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Computer Mediated Communication as a Collaborative Tool for Facilitating Student-Centered Learning in Project-Based Classrooms

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Computer mediated communication (CMC) tools have marched into schools to provide borderless teaching and learning to complement existing face-to-face interactions. This article describes how teachers have used CMC to facilitate asynchronous online communication among students' collaborative project groups in project-based classrooms. Secondary school teachers used the CMC tool to facilitate and manage students' learning in terms of brainstorming and challenging student ideas, building resources, and working collaboratively to complete group projects.

Introduction

Since 2000, project-based learning has been infused into the formal curriculum of the Singapore schools through the introduction of Project Work (PW). This initiative aims to inculcate creative and critical thinking, communication, collaborative learning, self-directed inquiry, and lifelong learning skills in all learners (Ministry of Education, 1999).

With the growing emphasis on teaching and learning with technology, in particular, computer mediated communication (CMC), it is timely for schools to

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explore alternative approaches for engaging students in PW learning, apart from the traditional face-to-face settings, where students have formed project groups only within their own classrooms. Our ongoing work taps the potential of asynchronous communication to enhance students' collaborative learning with peers who come from different schools, and to engage in scaffolded discussion forums facilitated by teacher-facilitators beyond the formal PW curriculum hours in schools. Our work has been conducted in three phases, with the teachers' initial participation and engagement in a project-based learning environment followed by students' engagement, and finally the development of a student-centered learning model in the context of PW.

Student-Centered Learning

Student-centered learning describes ways of contextualizing learning and teaching so that they are authentic, whereby students take ownership of activities, such as planning, learning, interacting with teachers and other students, researching, and assessing their own learning (Cannon, 2000). Research in student-centered learning emphasizes what learners do, and why they think they are doing it, rather than what the teacher does and achieves (Biggs, 1990; Shuell, 1986). While the constructivist view involves a process by which the learner is actively creating his or her knowledge, perspectives on constructivism vary (Seaton, 1998). These variations in perspectives include descriptions of sociocognitive learning (Needles & Knapp, 1994), situated learning (Brown, Collins, & Duguid, 1989), and social constructivist learning (Cobb, Yackel, & Wood, 1992).

There have been numerous efforts by researchers to describe what might constitute an effective constructivist learning environment, and this has brought about terms such as "community of learners" (Brown & Campione, 1994), "knowledge building communities" (Scardamalia & Bereiter, 1992), and "constructivist learning environments" (Morrison & Collins, 1995; Wilson, 1995). In this article, the word "communities" is used to describe environments whereby learners interact with one another, discuss, exchange ideas, and collaborate within and across classrooms in groups to work with project ideas, then research and refine ideas, and finally produce their own artifacts.

Collaboration

Collaboration, as used here, originates from the perspective of social constructivism, which can be traced back to Soviet psychologist Lev Vygotsky (Clark, 1999). According to Vygotsky, social constructivism is a variety of cognitive constructivism that emphasizes the collaborative nature of learning, whereby learners engage in collaborative activities, construct rather than

acquire knowledge, and extrapolate their own meaning from various experiences (Vygotsky, 1978).

Collaborative activities are broadly described as working together with another person or a group in exploring a question or working toward completing a group project (Goh & Lim, 2004).

Current face-to-face PW classroom learning environments involve students' collaboration in groups of four to five members, restricted to within their classrooms, but not across different classrooms and schools. Similarly, teachers work with their peers from the same school to design and implement project tasks. In view of the importance of collaboration, the perimeter for collaboration, we believe, should be extended to include greater collaboration among teachers and students *across schools*. In this context, we have used an asynchronous CMC tool to make possible teachers' and students' collaboration across schools. This approach was field tested in phases to provide teaching and learning opportunities for inter-school collaboration.

Facilitating Student-Centered Learning in Project-Work Classrooms

In view of teachers' expected multi-tasking roles, such as working as collaborators, designers, resource managers, and facilitators in student-centered learning, our work was mounted in three phases.

In phase 1, we investigated the teachers' current pedagogical knowledge and skills and sought to empower them with the knowledge and skill sets needed for more dynamic student-centered facilitation and meaningful engagement of students' collaborative learning in schools.

With the information obtained about the teachers' understanding of student-centered learning concepts and key facilitation processes in PW learning, we conducted workshops for teachers, who were also expected to demonstrate their knowledge and skills by designing project tasks for their students. We facilitated the teachers' project design in the asynchronous online PW learning environment.

In phase 2 of the study, PW teachers further implemented projects in their PW classrooms. This time they served as facilitators for their students, who worked in project groups across schools. We served as resource people by providing just-in-time learning for students and teachers. Qualitative information was obtained by interviews, focus group discussion, surveys, and classroom observations.

In view of the different school practices with regard to PW teaching and learning, variables such as establishing common one-hour weekly PW timeslots, one PW classroom per school, five PW teachers per school, specified student groups between two to three schools, and the choice of a computer mediated

communication tool were controlled for the purpose of our research.

Other experimental variables, such as ability of students and the provision of computer facilities within the school, were not within our purview.

In phase 3, the newly developed research model was conceptualized, based on teachers' project group discussion and face-to-face interviews. Overall impact was investigated using teachers' and students' perceptions of student-centered learning in terms of attitude, motivation, and teacher-student interaction. Also, teachers' project resources and a teachers' practice-oriented facilitation framework were developed in phase 3.

Teachers' Facilitation of Students' Collaborative Learning

In phase 1, 40 teachers (of 360 students in all) served as designers of student-centered projects and collaborated among themselves in the project-based learning environment. With the four PW learning outcomes, namely, collaboration, communication, knowledge application, and independent learning (Ministry of Education, 1999), the teachers designed their own project roadmap by engaging in discussion forums, such as brainstorming project ideas, selecting project ideas, and working on the projects. They used CMC to achieve their common goal—designing student-centered tasks for learners in the asynchronous online PW environment.

In phase 2, the teachers functioned as facilitators in the PW cycle, while their students worked in groups across schools.

Based on teachers' postings in the asynchronous online PW learning environment, some examples of how teachers facilitated were analyzed and are presented in Table 1. The teacher's facilitation in the CMC environment was based on the four PW learning outcomes in the collaboration, communication, knowledge application, and independent learning domains (Ministry of Education, 1999).

Collaboration

The teachers used the CMC tool as a means of information dissemination among themselves and student counterparts from other schools. By establishing such contact, effective interactions and online engagement were promoted. To facilitate students' learning in terms of online collaboration, teachers' highlighted group tasks and provided instructions for group members to look at each other's notes and to collaborate for ideas.

Communication

Further observations of teachers' online facilitation showed that teachers' responded promptly to students' questions and gave timely feedback, suggestions, and

Table 1. Teachers' facilitation in asynchronous online PW classroom.

PW Domain	Descriptions of Teacher's Facilitation
Collaboration	Communicates expectation of group roles; monitors online participation of students.
Communication	Reads and responds to students' notes; provides timely feedback
Knowledge Application	Monitors the online project file.; teaches just-in-time skills; makes available online self-learning resources; asks questions.
Independent Learning	Encourages summaries from groups, individuals, and reflection logs.

encouragement. It is noted that a mix of probes and supportive comments helps to extend conversations. Students cannot be expected to engage in meaningful discussion on a particular topic if they are at different stages of the project work cycle.

Also, group work and ongoing dialogue are best maintained if there is a common goal or purpose. Apart from providing progress updates, teachers also sent reminders and deadlines to keep students on-task. Further observations show that teachers encouraged dialogue between students by asking questions which focused on relevant aspects of the students' project. Teachers also tried to frame the problem by negotiating meaning with students and engaging them in fruitful online discussions.

Knowledge Application

In terms of facilitating deep understanding of projects, it was observed that teachers probed students' understanding by asking questions based on the information-processing skills and thinking skills as well as providing further resources for research. Teachers provided Websites and Internet resources and encouraged students to offer critiques of the information found on the Websites. From the students' postings, it was observed that students visited the suggested Websites; posted their own opinions and counter-suggestions of their own choice of Websites. Teachers also directed students to build on the notes posted by their group members. This seemed to promote students' endeavors to construct shared knowledge. Teachers' online facilitation also included just-in-time lessons to further equip students with the necessary skills for the collaborative project work.

Independent Learning

Teachers encouraged students to consolidate their discussion ideas and post their summaries online. It was observed that students were required to post their personal reflections online so that future difficulties or mistakes could be avoided. Teachers also provided reflection templates for students to document their thoughts.

It was found that regular visits to the online environment enabled teachers to provide timely feedback to students' ongoing discussions. The challenge for teachers was the division of time between facilitating several groups and keeping track of the progress of each group's discussions and work.

Our work has shown consistent teachers' online facilitation in offering support at appropriate moments, while students engaged in asynchronous online discussions during the PW cycle. It was also shown that the incorporation of CMC into the existing face-to-face learning environment has enabled diversified collaborative learning among the students across classrooms, which was never realized in the earlier PW classrooms. More importantly, we see that in order to make provision for asynchronous online communication to become part-and-parcel of students' enriched learning, schools require the readiness, preparedness, and motivation of teachers in embracing the full potentials of CMC, thus facilitating work and engaging the efforts of their students.

Conclusion

This project has sought to enhance teachers' pedagogical knowledge and skills in facilitating student-centered PW learning environments (face-to-face and online settings) and PW practices in schools. Based on students' feedback, we find that in order to actualize the full impact of project work on students' learning, teachers must play significant roles in designing appropriate projects and charting flexible roadmaps *together with students* in achieving desired goals. □

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Additional Resources

Website

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Book

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