Collaborative and Cooperative Interaction using Computers in the Classroom

Literature Review

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**Introduction**

Children of the 21st century live in a world of rapid technological change where information is abundant and people need to be able to collaborate, contribute, and think critically. Cooperative and collaborative learning environments provide a sense of belonging, an opportunity for sharing, encourages divergent thinking and is enhanced by interacting with technological devices and educational pedagogy. Learning theories have been at the core of research on cooperative learning. The work of Piaget (1950) and Vygotsky (1978) have formed the basis of the cognitive-developmental or constructivist theory. The premise that students cooperate together promotes cognitive development and that knowledge is social and constructed for learning and solving problems. Social interdependence theory (Deutsch, 1942, 1962; Johnson and Johnson, 1989, 2005) looks at how positive interactions help others achieve their goals. It includes mutual help, exchange of knowledge, and interactive communication. How students work together on computers is the topic of discovery.

Inquiry into student collaboration came from a way to problem solve the lack of being able to connect all the laptops to the wireless in my Grade One classroom. The wireless connection was not affording all laptop computers to connect, so I doubled students up; two children per one laptop. I was expecting negative reactions from those students who were doubled up. Instead, children were chatting, sharing, and interacting very cooperatively to solve tasks. This literature review will examine research studies and an article on technology in the classroom, specifically those aimed at examining the effect on children using computers cooperatively and collaboratively.

**Article #1 Summary**

Developing Primary Students’ Group Meta Cognitive

Processes in a Computer Collaborative Learning Environment.

Chalmers, C. & Nason, R. (2003) conducted a qualitative case study that incorporated many aspects of a teaching experiment approach in order to study the influence of group meta cognition instruction on the co-operative 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. Each group of students was required to search for relevant information from a web based site, use the information to develop a spread sheet and then rank 20 different countries’ performance at the Sydney Olympic Games. The study found that providing an activity to the students that promoted meta cognitive scaffolds and strategies resulted in positive changes in the students’ cooperative work and also increased their level of knowledge-building (Chalmers, C. & Nason, R. 2003). Conclusions supported the idea that student collaboration through the use of computers promotes cooperation and knowledge building.

**Critique**

The sample was done on a small group of students and a reference to whether there were any ethical, economic or gender issues considered was not provided. Student selection as stated by the authors was from a Grade 4/5 class that were seen as seriously malfunctioning. (Chalmers, C. Nason, R., 2003, p.1). They did not state the criteria for their assessment of seriously malfunctioning. A longer time span to realize consistencies with the data would have given more credibility to their results. The improvement in student cooperation and collaboration at the conclusion would suggest that further study of the group and other similar research could have been proposed to support Chalmers, C. & Nason, R.’s findings. Updated studies need to be done to show consistency.

**Article #2 Summary**

Matching the Affordances of Wikis to Collaborative Learning: A Case Study of IT Project

Students

Kuswara, A. & Richards, D. (2008-2009) used an action research approach to question the use of wikis for collaboration by Information Technology (IT) students. The aim was to collect data to understand the correlation between Web 2.0 tools and collaborative learning strategies to support meaningful learning within the context of problem solving in higher education, as well as student attitude about group activity. ( Kuswara, A. & Richards, D, 2008-9, p.1). The study took place over a two year period at Macquarie University in Sydney, Australia with three different cohorts of students. Students in cohort one were undergraduates enrolled in a compulsory third year course. Students in the second cohort were enrolled in a Requirement, Analysis, and Systems Design course and the third cohort were students in a final year project. Data was collected from group’s reflective journals, online survey, and face to face interviews. Consistent with action research method, the author’s modified some techniques to identify gaps and gain new insight to their original question. They wanted to learn more about why student were not using technology effectively (Kuswara, A. & Richards, D. 2008-2009, p.4).

The researchers found that a lack of understanding of the perceived affordances of the wiki tools to facilitate the collaborative activity between team members was present. (Kuswara, A.& Richards, D.2008-9, p.8).

**Critique**

Kuswara, A. & Richards, D. (2008-2009) report is well researched, conducted, and referenced. Their two year study used the activity theoretical background, the concept of affordances, and the way people interact to base their assumptions and area of inquiry. Action research was an ideal method of research, as it allowed the researchers to gather data over the school semesters and their results show support for their goals of gaining educational insight. This report contains informative diagrams and descriptions of method, survey questions and analysis of data and supportive material on activity theories. There was no mention of ethical, gender, or economic factors that could have impacted collected data.

The collected data supports Kuswara, A. & Richards, D. (2008-2009) research inquiry and they hope to develop a framework to allow people to identify the affordances they need to perform a certain activity and how to find and utilize the affordances in a supporting tool. This will allow teachers to better plan learning activities using supporting technology and students to realize the affordances in a collaborative learning environment (Kuswara, A. & Richards, D. 2008-9).

**Article #3 Summary**

Effects of Computer –Based Cooperative Learning on the Problem

Solving Skills of Grade Six Students

Researcher Steven Poris conducted a quantitative study using an experimental approach to determine if sixth grade student’s problem solving skills were improved by using computer software program that focused on a puzzle game in a collaborative learning situation. Student selection (106) was based on Grade Six classes during October 1997 in an elementary school in New Jersey, U.S.A. Four groups of students were formed. Two groups’ configuration was two children per computer; one group with a puzzle game and the other on a social studies simulation. The other two groups had one child per computer using the same software. Instruments used were observation 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, p.89).

**Critique**

Poris, S. (1997) research report was concise and well supported with common threads of learning and problem solving theories. Work was adequately cited and referenced. The computer puzzle game used was called “Sherlock for Windows” (Kaber, 1995) and appeared current and effective. Significant issues are the small student sample done in a short period of time. The pre and post tests included added credibility, though there were no references to ethical, gender, or economic consideration. Poris summarized his findings by recognizing collaboration as an important consideration for teaching instruction and he recommended further research.

**Article #4 Summary**

Technology in Support of Collaborative Learning

Authors Resta, P. & Laferriere, T. (2007) presented an educational review of research conducted in the last twenty years that focuses on applications of technology in support of collaborative learning. They did a review of CSCL literature that demonstrates a diversity of approaches and methodologies that included experimental, ethnography, action, and design research. The review includes theoretical research, case studies, educational considerations and their conclusions.

Resta, P. & Laferriere, T. (2007) comment that issues focusing on collaborative learning and computers are reflective of this relatively new and emerging field of research. Their extensive review of over 20 primary sources discusses methods, findings, and perceived concerns. The authors identify four instructional reasons for using technology in a collaborative learning environment. 1. To prepare students for the knowledge society. 2. To enhance student cognitive performance or foster deeper understanding. 3. To add flexibility of time and space for cooperative/collaborative learning. 4. To foster student engagement and keep track of student cooperative/collaborative work ( Resta, P. & Laferriere, T., 2007 ).

**Critique**

Resta, P. & Laferriere, T. (2007) write a concise article summarizing the major research studies including a well developed reference and cited findings. They point out many commonalities, as well as comment on gender, ethnic, and multiple issues that bias group selection within research studies.

Time requirement is one section the authors include that is significant to current pedagogical practices. They write that teachers need time to implement technology activities that foster collaboration and cooperation. Their recommendation of more research, especially directed towards student gender is mentioned.

**Article #5 Summary**

Social Interaction During Computer-based Activities: Comparisons by Numbers of Sessions,

School-level, Gender Composition of the Group and Computer-child Ratio

Willoughby, T. Wood, E. Desjarlais, M. Williams, L. Leacy, K. Sedore, L. (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. The two research questions asked: 1. Do boys’ and girls’ social interactions in small group computer-based activity differ according to school 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 than same gender groups while elementary children engage in collaborative behaviours more often in integrated than parallel computer conditions (Willoughby et al., 2009).

**Critique**

Willoughby et al.’s (2009) sample selection was based on parental consent. A post-experimental interview asked students if they enjoyed the computer task. Each student responded affirmatively. The authors included many tables of data showing their results with social behaviours (collaborative, off-task, and onlooker). The tables are well representative of all data collected and analyzed. The main critique for this study is that it was only conducted for three sessions over a five day period for 10 minutes each time. Children were informed that they were being video-taped by researchers and that they could not interact with them. This internal threat to validity is hard to measure, but nevertheless present. The authors admitted that a limitation was also present as they did not control for conducting multiple statistical tests and therefore caution should be used when interpreting the findings. In conclusion, this study supports the premise that computers have become an integrated part of the classroom and that gender composition in small groups needs to be a critical consideration, especially in computer collaborative activities. The authors acknowledge that further studies investigating social interaction with gender issues and various types of software should be done.

**Summary**

The four research studies and one article support collaboration and cooperation with technology. The common theme within each study is that technology is better assimilated in the classroom when students work together to learn affordances of software, build knowledge, and interact socially. Preschool to post secondary data shows that group interactivity is a form of cooperative learning that dates back to John Dewey (1897). The most important thing that teachers can take away from these studies is that computer literacy needs structure to include activities that are collaborative in nature and promote cooperation.

**Conclusion**

Many of these studies contain some specific concerns with the research method. Most commonly were student size and sample selection. All studies emphasize the importance of student collaboration and cooperation with technology to build knowledge and develop social interaction relationships. The idea that one computer per child promotes technology literacy has been significantly questioned with the results of cooperative and collaborative learning research. Further current research is needed to understand the significance of these findings and how teachers can structure classrooms to achieve best practices in the 21st century schools.

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