computer for research, 10.7% use computer for application and tools, and only 8.2% use e-mail. The father's education was 56.6% had college, university, or professional school, and 33.6% had graduate school. The mother's education was 69.7% had college, university, or professional school, and 23.0% had graduate school. Also, the percent of children's parents that use home computers everyday was 58.2% for the fathers and 51.6% for the mothers. The results also showed that 74.6% of the children's fathers and 66.4% of the children's mothers have good or excellent computer experience and skills. 46.7% of the parents answered that their children have leisure time at home everyday. The percent of K-4 children that participate periodically in cultural events was 95.1% visit zoo or aquarium, 78.7% visit museum, 61.5% go to the library out of the school, 34.4% go to the music class out of the school, 25.4% go to the dance class out of the school, and 17.2% go to the martial arts class. Finally, the mathematics achievement mean of K-4 children was 79.194, and the standard deviation was 13.6529.

The reliability of the instrument developed for this research was evaluated. The data collected from the parents' survey was tested for internal consistency by computing Chronbach's coefficient alpha. The coefficient alpha for the thirty-six measures of mathematics achievement and home computer environment was 0.6133. This indicated that the parents' survey data shows relatively moderate internal consistency (see Tables 130 and 131, Appendix E).

There were nine research questions investigated in this study. The first question posed by this study was: Is there a relationship between the gender of K-4 children and mathematics achievement? The hypothesis number one was there is a relationship between the gender of K-4 children and mathematics achievement. The t-test indicated that the mean score for females on mathematics achievement was 80.335, and the mean score for males was 78.317. The results of the t-test indicated that there were no significant differences between males and females ($p=0.421$). Therefore, the hypothesis number one was not supported.

The second question posed by this study was: Is there a relationship between the ethnicity/race of K-4 children and mathematics achievement? The hypothesis number two was there is a relationship between the ethnicity/race of K-4 children and mathematics achievement. The one-way ANOVA indicated that White and Japanese had better mathematics achievement means than Chinese, Korean, and the others. However, the mathematics achievement between groups indicated that the ethnicity/race of K-4 children and mathematics achievement was not significant ($p > 0.05$). Therefore, the hypothesis number two was not supported.

The third question posed by this study was: Is there a relationship between the primary home language of K-4 children and mathematics achievement? The hypothesis number three was there is a relationship between the primary home language of K-4 children and mathematics achievement. The t-test indicated that the mathematics achievement mean for children, whose primary home language was English, was 81.086, and the mathematics achievement mean for children, whose primary home language was non-English, was 75.357. The results of the t-test indicated that there were no significant differences between the primary home language groups ($p = 0.119$). Therefore, the hypothesis number three was not supported.

The fourth question posed by this study was: Is there a relationship between the socioeconomic status of K-4 children and mathematics achievement? The hypothesis number four was there is a relationship between the socioeconomic status of K-4 children and mathematics achievement. The results of the PPMC indicated that the correlation coefficient (r) between mathematics achievement and SES was 0.100. Therefore, the hypothesis number four was not supported.

The fifth question posed by this study was: Is there a relationship between the number of computers in the home and where they are located for K-4 children and mathematics achievement? The hypothesis number five was there is a relationship between the number of computers in the home and where they are located for K-4 children and mathematics achievement? The results of the factorial ANOVA indicated that there was no significant relationship between the numbers of computers in the home and where they are located for K-4 children and mathematics achievement ($p = 0.299$). Therefore, the hypothesis number five was not supported.

The sixth question posed by this study was: Is there a relationship between Internet access in homes of K-4 children and mathematics achievement? The hypothesis number six was there is a relationship between Internet access in homes of K-4 children and mathematics achievement. The results of the one-way ANOVA indicated that Internet access in homes for all grades and mathematics achievement was not significant ($p > 0.05$). Therefore, the hypothesis number six was not supported.

The seventh question posed by this study was: Is there a relationship between computer activities in homes of K-4 children and mathematics achievement? The hypothesis number seven was there is a relationship between computer activities at home of K-4 children and mathematics achievement. The regression indicated that only applications and tools of third graders was a good predictor of mathematics achievement. Therefore, the hypothesis number seven was not supported.

The eighth question posed by this study was: Is there a relationship between the social capital of K-4 children and mathematics achievement? The hypothesis number eight was there is a relationship between the social capital of K-4 children and mathematics achievement. The regression per graders had the following results. The kindergarten results indicated that the mother's education, the mother's uses home computer, someone else's computer experiences, the child's leisure time at home, and computer instructions in the classroom were good predictors of mathematics achievement. The results of the first graders indicated that father's uses home computer and family structure were good predictors of mathematics achievement. The results of the second graders indicated that computer instructions in the classroom were good predictors of mathematics achievement. The results of the third graders indicated that all social factors were not good predictors of mathematics achievement. Finally, the results of the fourth graders indicated that the father's uses home computer, the mother's uses home computer, the mother's computer experiences, the child's leisure time at home, and computer habits of the child's peers were good predictors of mathematics achievement. Therefore, the hypothesis number eight was supported.

The ninth question posed by this study was: Is there a relationship between the cultural capital of K-4 children and mathematics achievement? The hypothesis number nine was, there is a relationship between the cultural capital of K-4 children and mathematics achievement. The regression indicates that only music class of the fourth graders was a good predictor of mathematics achievement. Therefore, the hypothesis number nine was not supported.

Finally, a general regression used the mathematics achievement (dependent variable) and child’s computer activities, social capital, cultural capital, and SES (independent variables or factors). For child’s computer activities, social capital, and cultural capital, all factors were used. The results of the general regression indicated that the strong factors of the general regression were the father’s education, the mother’s education, the father’s uses home computer, the mother’s uses home computer, the child’s leisure time at home, family structure, and SES. On the other hand, applications and tools, e-mail, computer research, the computer habits of the child’s peers, library, and music class were the weak factors. Table 127 indicates that of all factors entered in the model, all factors were removed except six factors: e-mail, the father's computer experiences, the child’s leisure time at home, computer instructions in the classroom, family structure, and martial arts class. In Table 128, the R Square of the last model was 0.168, which indicated that 16.8% of the variance in the mathematics achievement was explained by the six factors. Finally, a summary of the regression coefficients in Table 129 shows that the father’s computer experiences, the child’s leisure time at home, and family structure were significant ($p < 0.05$). In short, the results of the general regression indicated that the father’s computer experiences, the child’s leisure time at home, and family structure were the best predictors of mathematics achievement.

A detailed discussion of the findings, conclusions and recommendations follows in Chapter 5.

Chapter 5 - Findings, Conclusions, and Recommendations

Purpose

The purpose of this paper was to investigate the effects of home computers on mathematics achievement from kindergarten to fourth grade children. The correlation between mathematics achievement and key elements or factors that described children's family backgrounds was measured. Each factor present in the domestic computing environment that could potentially influence the mathematics performance was: gender, ethnicity and race, socioeconomic status, primary home language, the number of computers in the home and where they are located, Internet access at home, computer activities at home, social capital, and cultural capital.

Purpose of chapter

The purpose of Chapter Five was to present a detailed discussion of the findings, conclusions, recommendations, and summary based on the statistical analysis that was completed in Chapter Four. In the findings, the descriptive statistics about the parent's questionnaire, the reliability test of the collected data, and the nine research questions and hypotheses were discussed and evaluated. In the conclusions, the results were interpreted according to the statistical analysis presented in the previous chapter. In the recommendations, some suggestions were discussed to serve as a guideline for future study. The last part of this chapter, a complete summary of the chapter was presented.

Chapter Organization

Chapter Five was divided into five different sections: (1) Introduction, (2) Findings, (3) Conclusions, (4) Recommendations, and (5) Summary. Section 1, Introduction, explains an overview of this chapter, including the Purpose of Paper, Purpose of Chapter and Organization of Chapter.

Section 2, Findings, presents a descriptive statistics about the parent's questionnaire, the results of the reliability test of the collected data, and the results of the nine research questions and hypotheses of this study.

Section 3, Conclusions, offer an interpretation of the results that reveals what the findings mean to this research.

Section 4, Recommendations, discuss some suggestions were discussed to serve as a guideline for future study.

Section 5, Summary, concludes the chapter with a brief summary of the findings, conclusions, and recommendations.

Findings

The preview chapter presented the statistical analysis that includes descriptive statistics, reliability test, and hypothesis testing. This research investigated the effects of home computers on mathematics achievement from kindergarteners to fourth graders. The correlation between mathematics achievement and key elements or factors that described children's family backgrounds was measured. Four hundred questionnaires were distributed to the parents of K-4 children of Manoa Elementary School, and 122 questionnaires were returned. Therefore, the percentage of return rate was 30.5%. The descriptive statistics presented the results of the parents' surveys. The frequency of the answers of the thirty-six questions about the children's computing environment and mathematics achievements were shown. The results showed that in the sample there were more male (56.6%) than female (43.4%) children. The predominant ethnic/race group was Japanese (41.8%). The parents answered that only 16.4% of primary home language was non-English. 77.9% of the parents answered that their children have access to computer in a public area, 18.9% in the child's bedroom, and only 3.3% do not have home computers. Also, 44.8% of the kindergarteners access the Internet periodically, and the mean of all grades was 54.9%. The percent of K-4 children that use the computer per activity was 73.0% play computer games, 64.8% use educational programs, 36.1% use computer for research, 10.7% use computer for application and tools, and only 8.2% use e-mail. The father's education was 56.6% had college, university, or professional school, and 33.6% had graduate school. The mother's education was 69.7% had college, university, or professional school, and 23.0% had graduate school. Also, the percent of children's parents that use home computers everyday was 58.2% for the fathers and 51.6% for the mothers. The results also showed that 74.6% of the children's fathers and 66.4% of the children's mothers have good or excellent computer experience and skills. 46.7% of the parents answered that their children have leisure time at home everyday. The percent of K-4 children that participate periodically in cultural events was 95.1% visit zoo or aquarium, 78.7% visit museum, 61.5% go to the library out of the school, 34.4% go to the music class out of the school, 25.4% go to the dance class out of the school, and 17.2% go to the martial arts class. Finally, the mathematics achievement mean of K-4 children was 79.194, and the standard deviation was 13.6529.

To measure the mathematics achievement, each subject receives a number from 0 to 4. If a subject was not applicable (number 4), it was discarded. Otherwise, the applicable subject receives a number from 0 to 3. The maximum points of this sum divide the sum of points of the all-applicable subjects, and 100 multiply the result. Therefore, each K-4 child received a number from 0 to 100 that represents the percent of the mathematics achievement. The mathematics achievement mean of K-4 children was 79.194, and the standard deviation was 13.6529. The mathematics achievement mean of kindergarteners was 80.082, and the standard deviation was 16.0368. The mathematics achievement mean of first graders was 78.903, and the standard deviation was 12.3941. The mathematics achievement mean of second graders was 78.370, and the standard deviation was 12.0983. The mathematics achievement mean of third graders was 78.920, and the standard deviation was 16.2194. The mathematics achievement mean of four graders was 79.605, and the standard deviation was 12.9707.

The reliability of the instrument developed for this research was evaluated. The data collected from the parents' survey was tested for internal consistency by computing Chronbach's coefficient alpha. The coefficient alpha for the thirty-six measures of mathematics achievement and home computer environment was 0.6630. This indicated that the parents' survey data shows relatively moderate internal consistency (see Tables 130 and 131, Appendix E).

There were nine research questions investigated in this study. The first question posed by this study was: Is there a relationship between the gender of K-4 children and mathematics achievement? The hypothesis number one was there is a relationship between the gender of K-4 children and mathematics achievement. The t-test indicated that the mean score for females on mathematics achievement was 80.335, and the mean score for males was 78.317. The results of the t-test indicated that there were no significant differences between males and females ($p=0.421$). Therefore, the hypothesis number one was not supported.

The second question posed by this study was: Is there a relationship between the ethnicity/race of K-4 children and mathematics achievement? The hypothesis number two was there is a relationship between the ethnicity/race of K-4 children and mathematics achievement. The one-way ANOVA indicated that White and Japanese had better mathematics achievement means than Chinese, Korean, and the others. However, the mathematics achievement between groups indicated that the relationship between ethnicity/race of K-4 children and mathematics achievement was not significant ($p > 0.05$). Therefore, the hypothesis number two was not supported.

The third question posed by this study was: Is there a relationship between the primary home language of K-4 children and mathematics achievement? The hypothesis number three was there is a relationship between the primary home language of K-4 children and mathematics achievement. The t-test indicated that the mathematics achievement mean for children, whose primary home language was English, was 81.086, and the mathematics achievement mean for children, whose primary home language was non-English, was 75.357. The results of the t-test indicated that there were no significant differences between the primary home language groups ($p = 0.119$). Therefore, the hypothesis number three was not supported.

The fourth question posed by this study was: Is there a relationship between the socioeconomic status of K-4 children and mathematics achievement? The hypothesis number four was there is a relationship between the socioeconomic status of K-4 children and mathematics achievement. The correlation coefficient (r) between mathematics achievement and SES was 0.100. The result of the correlation indicated that there was no relationship between mathematics achievement and SES. Therefore, the hypothesis number four was not supported.

The fifth question posed by this study was: Is there a relationship between the number of computers in the home and where they are located for K-4 children and mathematics achievement? The hypothesis number five was there is a relationship between the number of computers in the home and where they are located for K-4 children and mathematics achievement? The results of the factorial ANOVA indicated that there was no significant relationship between the numbers of computers in the home and where they are located for K-4 children and mathematics achievement ($p = 0.299$). Therefore, the hypothesis number five was not supported.

The sixth question posed by this study was: Is there a relationship between Internet access in homes of K-4 children and mathematics achievement? The hypothesis number six was there is a relationship between Internet access in homes of K-4 children and mathematics achievement. The results of the one-way ANOVA indicated that Internet access in homes for all grades and mathematics achievement was not significant ($p > 0.05$). Therefore, the hypothesis number six was not supported.

The seventh question posed by this study was: Is there a relationship between computer activities in homes of K-4 children and mathematics achievement? The hypothesis number seven was there is a relationship between computer activities at home of K-4 children and mathematics achievement. The regression indicated that only applications and tools of third graders was a good predictor of mathematics achievement. Therefore, the hypothesis number seven was not supported.

The eighth question posed by this study was: Is there a relationship between the social capital of K-4 children and mathematics achievement? The hypothesis number eight was there is a relationship between the social capital of K-4 children and mathematics achievement. The regression per graders had the following results. The kindergarten results indicated that the mother's education, the mother's use of home computer, someone else's computer experiences, the child's leisure time at home, and computer instructions in the classroom were good predictors of mathematics achievement. The results of the first graders indicated that the father's use of home computer and family structure were good predictors of mathematics achievement. The results of the second graders indicated that computer instruction in the classroom was a good predictor of mathematics achievement. The results of the third graders indicated that all social factors were not good predictors of mathematics achievement. Finally, the results of the fourth graders indicated that the father’s use of home computer, the mother’s use of home computer, the mother’s computer experiences, the child’s leisure time at home, and computer habits of the child’s peers were good predictors of mathematics achievement. Therefore, the hypothesis number eight was supported.

The ninth question posed by this study was: Is there a relationship between the cultural capital of K-4 children and mathematics achievement? The hypothesis number nine was, there is a relationship between the cultural capital of K-4 children and mathematics achievement. The regression indicated that only the factor child goes to a music class of the fourth graders was a good predictor of mathematics achievement. Therefore, the hypothesis number nine was not supported.

Finally, a general regression used the mathematics achievement (dependent variable) and child’s computer activities, social capital, cultural capital, and SES (independent variables or factors). For child’s computer activities, social capital, and cultural capital, all factors were used. Table 127 indicates that of all factors entered in the model, all factors were removed except six factors: e-mail, the father's computer experiences, the child’s leisure time at home, computer instructions in the classroom, family structure, and martial arts class. The R Square of the last model was 0.168, which indicated that 16.8% of the variance in the mathematics achievement was explained by the six factors. Finally, the general regression indicated that the father’s computer experiences, the child’s leisure time at home, and family structure were significant ($p < 0.05$). Therefore, the father’s computer experiences, the child’s leisure time at home, and family structure were the best predictors of mathematics achievement.

Conclusions

The purpose of this paper was to verify the effects of home computers on mathematics achievement from kindergarten to fourth grade children. The correlation between mathematics achievement and key elements or factors that described children's family backgrounds was measured. Four hundred questionnaires were distributed to the parents of K-4 children of Manoa Elementary School, and 122 questionnaires were returned. Therefore, the percentage of return rate was 30.5%.

There were nine research questions investigated in this study. The first question posed by this study was: Is there a relationship between the gender of K-4 children and mathematics achievement? Hypothesis number one was there is a relationship between the gender of K-4 children and mathematics achievement. The results indicated that the mean score for females on mathematics achievement was 80.335 and the mean score for males was 78.317. Although the mean score for females on mathematics achievement was greater than males, the results of the t-test indicated that there were no significant differences between males and females ($p = 0.421$). Therefore, the first conclusion of this study indicated that there was no significant difference between the mathematics achievement mean of male and female children from ages five to nine.

The second question posed by this study was: Is there a relationship between the ethnicity/race of K-4 children and mathematics achievement? Hypothesis number two was there is a relationship between the ethnicity/race of K-4 children and mathematics achievement. The mathematics achievement means among the ethnicity/race groups were 82.000 for the Whites, 79.029 for the Japanese, 78.750 for the Chinese, 77.350 for the Koreans, and 77.335 for the other ethnicities. The Whites and Japanese had better mathematics achievement means than Chinese, Koreans, and the other ethnicities. However, the results of the one-way ANOVA indicated that there was no significant difference between the mathematics achievement mean among the ethnicity/race groups. Therefore, the second conclusion of this study indicated that there was no significant difference between the mathematics achievement mean among the ethnicity/race groups. The interpretation of homogeneity of the groups could be explained through the fact that 82% of the children from Manoa Elementary School are Asian/Pacific Islanders (GreatSchool.net, 2006).

The third question posed by this study was: Is there a relationship between the primary home language of K-4 children and mathematics achievement? Hypothesis number three was there is a relationship between the primary home language of K-4 children and mathematics achievement. The mathematics achievement mean for children, whose primary home language was English, was 81.086, and the mathematics achievement mean for children, whose primary home language was non-English, was 75.357. On the other hand, the results of the t-test indicated that there were no significant differences between the primary home language groups ($p = 0.119$). Consequently, the third conclusion of this study indicated that there was no significant difference between the mathematics achievement mean for the primary home language groups from Manoa Elementary School. The interpretation of the equality of mathematics achievement between the groups could be explained through the fact that according to Manoa Elementary School (2004), only 4.8% of their children have limited English proficiency. Therefore, primary home language was not a significant factor that could influence the mathematics performance.

The fourth question posed by this study was: Is there a relationship between the socioeconomic status of K-4 children and mathematics achievement? Hypothesis number four was there is a relationship between the socioeconomic status of K-4 children and mathematics achievement. The fourth conclusion of this study indicated that the correlation coefficient (r) between mathematics achievement and SES was only 0.100, which indicated no relationship between the variables. The interpretation of this unexpected result was due to that Manoa Elementary School is located in a middle-and-high SES area. Table 31 shows that 73.8% of the parents answered to have a family income greater than $60,000.00. Consequently, the SES was not a selective factor for Manoa Elementary School children that could influence the mathematical performance. To better test the relationship between SES and mathematics achievement, the parent survey must include other schools with different family incomes.

The fifth question posed by this study was: Is there a relationship between the number of computers in the home and where they are located for K-4 children and mathematics achievement? Hypothesis number five was there is a relationship between the number of computers in the home and where they are located for K-4 children and mathematics achievement. The fifth conclusion of this study indicated that there was no significant relationship between the numbers of computers in the home and where they are located for K-4 children and mathematics achievement ($p > 0.05$). It is important to keep in mind that the negative result between the numbers of computers in the home and where they are located for K-4 children and mathematics achievement does not mean that the factor is weak, and that it can be ignored. When the family shares one computer, young children might have less access to computing technology. Therefore, the number of computers in the home and where they are located can be of fundamental importance for children's access to technology early, and get advantages in the future. In short, although the result of this study indicated that there was no significant relationship between the numbers of computers in the home and where they are located for K-4 children and mathematics achievement, the number of computer need to be sufficient for children's usage.

The sixth question posed by this study was: Is there a relationship between Internet access in homes of K-4 children and mathematics achievement? Hypothesis number six was there is a relationship between Internet access in homes of K-4 children and mathematics achievement. The descriptive statistics indicated that 54.9% of K-4 children from Manoa Elementary School access the Internet at home. However, the results of the one-way ANOVA indicated that there was no significance between mathematics achievement and Internet access in homes for all grades ($p > 0.05$). The sixth conclusion of this study indicated that there was no relationship between Internet access in homes of K-4 children and mathematics achievement. One interpretation of this result was that the children use the Internet more for fun than for research. For instance, Table 8 and 12 show that 77.0% of the parents answered that their children play computer games, and only 36.1% use the computer for research. Internet access becomes a significant factor when the children discover how useful the Internet is for researching.

The seventh question posed by this study was: Is there a relationship between computer activities in homes of K-4 children and mathematics achievement? Hypothesis number seven was there is a relationship between computer activities at home of K-4 children and mathematics achievement. The computer activity regression indicated that only applications and tools of third graders was a good predictor of mathematics achievement. However, it was not representative of all grades (K-4). Therefore, the seventh conclusion of this study indicated that there was no relationship between computer activities at home of K-4 children and mathematics achievement. One important consideration was that the correlation between computer activity and mathematics achievement could range from –1 to 1. In other words, the computer activity could have positive or negative effects on mathematics achievement depending on how the computer was used. If the children have fun with educative computer games, use e-mail and research for academic purposes, use applications and tools to improve their homework, and educational programs to reinforce the class instructions, the computer activities and mathematics achievement correlation could be positive. Otherwise, if the computer activity was used exclusively for fun, and decreases the interest for school, the same correlation could be negative. In short, the results of this study indicated that there was no relationship between computer activities at home and mathematics achievement, and one possible interpretation was that the positive and negative effects that computer activity causes on the mathematics achievement could be neutralized.

The eighth question posed by this study was: Is there a relationship between the social capital of K-4 children and mathematics achievement? Hypothesis number eight was there is a relationship between the social capital of K-4 children and mathematics achievement. When family and community members supervise, monitor, and provide leadership for children, the computer environment has a strong social capital, the home computer becomes a tool that can have a positive correlation with mathematics achievement. Conversely, where this social structure is weak, the young children cannot benefit from technology effectively to reinforce their mathematic skills. The regression results per graders indicated what social factors were good predictors of mathematics achievement. The kindergarten results indicated that the mother's education, the mother's use of home computer, someone else's computer experiences, the child's leisure time at home, and computer instructions in the classroom were good predictors of mathematics achievement. The results of the first graders indicated that the father's use of home computer and family structure were good predictors of mathematics achievement. The results of the second graders indicated that computer instruction in the classroom was a good predictor of mathematics achievement. The results of the third graders indicated that all social factors were not good predictors of mathematics achievement. Finally, the results of the fourth graders indicated that the father's use of home computer, the mother's use of home computer, the mother's computer experiences, the child's leisure time at home, and computer habits of the child's peers were good predictors of mathematics achievement. In short, there was a relationship between the social capital and mathematics achievement for almost all grades. The fact that there was no relationship between the social capital and mathematics achievement for third graders could be discarded because the small number of participation of this group increased the chances of errors. In addition, the nine out twelve social factors that affected the mathematics achievement at least in one grade were: the mother's education, the father's use of home computer, the mother's use of home computer, the mother's computer experiences, someone else's computer experiences, the child's leisure time at home, computer instruction in the classroom, computer habits of the child's peers, and family structure. Therefore, the eighth conclusion of this study indicated that there was a strong relationship between the social capital of K-4 children and mathematics achievement.

The ninth question posed by this study was: Is there a relationship between the cultural capital of K-4 children and mathematics achievement? Hypothesis number nine was, there is a relationship between the cultural capital of K-4 children and mathematics achievement. The six factors of the cultural capital tested in the regression for all grades were the child visits a museum, the child visits a zoo or an aquarium, the child visits a public library, the child goes to a dance class, the child goes to a music class, and the child goes to a martial arts class. The results of this study indicated that only the cultural factor the child goes to a music class of the fourth graders was a good predictor of mathematics achievement. However, it was not representative of all grades (K-4). Therefore, the ninth conclusion of this study indicated that there was no relationship between the cultural capital of K-4 children and mathematics achievement. One interpretation of this result was that cultural capital might be a strong factor on subjects from human and biology areas.

Finally, a general regression used the mathematics achievement (dependent variable) and child's computer activities, social capital, cultural capital, and SES (independent variables or factors) to find the best predictors for mathematics achievement. For child's computer activities, social capital, and cultural capital, all factors were used. The last conclusion of this study indicated that of all factors entered in the model, all factors were removed except six factors: e-mail, the father's computer experiences, the child's leisure time at home, computer instructions in the classroom, family structure, and martial arts class. The R Square of the last model was 0.168, which indicated that 16.8% of the variance in the mathematics achievement was explained by the six factors. Finally, the results of the regression indicated that the father's computer experiences, the child's leisure time at home, and family structure were significant. In short, the father's computer experiences, the child's leisure time at home, and family structure were the best predictors of mathematics achievement. The father's computer experiences was a good predictor for mathematics achievement because fathers with computer skills from their jobs and schooling were able to show rich and varied usage of computers, and engaged their children in critical discussions about the Internet. The child's leisure time at home was a good predictor for mathematics achievement because children have more leisure time at home to develop skills and use their computers for varied purposes. On the other hand, children who have less leisure time at home use their computers primarily for entertainment. Finally, family structure was a good predictor for mathematics achievement because when one or both parents were not present, the social capital was weaker than when they were present.

The results of this study indicated that there was no difference in mathematics achievement between male and female, among the ethnicity and race groups, between children whose primary home language was English and non-English, and between children from different family incomes. Also, the access to the Internet, the number of computers in the home and where they are located, computer activities, and cultural capital had no significant relationship with mathematics achievement. This fact may have occurred due to two reasons: First, the sample size was relatively low compared to the total population, increasing the possibility of a type II error. Second, the coefficient alpha for the thirty-six measures of mathematics achievement and home computer environment was 0.6630. The moderate internal consistency of the parents’ survey data could have caused errors in the results.

In short, this study indicated that almost all social factors had a significant effect in mathematics achievement. In addition, the father's computer experiences, the child’s leisure time at home, and family structure were the best predictors of mathematics achievement for K-4 children.

Although only social factors had a significant relationship with mathematics achievement, the other factors that described the home computer environment might be significant in mathematics achievement from eighth grade level. Therefore, each factor that describes the home computer environment needs to be worked on because it can potentially influence the children’s mathematics achievement in the future.

Finally, increasing computer usage among children does not mean that the children need to put away their toys, stop practicing sports, and explore the world exclusively on the Internet.

Rather, we need to use this knowledge to improve the home computer environment and to encourage mathematics achievement.

Recommendations

The aim of this study was to verify the effects of home computers on mathematics achievement in K-4 children. Future research can use the key elements or factors that described the complexity of home computer environment. These factors fall into four categories: family backgrounds, computer activities, social capital, and culture capital. Also, children's ethnicity and race is difficult to measure with only one variable because the parents could be of different ethnicity and race. In addition, future studies could consider adding another factor an extra mathematics course that some children could take outside of the traditional school program. For future research in the same area, the researcher could avoid type II errors by increasing the sample size. More than one school can be used because mathematics achievement can be unified with a simple percentage. However, there were some important aspects to the measurement of mathematics achievement. The data on mathematics achievement scores were collected only from the parent survey to guarantee that the participation was voluntary, the children's information was confidential, and the study was not intrusive on school activities.

Summary

The purpose of this paper was to verify the effects of home computers on mathematics achievement from kindergarten to fourth grade children. The correlation between mathematics achievement and key elements or factors that described children's family backgrounds was measured. Four hundred questionnaires were distributed to the parents of K-4 children of Manoa Elementary School, and 122 questionnaires were returned.

There were nine research questions investigated in this study. The first question posed by this study was: Is there a relationship between the gender of K-4 children and mathematics achievement? Hypothesis number one was there is a relationship between the gender of K-4 children and mathematics achievement. Although the mean score for females on mathematics achievement was greater than males, the results of the t-test indicated that there were no significant differences between males and females. Therefore, the first conclusion of this study indicated that there was no significant difference between the mathematics achievement mean of male and female children from ages five to nine.

The second question posed by this study was: Is there a relationship between the ethnicity/race of K-4 children and mathematics achievement? Hypothesis number two was there is a relationship between the ethnicity/race of K-4 children and mathematics achievement. The Whites and Japanese had better mathematics achievement means than Chinese, Koreans, and the other ethnicities. However, the results of the one-way ANOVA indicated that there was no significant difference between the mathematics achievement mean among the ethnicity/race groups. Therefore, the second conclusion of this study indicated that there was no significant difference between the mathematics achievement mean among the ethnicity/race groups.

The third question posed by this study was: Is there a relationship between the primary home language of K-4 children and mathematics achievement? Hypothesis number three was there is a relationship between the primary home language of K-4 children and mathematics achievement. The results of the t-test indicated that there were no significant differences between the primary home language groups. Consequently, the third conclusion of this study indicated that there was no significant difference between the mathematics achievement mean for the primary home language groups from Manoa Elementary School.

The fourth question posed by this study was: Is there a relationship between the socioeconomic status of K-4 children and mathematics achievement? Hypothesis number four was there is a relationship between the socioeconomic status of K-4 children and mathematics achievement. The fourth conclusion of this study indicated that the correlation coefficient (r) between mathematics achievement and SES was only 0.100, which indicated no relationship between the variables. To better test the relationship between SES and mathematics achievement, the parent survey must include other schools with different family incomes.

The fifth question posed by this study was: Is there a relationship between the number of computers in the home and where they are located for K-4 children and mathematics achievement? Hypothesis number five was there is a relationship between the number of computers in the home and where they are located for K-4 children and mathematics achievement. The fifth conclusion of this study indicated that there was no significant relationship between the numbers of computers in the home and where they are located for K-4 children and mathematics achievement. However, the number of computers in the home and where they are located can be of fundamental importance for children’s access to technology early, and get advantages in the future.

The sixth question posed by this study was: Is there a relationship between Internet access in homes of K-4 children and mathematics achievement? Hypothesis number six was there is a relationship between Internet access in homes of K-4 children and mathematics achievement. The results of the one-way ANOVA indicated that there was no significance between mathematics achievement and Internet access in homes for all grades. The sixth conclusion of this study indicated that there was no relationship between Internet access in homes of K-4 children and mathematics achievement. One interpretation of this result was that the children use the Internet more for fun than for research.

The seventh question posed by this study was: Is there a relationship between computer activities in homes of K-4 children and mathematics achievement? Hypothesis number seven was there is a relationship between computer activities at home of K-4 children and mathematics achievement. The computer activity regression indicated that only applications and tools of third graders was a good predictor of mathematics achievement. However, it was not representative of all grades (K-4). Therefore, the seventh conclusion of this study indicated that there was no relationship between computer activities at home of K-4 children and mathematics achievement. One important consideration was that the computer activity could have positive or negative effects on mathematics achievement depending on how the computer was used.

The eighth question posed by this study was: Is there a relationship between the social capital of K-4 children and mathematics achievement? Hypothesis number eight was there is a relationship between the social capital of K-4 children and mathematics achievement. The regression results per graders indicated what social factors were good predictors of mathematics achievement. The nine out twelve social factors that affected the mathematics achievement at least in one grade were: the mother’s education, the father’s use of home computer, the mother’s use of home computer, the mother’s computer experiences, someone else's computer experiences, the child’s leisure time at home, computer instruction in the classroom, computer habits of the child’s peers, and family structure. Therefore, the eighth conclusion of this study indicated that there was a strong relationship between the social capital of K-4 children and mathematics achievement.

The ninth question posed by this study was: Is there a relationship between the cultural capital of K-4 children and mathematics achievement? Hypothesis number nine was, there is a relationship between the cultural capital of K-4 children and mathematics achievement. The results of this study indicated that only the cultural factor the child goes to a music class of the fourth graders was a good predictor of mathematics achievement. However, it was not representative of all grades (K-4). Therefore, the ninth conclusion of this study indicated that there was no relationship between the cultural capital of K-4 children and mathematics achievement. One interpretation of this result was that cultural capital might be a strong factor on subjects from human and biology areas.

Finally, a general regression used the mathematics achievement (dependent variable) and child’s computer activities, social capital, cultural capital, and SES (independent variables or factors) to find the best predictors for mathematics achievement. For child’s computer activities, social capital, and cultural capital, all factors were used. The last conclusion of this study indicated that of all factors entered in the model, all factors were removed except six factors: e-mail, the father's computer experiences, the child’s leisure time at home, computer instructions in the classroom, family structure, and martial arts class. The R Square of the last model was 0.168, which indicated that 16.8% of the variance in the mathematics achievement was explained by the six factors. Finally, the results of the regression indicated that the father’s computer experiences, the child’s leisure time at home, and family structure were significant.

The results of this study indicated that there was no difference in mathematics achievement between male and female, among the ethnicity and race groups, between children whose primary home language was English and non-English, and between children from different family incomes. Also, the access to the Internet, the number of computers in the home and where they are located, computer activities, and cultural capital had no significant relationship with mathematics achievement. This fact may have occurred due to two reasons: First, the sample size was relatively low compared to the total population, increasing the possibility of a type II error. Second, the coefficient alpha for the thirty-six measures of mathematics achievement and home computer environment was 0.6630. The moderate internal consistency of the parents' survey data could have caused errors in the results.

Although only social factors had a significant relationship with mathematics achievement, the other factors that described the home computer environment might be significant on mathematics achievement from eighth grade level. Therefore, each factor that describes the home computer environment needs to be worked on because it can potentially influence the children's mathematics achievement in the future.

Finally, increasing computer usage among children does not mean that the children need to put away their toys, stop practicing sports, and explore the world exclusively on the Internet. Rather, we need to use this knowledge to improve the home computer environment and to encourage mathematics achievement.

References

Abrami, P. C. (2001). Understanding and promoting using complex learning using technology. Educational Research and Evaluation, 7, 113-136.

Aguilera, M. de, & Mendiz A. (2003). Video games and education: Education in the face of a "parallel school". ACM Computers in Entertainment, 16, 72-78.

Albright, S. C., Winston, W., & Zappe, C. J. (2004). Data analysis for managers with Microsoft Excel (2nd ed.). Belmont, CA: Thomson Brooks/Cole.

Attewell, P., & Battle, J. (1999). Home computers and school performance. Information Society, 15(1), 1-10. Retrieved September 12, 2005, from the Academic Search Premier database.

Ba, H., Tally, W., & Tsikalas, K. (2002). Investigating children's emerging digital literacies. Journal of Technology, Learning, and Assessment, 1(4). Retrieved September 13, 2005, from http://www.jtla.org

Bensley, L., & van Eenwyk J. (2001). Video games and real-life aggression: Review of the literature. Journal of Adolescent Health 2001, 29, 244-257.

Borton, W. (1989). The effects of computer managed mastery learning on mathematics test scores in the elementary school. Journal of Computer Based Instruction, 15, 95-98.

Borzekowski, D. L. G., & Robinson T. G. (2005). The remote, the mouse, and the No. 2 pencil. Archives of Pediatrics & Adolescent Medicine, 159, 607-613. Retrieved September 12, 2005, from http://archpedi.ama-assn.org/cgi/content/abstract/159/7/607

Bourdieu, P., & Passeron, J. C. (1977). Reproduction in education, society and culture. Los Angeles: Sage Publications. Retrieved September 12, 2005, from http://www.sagepub.com/book.aspx?pid=5664

Burns, T. C., & Ungerleider, C. S. (2003). Information and communication technologies in elementary and secondary education: State of the art review. International Journal of Educational Policy, Research and Practice, 3, (4), 27-54.

California Department of Education. (2005). 2005 standardized testing and reporting (STAR) program summary of results. Retrieved September 13, 2005, from http://www.cde.ca.gov/nr/ne/yr05/documents/star1.pdf

CEO Forum. (2001). Student achievement in 21st century. Year 4 STAR Report. Retrieved September 13, 2005, from http://www.ceoforum.org/downloads/report4.pdf

Clark, W. (2001). Kids and teens on the net. Canadian Social Trends, Fall2001(62), 6-11. Retrieved September 27, 2005, from Academic Search Premier database.

Coleman, J. D. (1988). Social capital in the creation of human capital. American Journal of Sociology, 94 (Suppl.):S95-S120.

Coley, R., Cradler, J., & Engel, P. (1997). Computers and Classrooms: The Status of Technology in US schools. Princeton, NJ: Policy Information Center, Educational Testing Service.

Common Sense Media. (2005). Violent video games and our kids. A Common Sense Approach 2005. Retrieved September 30, 2005, from http://www.commonsensemedia.org/resources/articles/ videobrochurefinal.pdf

Computers ‘can harm learning’ – study. (2005). Distance Education Report, 9(8), 2. Retrieved September 12, 2005, from Professional Development Collection database.

Davis, Fred. (1989) Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 319-334.

Downes, T. (2002). Blending play, practice and performance: Children’s use of the computer at home. Journal of Educational Enquiry, 3(2), 21-34.

Gall, M. D., Borg, W. R., & Gall, J. P. (1996). Educational research: An introduction. White Plains, NY: Longman.

Gay, L. R. (1996). Educational research: Competencies for analysis and applications (5th ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Gee, J. P. (2005). Good video games and good learning. Phi Kappa Phi Forum, 85(2), 33-37. Retrieved September 12, 2005, from the Academic Search Premier database.

GreatSchool.net (2006). The Parent's Guide to Success: San Francisco, CA. Retrieved April 19, 2006, from http://www.greatschools.net/cgi-bin/hi/other/191

Hall, E., & Higgins S. (2002). Embedding computer technology in developmentally appropriate practice: Engaging with early years professionals' beliefs and values. Information Technology in Childhood Education 2002, 301-320.

Harris, J. (2001). The effects of computer games on young children – a review of the research (RDS Occasional Paper No. 72). London: Research, Development and Statistics Directorate.

Hedges, L. V., Konstantopoulis, S., & Thoreson, A. (2003). *Computer use and its relation to academic achievement in mathematics, reading and writing. NAEP validity studies. Working paper series* (Report No. NCES-WP-2003-15). U.S., District of Columbia: National Center for Education Statistics. (ERIC Document Reproduction Service No. ED478976)

Holden, C. (1998). Dubious benefits of early computer use. *Science, 282*(5388), 407.

How PCs replicate inequality. (1999). *Wilson Quarterly, 23*(3), 116-117. Retrieved September 12, 2005, from Academic Search Premier database.

Howland, J., Laffey, J., & Espinosa, L. (1997). A computing experience to motivate children to complex performance. *Journal of Computing in Childhood Education, 8*, 291-311.

Huang, G. G. (2000). Mathematics achievement by immigrant children: A comparison of five English-speaking countries. *Education Policy Analysis Archives , 8*(25), 1-67. Retrieved October 7, 2005, from http://epaa.asu.edu/epaa/v8n25/

Jacobs, J. E., & Bleeker, M. M. (2004). Girls' and boys' developing interests in math and science: Do parents matter? *New Directions for child Y Adolescent Development, 2004*(106), 5- 21. Retrieved September 12, 2005, from the Academic Search Premier database.

Johnson, K. (2000). *Do computers in the classroom boost academic achievement?* A report of the Heritage Center for Data Analysis. Retrieved September 20, 2005, from http://www.heritage.org/Research/Education/CDA00-08.cfm

Judge, S., Puckett, K., & Cabuk, B. (2004). Digital equity: New findings from the early childhood longitudinal study. *Journal of Research on Technology in Education, 36*(4), 383-396. Retrieved September 13, 2005, from the Academic Search Premier database.

Kafai, Y. B., Fishman G. J., Bruckman, A. S., & Rockman, S. (2002). Models of educational computing @ home: New frontiers for research on technology in learning. *Educational Technology Review*, [Online serial], 10(2), 52-68.

Liao, Y. (1992). Effects of computer-assisted instruction on cognitive outcomes: A meta-analysis. *Journal of Research on Computing in Education, 24*, 367-380.

Manoa Elementary School (2004). School Status and Improvement Report 2003-2004. Honolulu, HI. Retrieved November 11, 2005, from http://arch.k12.hi.us/pdf/ssir/2004/Honolulu/SSIR137-1.pdf

Manoa Elementary School (2005). Home of the tigers: Honolulu, HI. Retrieved November 11, 2005, from http://www.manoa.k12.hi.us/

Margoulis, Y. (1988). Psychological peculiarities of computer-assisted educational games. *Voprosy- Psychologii, 2*, 45-51.

Martin, K., & Smith, K. (2003). *SPSS: A handy tool in the IR toolbox*. Presented at the HEDS Winter Conference, Santa Fe, NM. Retrieved September 13, 2005, from http://www.bucknell.edu/img/assets/4778/SPSS_For_Institutional_Researchers_11.5_2003.pdf

Messerly, J. G. (2004). How computer games affect CS (and other) students' school performance. *Communications of the ACM, 47*(3), 29-32.

O'Brien, B., Friedman-Nimz, R., Lacey, J., & Denson, D. (2005). *Gifted Child Today Magazine, 28*(3), 56-64. Retrieved September 12, 2005, from Professional Development Collection database.

Perie, M., and Moran, R. (2005). *NAEP 2004 Trends in Academic Progress: Three Decades of Student Performance in Reading and Mathematics* (NCES 2005-464). U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. Washington, DC: Government Printing Office. Retrieved September 13, 2005, from http://nces.ed.gov/nationsreportcard/pdf/main2005/2005464.pdf

Salonius-Pastermak, D. E. (2005). The next level of research on electronic play: Potential benefits and contextual influences for children and adolescents. *An Interdisciplinary Journal on Humans in ICT Environments, 1*(1), 5-22.

Shaughnessy, C. A., Nelson, J. E., & Norris, N. A. (1997). NAEP 1996 mathematics cross-state data compendium for the grade 4 and grade 8 assessment. Washington, DC: National Center for Education Statistics, 1997.

Speier, C., Morris, M. G., & Briggs, C. M. (2002, March). Attitudes toward computers: The impact on performance. Retrieved September 12, 2005, from http://hsb.baylor.edu/ramsower/acis/papers/hubona2.htm.

Subrahmanyam, K., Greenfield, P. M., Kraut, R. E., Gross, E. F. (2001). The impact of computer use on Children's and adolescents' development. *Applied Development Psychology, 22*(2001), 7-30.

Trotter, A. (1996). The great divide: Closing the gap between technology haves and have-nots. *Electronic School*. Retrieved October 6, 2005, from http://www.electronic-school.com/0696f1.html

U. S. Department of Commerce. (1999). *Falling through the net: Defining the digital divide.* Washington, DC: U.S. Government Printing office. Retrieved September 13, 2005, from http://www.virtualref.com/govdocs/41.htm

U. S. Department of Education (2003). *Computer and Internet use by children and adolescents in 2001.*, NCES 2004-014, by Matthew DeBell and Chris Chapman. Washington, DC: 2003. Retrieved September 13, 2005, from http://nces.ed.gov/pubs2004/2004014.pdf

U. S. Department of Education (2005). Rates of computers and Internet use by children in nursery school and students in kindergarten through twelfth grade: 2003. *National Center for Education Statistics*. Retrieved September 13, 2005, from http://nces.ed.gov/pubs2005/2005111.pdf

Walsh, D. (2001). Video game violence and public policy. *National Institute on Media and the Family*. Retrieved September 30, 2005, from http://culturalpolicy.uchicago.edu/conf2001/papers/ walsh.html

Wenglinsky, H. (1998). *Does it Compute? The Relationship Between Educational Technology and Student Achievement in Mathematics*. Princeton, NJ: Policy Information Center, Educational Testing Service.

Whitley, B. E., (1997). Gender differences in computer-related attitudes and behavior: A meta-analysis. *Computers in Human Behavior, 13*, 1-22.

Williams, N. C. (2002). *The relationship of home environment and kindergarten readiness.* Unpublished dissertation presented to the faculty of the Department of Educational Administration and policy analysis, East Tennessee State University. Retrieved September 30, 2005, from http://etd-submit.etsu.edu/etd/theses/available/etd-0815102-175930/unrestricted/WilliamsN082302a.pdf

Williamsom, B., & Facer, K. (2004). More than ‘just a game’: The implications for schools of children’s computer games communities. *Education, Communication & Information, 2004*(4), 255-270. Retrieved September 12, 2005, from the Academic Search Premier database.

Appendix A

Parent Questionnaire

Some studies have indicated that a children's home environment affects their mathematics achievement. The purpose of this questionnaire is to examine this influence. You can contribute to the research of this important topic by answering the questions below as carefully as possible. There is no "right" or "wrong" answer because each family is different. The responses are confidential, and will not be used for any other purpose. If you do not remember your recent child's mathematics achievement grades, you can use the last Manoa Elementary School Status Report. Please circle only one answer for each question.

1. What is your child's grade?

    0. kindergarten
    1. first grade
    2. second grade
    3. third grade
    4. fourth grade

2. What is your child's gender?

    1. female
    2. male

3. What is your child's ethnicity/race?

    1. White
    2. Japanese
    3. Chinese
    4. Korean
    5. Other

4. What is the primary home language?

    1. English
    2. non-English

5. How many computers do you have in your home?

    0. have no computer at home
    1. one
    2. two
    3. three
    4. four or more

6. Where does your child use the computer?

0. have no computer at home
1. public area (living room, kitchen, etc.)
2. child's bedroom

7. Does your child access the Internet?

1. rarely, almost never
2. few times per month
3. once per week
4. few times per week
5. everyday

8. How often does your child play computer games?

1. rarely, almost never
2. few times per month
3. once per week
4. few times per week
5. everyday

9. How often does your child use educational programs (drill and practice, math learning games, etc.)?

1. rarely, almost never
2. few times per month
3. once per week
4. few times per week
5. everyday

10. How often does your child use applications and tools (Word, Worksheet, PowerPoint, database, etc.)?

1. rarely, almost never
2. few times per month
3. once per week
4. few times per week
5. everyday

11. How often does your child use e-mail?

    1. rarely, almost never
    2. few times per month
    3. once per week
    4. few times per week
    5. everyday

12. How often does your child use a computer for research (Google, Yahoo, etc.)?

    1. rarely, almost never
    2. few times per month
    3. once per week
    4. few times per week
    5. everyday

13. Father's education

    1. elementary school
    2. middle school
    3. high school
    4. college, university or professional school
    5. graduate school

14. Mother's education

    1. elementary school
    2. middle school
    3. high school
    4. college, university or professional school
    5. graduate school

15. How often does the child's father use a home computer?

    1. rarely, almost never
    2. few times per month
    3. once per week
    4. few times per week
    5. everyday

16. How often does the child's mother use a home computer?

    1. rarely, almost never
    2. few times per month
    3. once per week
    4. few times per week
    5. everyday

17. How are the father's computer experiences and skills?

    1. the father does not live with the child
    2. poor
    3. medium
    4. good
    5. excellent

18. How are the mother's computer experiences and skills?

    1. the mother does not live with the child
    2. poor
    3. medium
    4. good
    5. excellent

19. Is there someone else (siblings, relatives, neighbors, etc.) that helps your child with computer experiences and skills?

    1. no, there is not
    2. yes, and his/her experiences are poor
    3. yes, and his/her experiences are medium
    4. yes, and his/her experiences are good
    5. yes, and his/her experiences are excellent

20. How often does your child have leisure time at home?

    1. rarely, almost never
    2. few times per month
    3. once per week
    4. few times per week
    5. everyday

21. How are the primary computing habits of the child's peers?

    1. I don't know
    2. games
    3. e-mail
    4. educative programs or applications (drill and practice, Word, etc.)
    5. Internet for research

22. How is your child receiving computer instructions in the classroom?

    1. rarely, almost never
    2. few times per month
    3. once per week
    4. few times per week
    5. everyday

23. Family structure

    1. no parents
    2. only father
    3. only mother
    4. mother with step father or father with step mother
    5. both parents

24. Family size (that live in the same child home)

    1. 7 or more people
    2. 5 or 6 people
    3. 4 people
    4. 3 people
    5. 2 people

25. How often does your child visit a museum?

    1. rarely, almost never
    2. once per year
    3. once each three months
    4. once per month
    5. every week

26. How often does your child visit a zoo or an aquarium?

    1. rarely, almost never
    2. once per year
    3. once each three months
    4. once per month
    5. every week

27. How often does your child visit a public library outside the school?

    1. rarely, almost never
    2. a few times per month
    3. once per week
    4. few times per week
    5. everyday

28. How often does your child go to dance class outside the school?

    1. rarely, almost never
    2. once per week
    3. twice per week
    4. three times or more per weak
    5. everyday

29. How often does your child go to music class outside the school?

    1. rarely, almost never
    2. once per week
    3. twice per week
    4. three times or more per weak
    5. everyday

30. How often does your child go to martial arts class outside the school?

    1. rarely, almost never
    2. once per week
    3. twice per week
    4. three times or more per weak
    5. everyday

The next five questions are about your child's mathematics achievement. If you don't remember your child's mathematics achievement, you can use the last Manoa Elementary School Status Report. This report has a section called mathematics that is composed of five mathematics subjects and their associative values for achievement grades.

Your child's mathematics achievement grades were:

31. Numbers and operations

    1. No progress
    2. Little progress
    3. Adequate progress
    4. More than adequate progress
    5. Not applicable

32. Measurement

    1. No progress
    2. Little progress
    3. Adequate progress
    4. More than adequate progress
    5. Not applicable

33. Geometry and spatial sense

    1. No progress
    2. Little progress
    3. Adequate progress
    4. More than adequate progress
    5. Not applicable

34. Patterns, functions, and algebra

    1. No progress
    2. Little progress
    3. Adequate progress
    4. More than adequate progress
    5. Not applicable

35. Data, analysis, statistics and probability

    1. No progress
    2. Little progress
    3. Adequate progress
    4. More than adequate progress
    5. Not applicable

36. Approximate family income: (OPTIONAL)

1. 0 to $15,000
2. $15,001 to $30,000
3. $30,001 to $45,000
4. $45,001 to $60,000
5. $60,001+

Appendix B

Letter to Principal

Dear :
(Principal)

As part of the requirements toward the completion of a Master of Information System degree at Hawaii Pacific University, I am planning to complete a study of how having a home computer affects K-4 children's mathematics achievement. With the acknowledgement that family background is an important contributor to mathematics achievement, it becomes imperative that educators continue to acquire knowledge in this area. This letter is to request your permission to conduct this study.

This particular study will contribute to current research by focusing on family characteristics and the home environment of the K-4 child, while attempting to determine factors that strongly correlate with mathematics achievement. Procedure will include only the analysis of the parent's responses to a questionnaire. The study will have practical significance in updating previous research, which, in turn, may have implications for parent and teacher education. This study is intended to determine which characteristics of the home computer environment are most conducive to promoting mathematics achievement. The results can guide and assist parents in providing an optimal educational environment.

Upon completion, I will be happy to share the results of my study with you.

I appreciate your consideration. If you have any questions, please contact me, or my instructor, Dr. Kenneth Rossi. His phone number is: (808) 544-1412, or by e-mail: krossi@hpu.edu. .
.

Sincerely,

Patrick Chevalier
1617 Kapiolani Blvd #1607
Honolulu – HI – 96814

Phone: (808) 375-6201
E-mail: pckkkh@yahoo.com

Appendix C

Letter to Parents

Dear :
(Parent)

In order to meet the requirements for a Master of Science in Information System, I am currently doing a study about a relationship between home computer environment and mathematics achievement for K-4 students. This study was approved by the superintendent Patricia Hamamoto and the principal Susan Imamura.

Attached you will find two documents. The first is an Informed Consent, a required form that simply says you are willing to participate in the study. The second is a simple parent survey containing items about different aspects of the home environment and your child's mathematics achievement. Would you please take time to complete the survey? All information will be kept strictly confidential. When you have finished the survey, please return it to me in the addressed, stamped envelope enclosed. You do not need to include your name, or address.

Your survey is very important to the success of this study, and I certainly appreciate your time and help! If you have any questions, please contact me, or my instructor, Dr. Kenneth Rossi. His phone number is: (808) 544-1412, or by e-mail: krossi@hpu.edu. .

Sincerely,

Patrick Chevalier
1617 Kapiolani Blvd #1607
Honolulu – HI – 96814

Phone: (808) 375-6201
E-mail: pckkkh@yahoo.com

Appendix D

Informed Consent

Hawaii Pacific University

PRINCIPAL INVESTIGATOR: Patrick Chevalier

TITLE OF PROJECT: The Effects of Gender, Ethnicity and Race, Primary Home Language, Socioeconomic Status, Number of Computers in the Home and Where They Are Located, Internet Access at Home, Computer Activities at Home, Social Capital, and Cultural Capital on Mathematics Achievement of K-4 Children from Manoa Elementary School.

PURPOSE: The purpose of this research study is to investigate the relationship between family environment and mathematics achievement of K-4 children at Manoa Elementary School.

DURATION: The survey instrument is brief and should take only 5 to 10 minutes to complete.

PROCEDURES: The instrument to be used in this study is a simple form calling for participants to respond by circling multiple-choice answers. The instrument does not request participants' names. To answer the questions about your child's mathematics achievement, you can use the last Manoa Elementary School Status Report.

POSSIBLE RISKS: No risks should be associated with this research, nor is there any direct benefit or compensation for the volunteer participants. Potential benefit for the participant would arise from that individual's analysis of the items contained on the survey, and his or her understanding of those items. The study will have practical significance in updating previous research, which in turn may have implications for both parent and teacher education. This study will also provide information about which characteristics of the home computer environment are most conducive to promoting mathematics achievement so that the results can guide and assist parents in providing optimal educational environments for their students.

CONTACT FOR QUESTIONS: If you have any questions or concerns, please contact Patrick Chevalier at (808) 375-6201. You may also directly contact Dr. Rossi, Hawaii Pacific University instructor, for any questions you may have about your rights as a research participant (phone: (808) 544-1412 or e-mail: krossi@hpu.edu).

CONFIDENTIALITY: Every attempt will be made to see that participants and test scores are kept confidential.

Appendix E

Results of Reliability Analysis

Table 130

Reliability Analysis – Scale (Alpha)

N	Variable	Mean	Std Dev	Cases
1	NUM_COMP	1.6967	.8989	122.0
2	INTERNET	2.0656	1.2179	122.0
3	GAMES	2.5082	1.2613	122.0
4	EDU_PROG	2.1475	1.1331	122.0
5	APPLICS	1.1803	.6430	122.0
6	E_MAIL	1.1148	.4670	122.0
7	RESEARCH	1.4836	.7631	122.0
8	FATHERED	4.2377	.6173	122.0
9	MOTHERED	4.1393	.5936	122.0
10	FATHERUS	4.1230	1.3458	122.0
11	MOTHERUS	4.0082	1.3391	122.0
12	FATHEREX	3.9918	1.0718	122.0
13	MOTHEREX	3.8115	.9211	122.0
14	SOMEONEX	2.4098	1.5199	122.0
15	LEISURE	4.1803	1.0446	122.0
16	HAB_PEER	1.7131	1.2364	122.0
17	INSTRUCT	2.4098	.9513	122.0
18	FAMSTRUC	4.8361	.5942	122.0
Table	130(continued)			
19	FAMSIZE	2.8689	.8523	122.0
20	MUSEUM	2.2131	.8929	122.0
21	AQUA_ZOO	2.3197	.6713	122.0
22	LIBRARY	1.7541	.7078	122.0
23	DANCE	1.3115	.5903	122.0
24	MUSIC	1.4836	.8256	122.0
25	MART_ART	1.3607	.8631	122.0
26	SES	4.5328	.9637	122.0
27	NUMBER	3.4672	.7734	122.0
28	MEASURE	3.6967	1.0356	122.0
29	GEOMETRY	3.5738	1.0198	122.0
30	FUNCTION	3.5492	.8342	122.0
31	ANALYSIS	3.7869	1.0060	122.0

N of Cases = 122.0

Statistics	Mean	Variance	Std Dev	N of Variables for Scale
	87.9754	79.5283	8.9179	31

Item Means	Mean	Minimum	Maximum	Range	Max/Min	Variance
	2.8379	1.1148	4.8361	3.7213	4.3382	1.3517

Table 131

Reliability Analysis – Scale (Alpha)

Item-total Statistics

Variables	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
NUM_COMP	86.2787	74.1696	.2939	.4722	.6482
INTERNET	85.9098	71.0083	.3428	.6048	.6409
GAMES	85.4672	70.9121	.3307	.6850	.6419
EDU_PROG	85.8279	73.6478	.2364	.5393	.6522
APPLICS	86.7951	78.3957	.0632	.5537	.6639
E_MAIL	86.8607	76.9970	.2822	.5402	.6545
RESEARCH	86.4918	75.6570	.2477	.5130	.6528
FATHERED	83.7377	76.0298	.2896	.3628	.6519
MOTHERED	83.8361	76.7167	.2365	.4512	.6549
FATHERUS	83.8525	70.4078	.3236	.3922	.6423
MOTHERUS	83.9672	70.5444	.3197	.4150	.6428
FATHEREX	83.9836	72.4791	.3233	.4621	.6441
MOTHEREX	84.1639	74.5018	.2627	.4256	.6505
SOMEONEX	85.5656	75.8014	.0535	.2324	.6771
LEISURE	83.7951	74.4783	.2196	.2829	.6538
HAB_PEER	86.2623	78.9885	-.0450	.2595	.6812
INSTRUCT	85.5656	79.6857	-.0626	.2794	.6762
FAMSTRUC	83.1393	77.5424	.1560	.3958	.6590

Table 131 (continued)

FAMSIZE	85.1066	79.6497	-.0557	.2776	.6738
MUSEUM	85.7623	75.3893	.2155	.4710	.6543
AQUA_ZOO	85.6557	76.2607	.2403	.4453	.6540
LIBRARY	86.2213	78.8184	.0166	.2698	.6670
DANCE	86.6639	77.1671	.1941	.3226	.6571
MUSIC	86.4918	76.1032	.1905	.2118	.6563
MART_ART	86.6148	76.2553	.1677	.4627	.6580
SES	83.4426	75.1744	.2050	.4612	.6551
NUMBER	84.5082	75.3264	.2685	.4692	.6513
MEASURE	84.2787	71.4754	.3986	.6894	.6375
GEOMETRY	84.4016	73.9283	.2600	.7310	.6502
FUNCTION	84.4262	75.7507	.2122	.6139	.6548
ANALYSIS	84.1885	75.5592	.1691	.6636	.6581

Reliability Coefficients 31 items

Alpha = .6630 Standardized item alpha = .6773