A Quasi-Experimental Design Research Proposal

The Effect of Collaboration through Computer Use with Grade One Students

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**Introduction**

Student collaboration with technology is an emerging topic in education today. Creating effective 21st century schools requires more than just using technology in the classroom. Traditional assessment examines knowledge output of the individual learner. Has the current individual performance assessment of learning been to the detriment of collaborative skill development?

*Any technology tends to create a new human environment.... Technological environments are not merely passive containers of people but are active processes that reshape people and other technologies alike. (McLuhan, M., 1962), The Gutenberg Galaxy.*

Social learning theories have been researched and developed for nearly one hundred years. From early cognitive theories (Piaget, 1926) to behaviourist theories of Pavlov, (1927), Skinner, (1953-68), Watson, (1925), Vygotsky, (1962-78), and recently Johnson and Johnson, (1996), social learning theorists see positive interdependence as promoting learning through social interaction. Johnson and Johnson (1996) define cooperative learning as the pedagogical use of small groups of two or more students who work together to maximize their own and each other’s learning.

**Statement of Problem**

This research proposal seeks to investigate how the performance of students working “one on one” compare to those working “two on one” with laptop computers. The concept of this research question came about during a computer class. I had two students working on one laptop to problem solve the lack of computers connected to the wireless. I observed the groups of two students per one laptop and noted that the interaction was receptive and productive. Students were collaborating and having fun learning together. It is hypothesized that students collaborating together on one laptop will contribute to cooperative learning and therefore enhances performance.

**Literature Review**

A literature review was conducted to determine existing research in the area of educational technology that focuses on student collaboration in a learning environment. This literature review summarizes and critiques four research studies and one article that address the effect of collaborative and cooperative interaction of students through computer use.

Chalmers, C. & Nason, R. (2003) conducted a qualitative case study that incorporated many aspects of a teaching experimental approach in order to study the influence of group meta cognition instruction on the cooperative groups. The purpose of the study was to investigate three small groups of middle-grade primary school students engaged in the collaborative construction of computer-based mathematical models. The study took place over a six week period in an elementary school in Queensland, Australia. Student selection was specific to groups of children that exhibited behaviours of non-cooperation and who spent their time in non-productive conflicts. The research findings are consistent with previous cooperative learning theories and meta cognitive research that found that providing groups with knowledge skills and meta cognitive scaffolds results in more efficient group work (Chalmers, C. & Nason, R. 2003). However, conclusions were based on a small sample of students and ethical, economic or gender issues were not mentioned as an area of consideration. Further current studies need to be done to show consistency with their findings.

Another study, Kuswara, A. & Richards, D. (2008-2009) used an action research approach to question the use of wikis for collaboration by Information Technology (IT) students. In the two year study which is the longest study reviewed, the authors found that collaborative learning strategies support knowledge building. It was also found that students need to understand the affordances of a program to facilitate collaborative activities.

Poris, S (1997) conducted a quantitative study using an experimental approach to investigate if problem solving skills were improved when using computer software with four separate groups of students. Student selection (106 in total) was based on grade six classes during October 1997 in an elementary school in New Jersey, U.S.A. Four groupings of students were formed to gather data. Two groups had two children per computer; one group with a puzzle game and the other on social studies simulation. The other two groups had one child per computer; one group with the puzzle game and the other group on social studies simulation. Instruments used were observations and t-test comparison of post-test data. Results indicate that students who participate in a computer-based cooperative learning experience using software that fosters the use of problem solving skills, show significant improvement in their problem solving ability (Poris, S., 1997).

Another study conducted by Willoughby, T. Wood, E. Desjarlais, M. Williams, L. Leacy, K. Sedore, L. (2009) also supports the idea that computers have become an integrated part of the classroom, especially when used with collaborative, structured activities. Willoughby et al. (2009) conducted a quantitative research plan that incorporated an experimental approach in order to study the influence of gender and group social interaction during small group computer-based activity. They looked at preschool versus elementary, computer-child ratio and gender composition. They asked the following two research questions. 1. Do boys’ and girls’ social interactions in small group computer-based activity differ according to grade level? 2. What is the frequency with which boy/girl dominates the use of the computer in collaborative activities? The researchers used three sessions with 116 preschoolers and 108 fifth and sixth grade students from south western Ontario. They found that preschoolers engage in more collaborative behaviours in mixed-gender groups than same gender groups, while elementary children engage in collaborative behaviours more often in integrated than parallel computer conditions (Willoughby, T. Wood, E. Desjarlais, M. Williams, L. Leacy, K. Sedore, L. 2009). The authors did not control for conducting multiple statistical tests and therefore caution should be used when interpreting their findings. They point out that gender composition in small groups needs to be a critical consideration.

Finally, the article written by Resta, P. & Laferriere, T. (2007) is a compilation of research conducted in the last twenty years that focuses on applications of technology in support of collaborative learning. They did a review of computer-supported collaborative learning (CSCL) literature that demonstrates a diversity of approaches and methodologies that range from experimental to ethnography, action and design research. This review includes theoretical research, case studies, educational considerations and their conclusions support technology use structured within collaborative learning environments.

Resta, P. & Laferriere, T. (2007) suggest improvement in current pedagogical practices concerning integration of technology within the classroom environment. They recommend that teachers be given more time to implement technology activities that foster collaboration and cooperation. The authors also recommend more research being done, especially research that focus on outcomes of collaboration, such as critical thinking skills, understanding, and knowledge creation. (Resta, P. & Laferriere, T., 2007).

In summary, each study supports the argument that structuring meta cognitive scaffolds and strategies result in positive change in students’ cooperative work and also increases their level of knowledge-building. All findings conclude that collaborative learning environments are an integral part of student learning.

Although previous research on collaborative learning environments through digital exploration supports cooperation and greater knowledge building, there is little current research data specifically comparing the performance of students working "one on one" to those working "two on one" on laptops in the primary grades. It is hypothesized that the performance of students working "two on one" compared to those working "one on one” encourages collaboration and enhances knowledge.

**Methodology**

Design

Quantitative research using a quasi-experimental approach will be used in this study. A pre-test and post-test will be administered to the experimental and control group. The experimental group will have two students per one laptop and the control group will be one student per laptop. A comparative look at both groups will shed light on the hypothesis of how does the performance of students working "one on one" compare to those working "two on one" on laptops?

This approach was chosen as it is the only type of research that can test hypotheses to establish cause-effect relations. It is the most structured of all research methods and if well conducted, experimental studies produce sound results concerning cause-effect relations.(Gay, L.R., Mills, G.E., & Airasian, P., 2009, p.240). Quasi-experimental design is the more accurate description as this research proposal does not use random selection.

Participants

Forty-eight grade one students from Irwin Park Elementary School in West Vancouver, ages 6-7 years old, will be selected from two classes for this study. The experimental group will be made up from one class of 12 girls and 12 boys. The other class of 11 girls and 13 boys will be the control group. Each class has comparable levels of math achievement determined by last year kindergarten testing, as well as assessment done on all grade one students for term one and two report cards. Presently, all students receive regular technology instruction for two 45 minutes per week. The two classes receive similar instruction as both teachers collaborate on lesson planning and learning outcomes. In this way, participant and environmental variables and internal threats are recognized and considered.

Instruments

A consent form will be given to each student for parental or guardian permission to participate. The participants will be informed that the University of British Columbia supports this research study under Policy #89. UBC’s program protects participants and ensures that UBC research is carried out in compliance with the highest ethical standards while collecting data. Quantitative data collection will be in the form of a pre-test and post-test (standardized math skill test of multiple choice), teacher observations, software assessment of math levels, and a survey. In the experimental group students will be paired according to their own choice of partner. Students in the control group will each have a laptop and work individually.

Procedure

Research will be conducted during two weekly computer classes for 12 consecutive weeks. Observations will be done on each class to record how students are interacting and using the affordances of the program. The math software program will be introduced with minimal instruction to observe the level of interaction and understanding. Observations will be made on student interaction with no teacher intervention. Experimental group observations will focus on how students collaborate together to solve math questions using one laptop. The Control group will be observed for how they problem solve individually to solve math questions.

Data Analysis

The goal of this study is to determine if student performance is enhanced through collaborative learning while engaging with math software on laptops. The effectiveness of the two students per one laptop compare to one student per one laptop will be determined through examining pre tests and post tests. A difference between initial pre-test and post-test results will be calculated and compared using the *t test* for independent samples. Teacher observations from both classes will be compared and significant behaviours noted. Software assessment will be reviewed. At the end of the 12 week study, students in the experimental group will be given a short survey consisting of 3 questions. 1. Did you enjoy working with a partner? (Yes/No) 2. Do you think working with a partner was helpful when answering math questions? (Yes/No) 3. Would you prefer to work by yourself or with a partner? (Self/ Partner). Survey results will be graphed and data analyzed.

**Significance and Implications**

This study is significant and relevant to understanding the importance of collaborative learning. It will provide teachers with the knowledge that designing activities in computer class that promote collaboration are valuable to student learning. The results from this study could give support for conducting further studies in this area. Future studies could investigate different age and gender groups. Outcomes could influence teaching methods, technology budgets and support staff, as well as influence the construction of online learning platforms. The data could influence software companies to design programs that allow students to engage in collaborative activities. This is a very significant factor as this could be an instrument of change in how classroom environments are structured and the methods teachers use to facilitate learning. Above all, it supports the goals for the 21st century learners that endorse creativity, critical thinking, problem-solving skills, and communication and collaboration skills.

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