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Web-based Collaborative learning in secondary education: Teachers' reflection

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ABSTRACT

This article is based on the researchers' reflections after twice participating in a Web-based Collaborative Learning Program Contest. The contests were held by Asia-Pacific Economic Cooperation (APEC) Cyber Academy (ACA). In collaborative learning, teachers are expected to provide participants with scaffolding assistance. The ACA is designed to provide student-centered activities for enhancing skills in information and communication technologies. Students are expected to find data, prepare presentations, and report their topics in English to communicate with other teams from

other countries. During these processes, the researcher tried to apply theoretical models such as computerized instruction and topic based learning. The results of this study show the various benefits of Web-based Collaborative Learning for students and teachers. This study also includes several recommendations for primary and secondary schools.

Keywords: Web-Based Collaborative Learning, Action Research

INTRODUCTION

Web-based technology is a potential tool for supported collaborative learning that is being used to support teacher enriching their teaching performance (Liaw, Chen & Huang, 2008). In a traditional classroom or a distant dispersed environment, web-based technology is a successful and frequently adopted method for the learner and their colleagues to cooperate effectively and share in the learning experience. The collaborative learning process encourages students to ask questions of each other, explain and defend their own points of view, state the rationale for their beliefs, and to assimilate discussion results in their knowledge to stimulate and improve learning (Cheng & Chen, 2008). The concept of the instruction called student-centered learning is an approach to education that focuses on the needs of the students. This approach has many implications curriculum design, course content, and interactivity of courses. With the rapid development of emerging technologies in recent years, the integration of Information and Communication Technology (ICT) has begun to attract the attention of teachers (Wang, 2008). Web-based technology has expanded globally into a virtual, network-based environment. Web-based Collaborative Learning transforms traditional in-class collaborative teaching strategies into a computer-supported approach.

There are many differences between traditional and web-based classroom settings. Traditionally, teachers are at the center of education, with students assuming a receptive role. Traditional instructional activities such as lecture preparation and delivery, student participation, discussion, feedback, and evaluation can be easily translated to a web environment (Aggarwal & Bento, 2000). Cross-platform environments, hyperlink networks, and synchronous or asynchronous communication are all appropriate functions in web-based systems (Liaw, 2004). The web-based education phenomenon is being felt throughout the world. “The same time, same place, only some people” traditional educational environment is giving way to an “anytime, anyplace, and anybody”

instructional model (Aggarwal & Bento, 2000). This new model provides students with better opportunities for retrieving information and actively interacting with other students and teachers.

In 2008, The Ministry of Education of Taiwan officially announced its Whitepaper for ICT in K-12 Education. This whitepaper clearly elucidates the 8 goals of pushing information education within the four subsequent years (2008-2011). These goals include (1) training students to be able to apply information technology to problem solving, (2) fostering students to use information technology in correct concept and attitude, (3) promoting equal digital access between teachers and students, (4) cultivating in teachers the ability to apply information science and technology, (5) developing multiple digital teaching resources, (6) enhancing the software and hardware facilities and web-based services in classrooms and on campus, (7) promoting of applying information technology in teaching for all schools, (8) establishing a sound administrative mechanism of information science education (Ministry of Education, 2008).

Regarding the international collaboration programs of information education, the Ministry of Education in Taiwan (2008) discovered that there are still huge gaps in international communication and team sharing that need developing and improving to promote information education. Reasons for enforcing international mutual-communication include a low interest in developing international communication due to pressure in high school, teacher's and student's lack of foreign language communication ability and cultural understanding, the lack of relevant mechanisms, and an outdated information education model. Due to the insufficiency of international (exchange) communication, relevant proposals must be taken to facilitate the school international effectively. The APEC Cyber Academy (ACA) (http://linc.hinet.net/apec/) plans one such action proposal. This plan has been executed since 2002 using international web-based collaborative learning activities, and is designed to promote the exchange, connection, development, and collaboration of information education among all APEC members. Not only does it encourage domestic K-12 school seed teachers to participate in international web-based collaborative learning activities, but it also enforces those teachers' abilities in integrating information technology into teaching. This plan further leads domestic students to gear in the world track, and explores students' global visions and international views.

The contest activities of the APEC Web-based Collaborative Learning Project originate from the APEC Cyber Education Network (ACEN) project that was passed by APEC's Human Resource Development Team. By conducting international web-based collaborative learning activities, it promotes web-based learning development and collaboration in the K-12 schools of all APEC members. The APEC Cyber Academy is an international web-based learning environment designed specifically for K-12 students. The primary goal of ACA is to provide learner-centric, collaborative, ICT and international learning experiences to K-12 students and teachers (Lin, 2007a).

The development of web-based learning systems has become widespread since the beginning of 1990, and is becoming an important part of human learning and living in the 21st century. Liaw (2004) mentioned that there are five characteristics of web-based environments: First, web-based systems offer a multimedia environment. Second, web-based systems integrate various kinds of information to construct information bases. Third, web-based systems support interactive communication. Fourth, web-based systems support networks to assess information. Fifth, web-based systems provide a cross-platform environment. Koschmann (1996) stated that the Computer-Supported Collaborative Learning (CSCL) paradigm includes web-based collaborative learning systems. Web-based collaborative learning allows students to approach more complex problems, and to share designs, critiques, and arguments with partners (Bravo, Redondo, Ortega, & Verdejo, 2006).

From the viewpoint of education, the Internet links the world, and extends information to remote areas without limit. This provides those who know how to use network technology with a significant learning advantage. Therefore, promoting web-based collaborative learning helps meet the demands of the current era.

To design effective web-based collaborative learning, it is first necessary to understand the key elements, advantages, and disadvantages of this approach, as well as the limitations of using web-based collaborative learning. Only then is it possible to make a complementing between the strength and the weakness and come up with extensive consideration. There are fundamental features and requirements in collaborative learning; Sun and Lin (2004) stated that the features of web-based collaborative learning are active learning, simulation-based learning, interactive and intercreative learning, and accumulative learning. In the era of digital learning, web-based collaborative learning could be recognized as a new kind of learning model. Neo (2003) found that students engaged in web-based collaborative learning enhanced their problem-solving and critical

thinking skills, learned to work in a team, and become more autonomous learners. Web-based resources allow students to obtain up-to-date information in many areas, and manipulate and reuse primary resources in a variety of ways (Kim, Hannafin, & Bryan, 2007; Jang, 2009). Therefore, students involved in web-based collaborative learning require mutually dependent relationships, personal interaction, individual task and obligation and team skills. Reliable and easy-to-use tools are also required, and teaching materials integrated with real experiences, easily collected and shared resources, and proper leadership or coordination.

The author of this paper is a teacher who has instructed students in contest participation, and is also part of the administrative staff of a school. In addition to teaching responsibilities, he is also in charge of the planning and execution of school-wide information education to assist teachers in using information technology and integrating it into their teaching. Through the experiences acquired in promoting school-wide information education and participating in several APEC Web-based Collaborative Learning Project Contest Activities, the researcher expects to find out the inspirations and dilemmas of relevant problems to be used as a reference for schools and persons that practice similar activities. The research method of this study is based on the action research approach. The purpose of presenting these research results and suggestions is to share problem solving experiences instead of making extensive inferences. This study aims to be used as a reference for teachers who intend to conduct similar activities or for schools that intend to promote similar information education. Specifically, the objects of this study are as follows:

1. Exploring the benefits of integrating information technology into web-based collaborative learning.
2. Examining the difficulties encountered by teachers in integrating information technology with teaching.
3. Proposing suggestions to help school administration staff promote information education.

METHOLOGY

Procedure

The social context of the learning environment plays an important role in collaborative learning. The ACA, which is an international learning environment for K-12 students, hosts an annual international online contest that allows the K-12 students to interact and collaborate on projects. There are three independent programs in the contest: The Web-based Collaborative Learning Program, the ICT Cyber Camp, and the APEC Journalists. In the Web-based Collaborative Learning Program, there were associated with team's projects that only accept group entry. For participation one of the projects, students have to form teams, take part in weekly learning activities, complete assignments collaboratively, and communicate with their distant learning partners through ACA's communication tools (Lin, 2007a).

Figure 1 describes the online structure of an individual web-based collaborative learning project. All the learning materials and tools are put together in the web site. The collaborative learning activities and processes also take place online in the website (Lin, 2007b). Activities in projects focus on cross-team collaboration and interaction. In the 8th week of the participating team has to negotiate with another team who is from another country (Lin, 2007a). The team had to set up a schedule for conferencing either with text or video conferencing. The theme of video conferencing is exchange the reflection, experience, or comment about the project. Here, learning becomes a social activity in which teachers, students and peers work as members of a learning community to gain new knowledge and experiences together.

By first searching relevant literature, this paper summarizes relevant information on education policy and promotion methods. As for in-school promotion methods, the contest message is initiated by the researcher. And the teachers recruit students to organize teams. Then the teacher and student would determine their team goal together. Such as decide the team name and the contest project. Subsequent steps include the following: make record and results during the process, conduct introspection, analysis, adjustment, and induction. Finally, this study shares and publishes the outcomes. Each team has to summarize the discussion in the conferencing with a web page and publish it on the ACA.

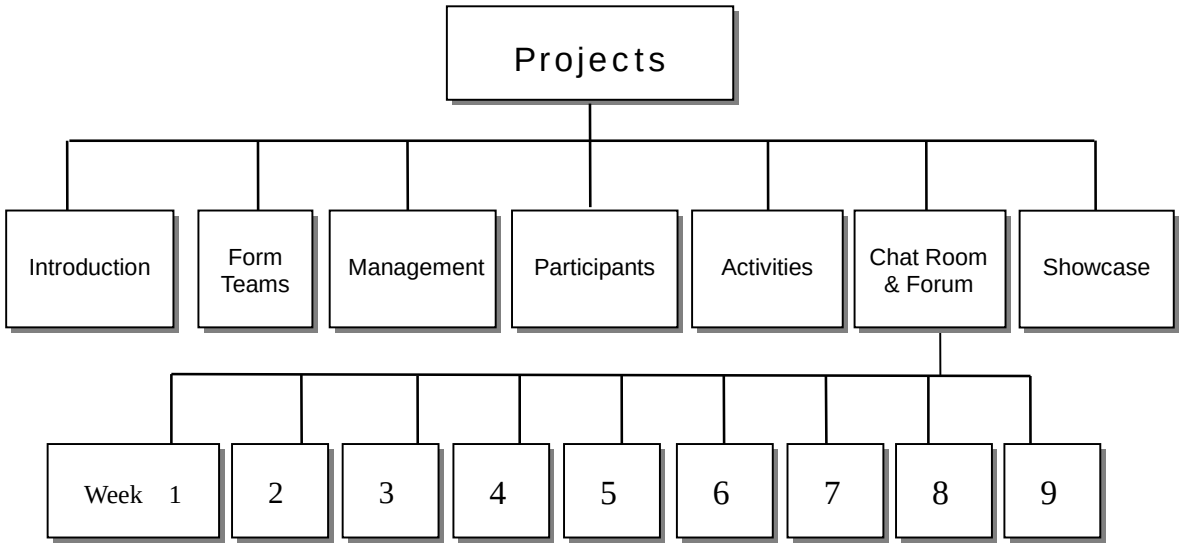

Figure 1 The structure of web-based collaborative learning project (Lin, 2007b, p. 110)

Figure 2 shows the procedure of the Web-based Collaborative Learning Contest in this study.

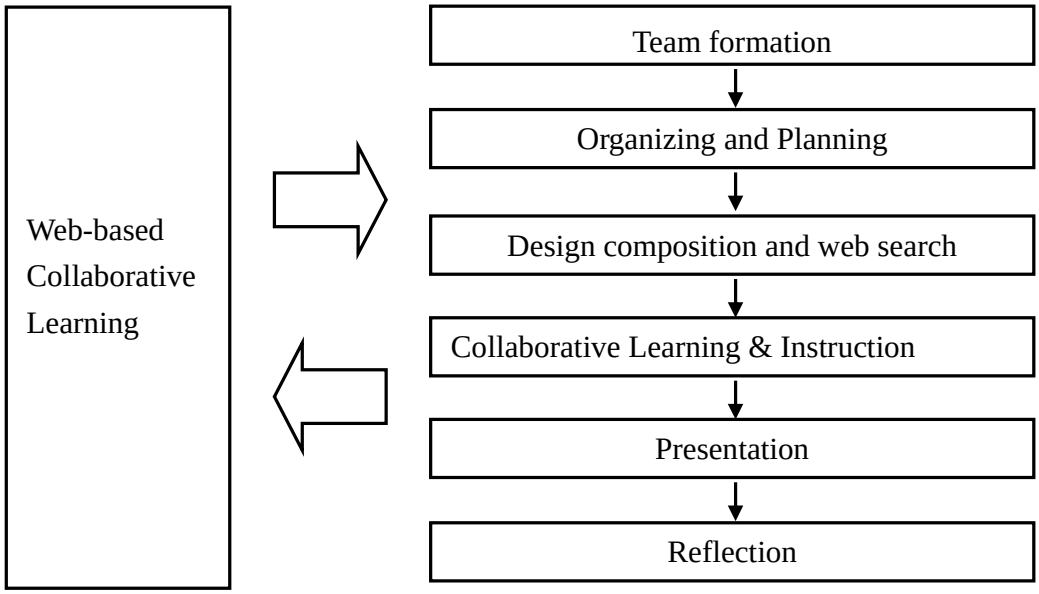

Figure 2 The procedure of the Web-based Collaborative Learning Contest

Action research

The web-based collaborative learning team organized for this research consisted of junior high teachers and students that attended the competition called an APEC Research Project. The web-based collaborative learning has been conducted with respect to a specific project. The research methodology of this study is the action research method. Action research is a process through which practitioners study their own practice to solve problems in their daily work. In the action research approach, teachers are involved in researching the relationship between their theories of learning, instruction, and teaching, and their practices in the classroom (Sidney, Rosemary, & Mary, 2009). According to Berg (2004), as shown in Figure 3, action research is the process of continual revision and diagnosis, and solving problems in specific scenario. This approach includes 4 steps: (1) Identifying the research questions, (2) Gathering the information to answer the questions, (3) Analyzing and interpreting the information, and (4) Sharing the results with the participants. During the process of instructing students participating in the contest, the researcher continued revising the method of web-based collaborative learning. The following chart illustrates the Action Research process.

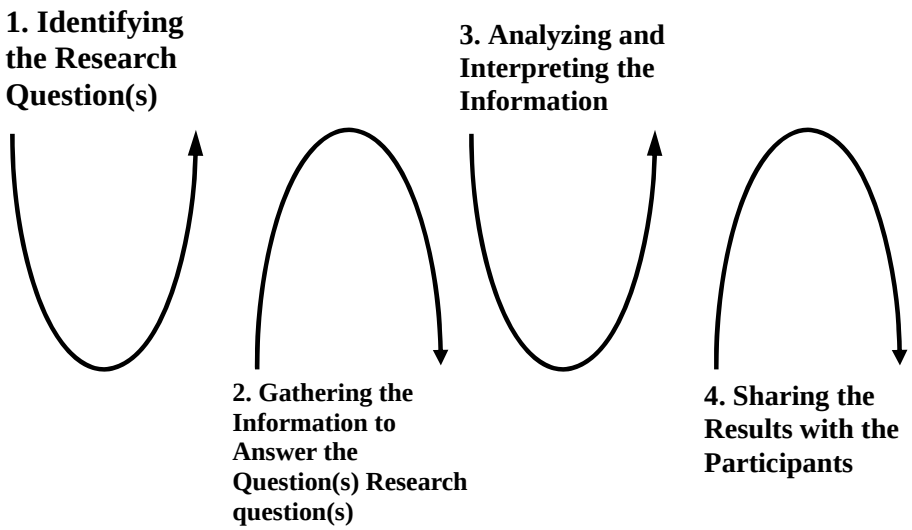

Figure 3 The Action Research Spiral Process (Berg, 2004, p. 198)

Participants

Students of ten junior school classes (grade 8, 4 boys and 8 girls, average age of 13 years) and two teachers (Teacher A, English teacher, female; Teacher B, Computer teacher, male) participated in this study. The school is located in middle Taiwan and was designated as an information education center school in 2004 by the Ministry of Education in Taiwan. The two teachers were convinced of the necessity of teaching students web searching, reading, and evaluating skills.

The name of the team participating in the 2007 contest was Golden Team which focused on introducing the money used in Taiwan. The team was awarded the honor of 2nd place for 2007. The same two teachers acted as instructors in 2008, and the name of the team participating in the contest was Holala which focused on introducing Chinese-relevant folklore festivals and holidays. The whole contest process lasted for 9 weeks with a specified project. The students completed each week's tasks in sequence, following their teachers' instructions. Teachers' assistance includes English correction, project comments, and technical trouble-shooting.

Data collection

This study used an action case study. Interviews were conducted to determine which contextual factors affect web-based collaborative learning and students' learning.

The in-depth nature of this research required the collection of a variety of data on the experience of both types of research participants (i. e., teachers and students). For this purpose, period observations and face-to-face interviews with teachers were combined with student interviews and final contest results.

The interview questions included:

- In your opinion, what is the benefit of integrating information technology into web-based collaborative learning?
- Could you describe your learning strategy in web-based collaborative learning?
- Did you encounter any difficulties during the web-based collaborative learning contest period? How did you deal with these difficulties?

RESEARCH FINDINGS

This study portrays the two web-based collaborative learning contests in terms of the way the teachers and students participated in the contests. Contextual factors that influence the contests are also analyzed, as well as the contest outcomes.

Paying attention to project knowledge

During the contest period, students' research projects determined their valuable content with regard to the contest project. In 2007, the project was **money**, and in 2008, the project was **holidays**. Students who used concrete and factual research questions for aspects of the contest projects were able to find useful information. Students read and processed web content, and then wrote text on their project website pages. Therefore, the workability and content knowledge of the contest project were both important for their collaborative learning. In the video conferencing process, students had to share their knowledge through web-based inquiry activities.

The collaborative activities between students

Students had to engage in different types of activities to successfully complete team goals. In addition, they should have a member-support and well-being function. During the computer work, students felt they shared the same goal and realized that they must collaborative together. Students knew that they must help each other to win the contest. For example, they had to pay attention to their web literacy skills. To focus on the specific searching, reading and evaluating web skills (Kuiper et al., 2009), students were requested to collaborate, focusing on the necessity of skills and sharing knowledge with others. Students had to perform task-related activities aimed at solving the problem at hand.

Final contest results

Excellent performance was achieved as the result of previous experience in web-based collaborative learning, which implies that adopting the method of web-based collaborative learning helps instruct the students with project exploration and learning.

In 2007, The eight learning projects are *Money, Convenience Store, Food Pyramid, Bacteria Assembly, A Day in Our school, Our Advertisement, Our Holidays, and What are Typhoons and Tornadoes?*. Each project is composed of nine-week collaborative assignments. Students are only allowed to join one team and enroll in one project, period. All programs emphases on project-based and problem-based learning. The annual contest attracted 130 teams and 1152 students from eight APEC countries which included Indonesia, Philippines, Japan and Taiwan. We choose the topic Money to our team project and introduced the money used in Taiwan. Two teachers and 12 students formed the team. The team was awarded the honor of 2nd place this year.

In 2008, the Web-based Collaborative Learning Program consists 8 independent projects which included *Money, Mallrats, Food Pyramid and Food Labels, Holidays and Vacations, Bacteria, Antibiotics and Antibiotic Resistance, A Day in Our School, Newspapers, Weather and Natural Disasters.* We choose the topic Holidays and Vacations to the team project and focused on introducing Chinese-relevant folklore festivals and holidays. There were 20 teams and 155 students participated this project from Philippines, Taiwan, Thailand and The United States of America. The team was awarded the honor of 1st place for 2008. Table 1 lists the contest outcomes of the Web-based Collaborative Learning Program Contests held in 2007-2008.

Table 1 Performance List of Participating in Web-based Collaborative Learning Contests

Year	Team Name	Project	Teachers	Students	Rank
2007	Golden Team	Money	2	12	Second place
2008	Holala	Holidays and vacations	2	12	First place

DISICUSSION

The students' projects, feedback, and semi-structured interviews with two teachers reveal the benefits of Web-based Collaborative Learning, and the difficulties of conducting Web-based Collaborative Learning for students and teachers. The following section describes these results.

The Benefit of Web-based Collaborative Learning

Because Web-based Collaborative Learning combines collaborative learning and the use of ICT, researchers have suggested and tested the various educational, social, and motivational benefits of Web-based Collaborative Learning (Hertz-Lazarowitz & Bar-Natan, 2002; Benbunan-Fich, Hiltz, & Turoff, 2003; Fjermestad, 2004). Apparently, Web-based Collaborative Learning has positive effects on education (Janssen, Erkens, Kanselaar, & Jaspers, 2007). Jonassen (2000) believed that the learning process of information education includes the following three processes. The first is "Learning from Computer" then "Learning about Computer" and finally, "Learning with Computer".

Helping teachers and students to be able to use a computer to perform learning is one of the main goals of conducting web-based collaborative learning. Previous contest experiences showed the benefits for the students, teachers, and the school can be generalized as web-based collaborative learning.

Benefits for the students

Participating in web-based collaborative learning is meaningful and valuable in every aspect of student enhancement. Collaborative learning shifts the responsibility of learning from the teacher to the learner (Bruffee, 1995). The students must learn to regulate their roles during the collaboration learning process. When a group of students set their team goal, all students must support each other. The students should also learn how to be goal oriented when the working process in certain way. Therefore, learners have the responsibility to participate in collaboration processes to fulfill their learning goals (Liaw etc., 2008). The benefits web-based collaborative learning includes the following perspectives:

Increasing the Self-Confidence

A learner-centered environment empowers students' active participation in their learning processes and makes them responsible for their own work (Neo, 2003). By producing a web page with a specific topic, the students were greatly benefited in the aspects of the relevant subjects' cognition enhancement and relevant knowledge deepening. Group journals and websites reveal the student's deep reflections.

> *"In the beginning, I was afraid when teacher asked me questions. After I collaborated with others, I found that it stimulated me to come up more ideas. I felt more confidence in facing the questions." (Student interview)"*
>
> *"During the video conferencing, I felt it was a nice experience for me to use English in communication. Maybe I have many mistakes in it, but I tried to do it on my own. I benefited from it a lot." (Student interview)*

Since Mandarin is the language used in Taiwan, students who participated in the web-based collaborative learning contest had to use English to communicate with students from other countries or use English to write their articles. English was also required in the video conference function for the last several weeks of the contest, and

students had to use English to converse on-line with other students. This is helps enhance the self-confidence of students in using English to express their own opinions.

Enhancing the International Vision

Interviews with students participating in web-based collaborative learning reveal that one of the reasons why students enjoy participating in this activity is the increased opportunity to communicate with students from other countries. The students participating in the contest also believed that becoming acquainted with the students of other countries could also enhance their internationalized and globalized conceptions. The same is true for web-based exchange and intercommunication with students from other countries during the contest process.

Fostering an understanding of the Community Environment

In the 2007 contest, the students introduced the money being used in the country by introducing events from their own country. This approach enhances the student's interest in the history and legendary stories of the coins, and helps them learn how to introduce these features to students from other countries. Not only does it create a deeper understanding of tradition, but links tradition and modernity in more depth. It also enhances students' problem-solving abilities, and fosters proactive habits in knowledge seeking on a specific subject. As to the methods of data searching, the students feel happy to use the internet to acquire relevant information. Team collaboration is also helps students learn how to cooperate with colleagues, and share their achievements and difficulties during the participation process. Learning with peers may benefit not only individual performance, but also enhance team performance by increasing the quality of the team's product (Liaw etc., 2008). The teacher's leadership at the appropriate times helps the students solve disputes and tolerate each other.

Enhancing the Students' Web literacy

The "Learning by Doing" approach advocated by Educator Dewey is the best aphorism for student participation in the contests. This collaborative learning process enables students to experience authentic learning in a virtual environment. According to Kuiper, Volman, & Terwel (2009), there are three components of web literacy: web searching skills, web reading skills, and web evaluation skills. This study shows that web-based collaborative learning enhances the students' fundamental web literacy,

including their ability to define appropriate key words to locate web information, and understand their limitations and possibilities.

Web-based collaborative learning also enhances computer operation capabilities such as document processing, editing, graph scanning, image processing, etc. For the high school student, cultivating computer literacy is a necessary and valuable step toward future learning. The collaborative learning process enables students to become interactive learners and to build greater knowledge.

Benefits for the teachers

It is very important to consider the motives and beliefs of the teachers who integrate information education into teaching. Since the teaching preparation and teaching tasks are already a significant part of their responsibilities, many teachers will think that this is "*an extra job*". Therefore, it is necessary to motivate teachers to encourage their participation. The following section elucidates the benefits for teachers engaged in this activity.

Development of professional expertise

Teachers can improve their professional image by enhancing their expertise, in computer capabilities. For the individual teacher, being able to learn new technology and skills could allow the integration of different territories with the teacher's own knowledge and capabilities. Conducting web-based collaborative learning could also enhance the feeling of achievement and the teacher's image as an expert in certain areas. Helping their students win an award in an international competition can also give the teacher a very high sense of honor.

> *"To innovate instruction was useful for me as a teacher. I learned more about my students' thinking, and could guide students more precisely and deeply. I experienced a new way of teaching and the feeling of success. It will be very helpful for my future teaching career" (Teacher A, female). "However, I realize that I need to work more now, that I need to master new computer skills" (Teacher B, male).*

Students can also sense the teacher's dedication and contribution, which can also enhance the teacher's professional image.

New relationships between the teacher and the student

The teachers were also convinced that integrating information technology into teaching can increase the learning motives of their students.

> *"Having class in a computer classroom was very attractive to students. Students found the hands-on technology, such as video-recording, to be amusing" (Teacher A, female). "Sharing tasks and collaborating in the learning process helps develop the students' team spirits and tacit understanding. It also fosters a spirit of mutual assistance in students" (Teacher B, male).*

Because this study requires the teacher and the student to complete the contest together while participating in contest, the teacher must always discuss with the students by playing a role of friend. Going through this type of teaching contest usually nurtures a tacit understanding between the teacher and the students.

Difficulties and limitations

Integrating information technology into teaching is currently a major trend in education, and whether or not the teacher possesses web-based teaching abilities may become a critical factor in pushing the integration of information technology into teaching activities. Hence, the teacher's knowledge and computer literacy is becoming more important. The teachers' experience of teaching students in the web-based collaborative learning contests shows that several difficulties and limitations may influence the contest process.

First, there is the influence of teachers' individual factors, which may be the most important factors. Hara (1999) pointed out that many teachers have commensurate doubts about the usage of technology. Teachers are often heavily loaded with class-hours each week, and spent a lot of mental and physical effort on the job of teaching preparation. As a result, they may not be able to spare more time to design teaching materials integrate information technology into teaching. Participating in the Web-based collaborative learning contest requires the use of extra time, e.g. the lunch break. In addition, since English is the major communication tool for this contest, it is also a challenge to Taiwanese teachers. That is to say, insufficient language ability can make teachers reluctant to get involved in this type of activity.

Second, the school environment could not support teacher to conducting web-based collaborative learning. To implement web-based collaborative learning, one very important point is whether or the school has built up a suitable environment. For example,

the grouping of the students, the school's information equipment, and internet connection speed all affect the teachers' willingness to integrate information technology into their teaching.

Third, students' abilities in word processing and on-line discussion are another limitation. The literature shows that many students appreciate the Internet's apparent "easiness:" lots of information is only 'one mouse clicks away' (Large & Beheshti, 2000; Kuiper et al., 2009). The contest asked students to use the web differently, staying focused on the research question, searching purposefully, and learning how to express the project in an organized manner. There were some gaps between the students' expectations and their web use preferences. Hence, teachers required more structure, support and guidance to enhance students' motivations and participation.

The final factor to consider is the influence of Credentialism**.** According to Tu & Twu (2002), studies have shown that there were no significant differences in achievement between traditional and technology-based instructions. Especially in junior high schools in Taiwan, the impact of the admission system has a major influence on teaching techniques. Most teachers implement traditional lectures as the major teaching strategy (Jang, 2009). Special teaching methods or innovative teaching methods are not always easily accepted by the students or their parents. Some high-achievement students may ask the teacher not to waste their class time to avoid a negative impact on their achievement. This would dampen the teachers' morale and other students' zeal.

CONCLUSIONS AND REFLECTIONS

Information technology has been developing rapidly, and deeply influences teaching activities. Further, the role of information has been changing as the times change. Jonassen (2000) believed that the role played by information has transformed from information as a teacher to information as a learning partner. The relationship between computers and learning illustrates this trend: computers support Knowledge Construction, Knowledge Explorations, Learning by Doing, Collaborative Learning, and Learning by Reflection. This research proposes that the in-school promotion of information education can be exposed to inspection and introspection through the individual teachers, the school environment, school courses, social factors, etc.

The Individual Teacher

In addition to enhancing student motivation for learning, the purpose of integrating information into teaching is to promote learning performance and enhance the teacher's effectiveness. Lim and Chai (2008, pp. 2002-2003) explained that:

> *"….as learning environments that are mediated by technological tools to support effective instruction; where effective instruction is not only about designing specific learning activities to meet certain instructional objectives, but more importantly, it is about engaging and facilitating students' knowledge construction activities that involve higher-order thinking as intentional processes for solving authentic problems within a collaborative social context".*

The most important influential factor is the teacher's belief. The teacher's ideal and belief will become a key element in whether or not he supports the continuing renovation. Is the teacher willing to try different teaching methods? Does the teacher have an attitude of acceptance or rejection toward information technology? Can the teacher happily try different ways of teaching? The school's administrative system should provide the necessary equipment and technological support and encourage teachers to sharing relevant experience; this can help enhance the teacher's sense of achievement, reduce setbacks and barriers, and attracting more teacher participation.

School Environment

According to Tondeur, Valcke, and van Braak (2008a), a school's culture characteristics are positively related to its use of computers as a learning tool and the adoption of ICT. For hardware equipments and human resource, one needs to consider the following factors. Is the computer room large enough? How about the Internet access speed? Are the facility management and human resources support sufficient and effectively allocated? In addition, do students own a computer at home, and is it linked to the Internet? The school administration should provide sufficient equipment and technology support. At the school level, the technology infrastructure and ICT policy are effective ways to enhance teacher participation. These factors highlight the potential impact of actions and policies at the school level, such as the development of a school-wide vision, school-based in-service training, and precise consideration of the nature of computer access in the classroom (Albirini 2006; Tondeur et al. 2008a; Tondeur,

van Keer, van Braak, & Valcke, 2008b). A learning environment could be created in which both teachers and students can share knowledge and skills in web-based collaborative activities.

School Courses

The course-developing committee discusses the development of the standard courses in any given school. School courses should be able to match the practice of integrating information technology into teaching, and the following questions must be contemplated: What are the school's features and vision? What is the content of computer course teaching? What will the degree of information technology integration be? Is possible to conduct a relevant information education forum for teachers, or provide them with on-job advanced study? This can provide teachers with better knowledge and capability in the aspect of information education.

Social Factor

In addition to the above-mentioned factors, the social factor is one of the key points to be considered when pushing the integration of information technology into teaching. Will the community surrounding the school support to conducting web-based collaborative learning? When there is not enough money for outside technology and materials, is it possible to obtain financial support from the industry and civil organizations? In addition, it is still necessary to consider social value and impressions? If the school is a part of the education system, it must take education as the starting point while cooperating with the industry, well consider the school development (Huang, 2005).

The researcher of this study plays dual roles in administrative personnel and teaching staff. In one way, he must promote in-school administrative tasks from the position on school administration; on the other hand, the researcher must assist schoolteachers with integrating information technology into teaching. During the research process, the interference of administration and teaching biases could not be avoided. This is both a strong point and weak point in conducting action research. The task of integrating information technology into web-based collaborative learning produces plentiful first-hand data. However, this highlights the limitation of the research practice and skills of the teachers themselves. The long duration of the research process, the level of skill in data collection and analysis, and the subjectivity of relevant problems may

cause bias in the writing of the research results. These are the limitations of this research.

Teacher action research is essentially a systematic process of promoting reflective practice. This allows a teacher to look beyond an immediately pressing event, and be more reflective (Sidney et al., 2009). The purpose of this paper is to share the researcher's experience in promoting information education and participation in web-based collaborative learning. The researcher wishes to enhance the quality of education by integrating web-based education into teaching. Besides, the development of information technology can produce a dramatic change in knowledge impartation compared to traditional teaching. Web-based technology not only offers many possibilities for teaching and learning, but also new challenges to teachers and students.

Schoolteachers and administrative staff members should not stop learning skills that can be applied to teaching, and should enrich themselves with expertise relevant to various aspects of teaching. Teacher should search for the sense of achievement and fatigue from the students' learning performances. To let information technology renews the teaching process and enhances teaching effectiveness.

REFERENCES

Aggarwal, A.K., & Bento, R. (2000). *Web-Based learning and teaching technologies: Opportunities and challenges*. London: Idea Group Publishing.

Albirini A. (2006). Teachers' attitudes towards information and communication technologies: The case of Syrian EFL teachers. *Computers & Education*, *47*(4), 373-398.

Benbunan-Fich, R., Hiltz, S. R., & Turoff, M. (2003). A comparative content analysis of face-to-face vs. asynchronous group decision making. *Decision Support Systems, 34*(4), 457-469.

Berg, B. L. (2004). *Qualitative research methods for the social sciences*. Boston: Allyn and Bacon.

Bravo, C., Redondo M. Á., Ortega, M., & Verdejo M. F. (2006). Collaborative environments for the learning of design: A model and a case study in Domotics. *Computers & Education, 46* (2), 152-173.

Bruffee, K. A. (1995). Sharing our toys: Cooperative learning versus collaborative learning. *Change*, *27*(1), 12-18.

Cheng, K. W., & Chen, Y. F. (2008). A practical learning example for accounting on web-based collaborative learning. *Business Education Quarterly, 118*, 23-28. (In Chinese).

Fjermestad, J. (2004). An analysis of communication mode in group support systems research. *Decision Support Systems, 37*(2), 239-263.

Hara, K. (1999). Teachers' attitudes toward information skills instruction. *Education Libraries Journal, 42*(2), 5-14.

Hertz-Lazarowitz, R., & Bar-Natan, I. (2002). Writing development of Arab and Jewish students using cooperative learning (CL) and computer-mediated communication (CMC). *Computers & Education, 39*(1), 19-36.

Huang, I. L. (2005). School marketing operations indices for junior high and primary schools. *Journal of National Taiwan Normal University, 50*(2), 139-158.

Jang, S. J. (2009). Exploration of secondary students' creativity by integrating web-based technology into an innovative science curriculum. *Computers & Education, 52*(1), 247-255.

Janssen, J., Erkens, G., Kanselaar, G., Jaspers, J. (2007). Visualization of participation: Does it contribute to successful computer-supported collaborative learning? *Computers & Education, 49*(4), 1037-1065.

Jonassen, D. H. (2000). *Computers as mindtools for schools.* New Jersey: Prentice Hall, Inc.

Kim, M. C., Hannafin, M. J., & Bryan, L. A. (2007).Technology-enhanced inquiry tools in science education: An emerging pedagogical framework for classroom practice. *Science Education, 91*(6), 1010-1030.

Koschmann, T. (Ed.). (1996). *CSCL: Theory and practice of an emerging paradigm*. London: Lawrence Erlbaum Associates.

Kuiper, E., Volman, M., & Terwel, J. (2009). Developing web literacy in collaborative inquiry activities. *Computers & Education, 52*(3), 668-680.

Large, A. & Beheshti, J. (2000). The web as a classroom resource: Reactions from the users. *Journal of the American Society for Information Science, 51*(12), 1069-1080.

Liaw, S. S. (2004). Considerations for developing constructivist Web-based learning. *International Journal of Instructional Media, 31*(3), 309-321.

Liaw, S. S., Chen, G. D., & Huang, H. M. (2008). Users' attitudes toward Web-based collaborative learning systems for knowledge management. *Computers & Education, 50*(3), 950-961.

Lim, C. P., & Chai, C. S.(2008). Rethinking classroom-oriented instructional development models to mediate instructional planning in technology-enhanced learning environments. *Teaching and Teacher Education, 24*(8), 2002-2013.

Lin, C. S. (2007a, March). *APEC Cyber Academy & APEC 2006 international online contest*. Paper presented at the meeting of APEC Cyber Academy 2007 International Conference on ICT and English Learning, Tainan, Taiwan.

Lin, C. S. (2007b, March). *Game-based learning and international virtual learning community: Eternal efforts of APEC Cyber Academy and keys to the future in English learning*. Paper presented at the meeting of APEC Cyber Academy 2007 International Conference on ICT and English Learning, Tainan, Taiwan.

Lin, C. S. & Chou, C. C. (2007). *APEC cyber academy: Integration of pedagogical and HCI principles in an international networked learning environment*. Hershey, PA: Idea Group, Inc.

Ministry of Education (2008) :*Taiwan MOE's Whitepaper for ICT in K-12 Education*. Taipei: Ministry of Education.

Neo, M. (2003). Developing a collaborative learning environment using a Web-based design. *Journal of Computer Assisted Learning, 19*(4), 462-473.

Sidney N. M., Rosemary C. R., & Mary E. L. (2009). Benefits of collaborative action research for the beginning teacher. *Teaching and Teacher Education, 25*(2), 344-349.

Sun, C. T. & Lin, S. S. J. (2004). CORAL-View: A Network-based design environment for collaborative learning. *International Journal of Instructional Media, 31*(2), 151-166.

Tondeur, J., Valcke, M., & van Braak, J. (2008a). A multidimensional approach to determinants of computer use in primary education: Teacher and school characteristics. *Journal of Computer Assisted Learning, 24*(6), 494-506.

Tondeur, J., van Keer, J., van Braak, J., & Valcke, M. (2008b). ICT integration in the classroom: Challenging the potential of a school policy. *Computers & Education, 51*(1), 212-223.

Tu, C. H. & Twu, H. L. (2002). Educational technology in Taiwan. *Educational Media International, 39*(2), 153-164.

Wang, Q. Y. (2008). A generic model for guiding the integration of ICT into teaching and learning. *Innovations in Education and Teaching International, 45*(4), 411-419.