Applying Wireless Technologies to Build a Highly Interactive Learning Environment

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Abstract

This study tries to apply wireless technologies to build a highly interactive environment. For this purpose, this study first identifies four types of interaction between the members in the technology-embedded classroom contexts, including: (1) face-to-face interaction; (2) computer-mediated interaction; (3) human-computer interaction; and (4) personal device supported simultaneous group interaction. In our analysis, each type of interaction above has its advantages and limitations, and there is no one can achieve all instructional goals along. So, the second purpose of this study is to integrate wireless local area network (WLAN), electronic whiteboard, interactive classroom server, and resource and class management serve to build a highly interactive learning environment, which can support members to flexibly proceed any type of interaction to achieve specific instructional goals. Finally, this study integrates the learning environment design with one of traditional pedagogical models – the Jigsaw II Model to demonstrate how such highly interactive learning environment can best promote instructor's teaching and students' learning.

Keywords: *Cooperative/Collaborative Learning, Wireless Digital Learning Assistant, Highly Interactive Learning Environment*

1. Introduction

From a constructivist's viewpoint, to achieve meaningful learning in the classroom must require and involve lots effective interaction between the members in the learning environment, including instructor and students. Interactivity is crucial in the instruction and learning process because it helps stimulate and motivate both instructor' and students' thinking and facilitates them to reconstruct their own cognitive structure.

In the last few decades, educational technologies have increasingly transformed learning activities, interaction between members in the classroom, and pedagogical practices. Traditionally, instruction and learning activities in the classroom are often confined to limited time and space. Instructors and students' roles in the classroom are stereotyped. With the emergence of computer technologies and Internet networking, a number of new technologies have been applied to enhance the quality of instruction. Previous studies on educational technology have reported positive impact of technology upon students' learning, suggesting, "technology-enabled collaborative learning yields superior outcomes to non-technology enabled collaborative learning." [1] On the other hand, with the use of instructional technologies, teaching and learning process are relocated from the physical to the virtual classroom. [2] Compared with traditional classrooms, virtual environments motivate more participation and collaborative dynamics between instructor and learners and thus allow for the reconstruction of roles and interpersonal relations. [3]

More recently, wireless technologies have been a hot issue and started to become an essential integral component in classrooms in significantly transforming how students learn, the student-teacher and peer interaction, and the effectiveness of teacher work. In Taiwan, for instance, the invention and development of wireless instructional devices called "wireless personal learning assistant" has gathered a lot of attention and discussion. Several recent empirical studies have suggested the advantages of utilizing wireless technologies in learning environments, including enhancing availability and accessibility of information networks [4] [5] [6]; facilitating students' engagement of learning-related activities in diverse physical locations; supporting group work on projects; and enhancing communication and collaborative learning in the classroom. [4]

Despite of those positive impacts mentioned above, some studies held a more conservative attitude toward technology-supported instruction. Park and Burris regarded the problem as "whether technology is effective in particular contexts that warrant using it as a vehicle to achieve specific instructional goals." [7] Specifically, Gay et al noted that "not every teaching activity or learning community can or should successfully integrate mobile computing applications" because different structure and content of classes, pedagogical models, and curricular philosophies all influence how wireless technologies are used. [4] In light of the concern addressed above, this paper attempts to explore how new instructional technologies affect teacher-student and peer interaction in complicated classroom contexts.

This paper begins with an interpretation of four types of interaction between members in the classroom, identifying their unique features, advantages, and limitations. Then, a new learning environment design is presented, which employs wireless digital learning assistant (WDLA, a set of instructional devices we have developed based upon a consideration of the four types of interaction) to support and promote the instruction and learning process. On the basis of a belief that a better instruction and classroom design to promote interactivity is an integration of new educational technologies and suitable pedagogical strategies, we propose a specific pedagogical approach by applying the Jigsaw Ⅱ Model to the highly interactive classroom (HIC) with the WDLA to facilitate effective interaction between instructor and students.

2. Four Types of Interaction in the Instruction and Learning Process

2.1. Face-to-face interaction

Traditionally, instruction and learning activities have been delivered in a physical space known as "the classroom". When a course is offered, it is often assumed that it will be accompanied by a room consisting with desks or tables directed toward a podium, chalkboard, and lecturer. [3] Among many pedagogical methods designed for the classroom context, lecturing is regarded as the most typical face-to-face and one-to-many instruction that yields direct interaction between instructor and students. The instructor and his/her lecture often play the central role in the lecture-based class because students comfortably accept and remain their passive roles. This pedagogy is specifically encouraged and enabled by the physical configuration of the classroom because the podium, desks, and tables are all designed for a one-to-many transmission of information. Collaborative learning (CL), another pedagogical method identified as groups working together for a common purpose, is also frequently used in the face-to-face classroom context. [10] Unlike lecturing that focuses on isolate learning, CL highlights the significance of group processing. Nowadays, collaborative/cooperative learning is widely approved because CL allows positive interdependence between group members and encourages verbal and non-verbal face-to-face interaction between members in the classroom.

Despite that traditional face-to-face classroom contexts permit instructors to detect visibly physical and implicit nonverbal cues, such as raising hands and nodding that communicate either understanding or confusion, there is no guarantee such gestures will be communicated by the student or acknowledged by the instructor. [3] For one reason, the confined physical space and scheduled time both discourages and disables effective interaction between instructor and students. For another reason, there are many external factors, such as students' position in the classroom also affect students' involvement and participation. [8]

2.2. Computer-mediated interaction

With the addition of computer technology and Internet networking, the teaching and learning process is relocated from the physical to the virtual classroom. Virtual learning is a common term used to describe these changes. For instance, classrooms are no longer the only place to learn. Students in the classroom may use computer networks to communicate with each other rather than talk face to face. In the virtual classroom, there is not exact necessity for instructors to deliver lectures – they may lead a group discussion on the bulletin board systems (BBS) rather than give an in-class lecture. Instructors commonly regarded students entering a virtual classroom should do something more than find and read texts but involve the students in some activities, such as an assignment, an exercise, a debate, or problem-solving. [3] This kind of interaction, the interaction via certain computer media and Internet connection like electronic mail (e-mail), BBS, or electronic meeting, has been called computer-mediated interaction /communication (CMC). [13]

Computer-supported collaborative learning (CSCL) is one type of CMC application in education to enhance students' collaboration and interaction. [4] CSCL is a computer-based network system that provides a shared interface for both individuals and groups to work on group work. In this design, students need to access to a specific bulletin board to fulfill assigned homework, such as peer review or group discussion. One of its major characteristics is its capability to allow students to engage in learning-related activities in diverse physical locations at any time. Teachers' major job in the CSCL learning environment is not to give lecture but to coordinate group work. Compared with face-to-face interaction in the traditional classroom, the (CMC) among students is more likely to encourage students' participations. Students' role thus becomes active learners rather than traditional passive learners.

The CSCL design enables three types of interaction between members in the classroom, including: (1) one-to-one interaction between a student and another student either in the same group or in different groups; and between a student and the teacher (2) one-to-many communication between the instructor and students; and

(3) many-to-many communication between students. Nevertheless, the CSCL design cannot effectively improve students' learning without the support of appropriate pedagogical practice. For one reason, not every teaching and learning activity can effectively integrate new computer technologies. For another, there are many other external factors, such as classroom structure and the composition of student members that may affect the outcome of students' learning.

2.3. Human-computer interaction

Since the 80s, the emergence and application of "Computer-Assisted Instruction" (CAI) has led to an educational revolution, which significantly changes how people learn. Generally speaking, CAI are pre-designed computer software or web-based programmer designed to tutor students or users. [11] When using CAI, learners follow the guidance on the screen to process the instruction. CAI design allows a learner to interact with a computer in a way that the CAI programmer responds to the learner's choosing of certain instruction materials. In other word, this type of instruction is a one-on-one instruction, or individualized instruction, because each student is automatically assigned with a computer who has been a virtual instructor or training assistant.

Intelligent Tutoring Systems (ITS) is one type of CAI design aimed at providing the benefits of one-on-one instruction automatically and cost effectively. It goes beyond training simulations by answering users questions and providing individualized guidance. Moreover, it can assess each learner's actions within these interactive environments and develop a model of their knowledge, skills, and expertise. To some extent, ITS is acting as not only a problem-solving monitor but also a couch or consultant.

One of the major features of CAI is its design of human-computer interaction (HCI), concerned with "the structure of communication between human and machine, joint performance of tasks by humans and machines, and human capabilities to us machines." [12] Simplily speaking, when a student is using a computer in doing something, he/she is interacting with the computer. By simulation, computers can act like human beings, such as providing suggestions or ideas and giving evaluations. Nevertheless, unlike human beings, computers are unable to generate or express true and sophisticated emotions like anger or furstration. Despite that CAI permits two-way communication between learners and the virtual tutor, such communication is lack of emotional tone and direct nonverbal cues because pre-designed CAI systems only can respond to learners in certain ways. Specifically, CAI is unable to provide more flexible choices of responses for learners. In spite of this limitation, CAI can benefit learners by always giving them immediate responses and allowing them to take far longer to learn missing knowledge and skills without coaching from a human instructor or an automated tutor. Moreover, learners' portfolio in the whole learning process could be recorded for further reviews.

2.4. Personal device supported simultaneous group interaction

Owing to an increasing concern on how student-teacher and peer interaction can facilitate learning, some researchers attempt to create new type of computer technology to enhance student-teacher and peer interactions. EduClick, for instance, is our earlier effort aimed at designing a technology-enabled learning environment to enhance interactivity in the ordinary classroom. [15] EduClick enables each student to use a remote controller to choose an answer in responding to the instructor's question. Following that, the instructor can use his/her remote controller to give evaluations to each student respectively. Having similar functions like EduClick, Group Decision/Process Support Systems (GPSS), which is often used in electronic meetings and business settings, can be also used as an educational technology-supported tool to improve the learning experience of each student in the group decision-making process. The GPSS functions in a way that students use the handheld devices, such as a learning pad, to respond to the instructors' questions in either multi-choice or yes-no and true-false format, and then the system stores their responses in a remote database and displays the collective responses on the screen in the front of the classroom. Meanwhile, all responses can be saved in a session file, allowing students and instructors to analyze the results of the questions and answers in follow-up work. GPSS enables a spontaneous two-way communication between students and the instructor, specifically allowing one-to-many and many-to-many communication. Such interaction is called as "personal device supported simultaneously group interaction." When the instructor poses a question, each student can respond to this question spontaneously. As such, the instructor can gather and perceive all different opinions in a short time and then give respective feedbacks. Under this circumstance, the role of the instructor has transformed from traditional "sage on the stage" to a classroom coordinator who coordinates the classroom ongoing discussion and interaction. Students' role as passive learner is also shifted to autonomous or active learner.

GPSS was reported to offer an easy means to gather attention, to promote students' participations, and to generate a lot of rapid feedback from both students and the instructor. In using a GPSS, students will no longer have to raise their hands to speak, interrupt each other in order to talk, or forgo making a comment because someone else is talking. [9] Since the instructor can see immediately how well students comprehend a specific topic or issue he/she has presented and in turn provide immediate feedback, the communication between the instructor and students becomes more effective. In addition, students may not have to take notes when a GPSS is presented because all comments ware recorded by the system. Despite of these advantages, several limitations of the GPSS application have been noted. The changing conditions within each class (i.e. the composition of class members and the characteristic of the instructor and students) may have migrated effects of using a GPSS. Moreover, it is difficult to determine if in fact all students were participating during the electronic discussion. While the instructor was observing the students during their electronic discussion and participation appeared to be high among all students, it is possible that a few students may not have engaged in the discussion, but merely observed others or did something else. [1]

3. Learning Environment Design with Wireless Digital Learning Assistant

Since the educational reform was demonstrated and undergone in 1998, the Ministry of Education in Taiwan has drawn up and implemented several educational technology-related projects in order to promote student-teacher and peer interaction in the classroom. The highly interactive classroom (HIC), a learning environment system designed and developed by Learning Technology Lab of National Central University in Taiwan, is one of these ongoing projects.

The original version of highly interactive classroom (HIC) [16] is a 3-layered structure for one computer allocated classroom within EduClick. [15] Each student in the HIC has an infrared remote controller to participate learning activities, such as formative evaluation and prompt Q&A. The infrared remote controller lets student interacting with teacher and other students through the classroom computer coordination. [5] In essence, HIC is a wireless communication environment with handheld devices. With the device, the instructor can present instruction materials, conduct evaluations, and control activities pace in the classroom. However, the limited function of infrared remote controller restrains activity types the instructor could apply.

In this study, a more flexible and powerful HIC environment design would be proposed, shown in Figure 1. The HIC with wireless digital learning assistant (WDLA) retains wireless communication by replacing infrared with 802.11b through wireless access points, and replacing remote controller with WDLA as handheld device. Basically, the WDLA is a helpful device that can support all types of the interaction we have mentioned.

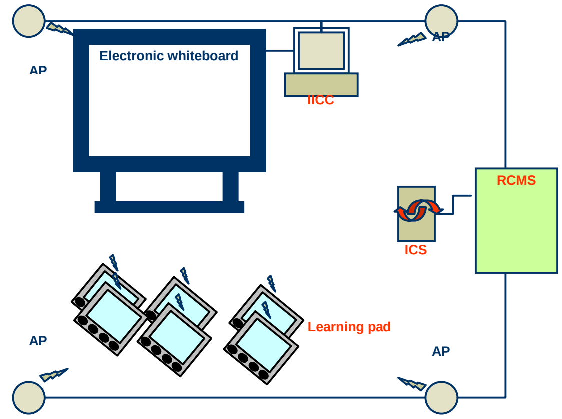

Figure 1. Learning environment design with wireless digital learning assistant.

Teachers perform instruction activities by operating the master computer allocated in the classroom, and each student uses a handheld WDLA to interact with others, respectively. An electronic whiteboard is connected to the master computer so that teacher may perform his/her instruction as usual. Students read digitized textbook, practice assigned exercises, and participate in instruction activities on WDLA. For assisting instruction and learning activities, there are two servers in the HIC, including *interactive classroom server* (ICS) and *resource and class management server* (RCMS). The ICS is a coordinator, which coordinates instruction and learning activities. The RCMS is a resource center, which manages instruction resources and keeps track of individual student's learning portfolios.

4. Interactive Instruction Control Center and Interactive Learning Center

In the HIC with WDLA, there are two clients for instructor and students respectively. The interactive instruction control center (IICC) supports the instructor with various functions for fully controlling students' participation as well as smoothly performing his/her instruction. On the other hand, interactive learning center (ILC) is the learning portal installed on WDLA that learner uses it to participate learning activities and perform individual exercises.

4.1. Interactive Instruction Control Center for teachers

IICC (see figure 2) is installed on the master computer for instruction and connected to an electronic whiteboard. The instructor presents pre-authored contents, such as PowerPoint presentation files, web pages, videos, and online tests, by simply clicking a file name listed on the panel. The pre-authored contents are arranged on and retrieved from the RCMS. The selected frames would broadcast to all students, multicast to assigned group members, or uni-cast to an assigned individual student in the classroom under the ICS coordination. Frames, URLs, programs, and recorded information not only deliver from the instructor to students, but also from students to the instructor. These functions support the instructor to monitor and guide students learning. During instruction progresses, the instructor takes notes and makes marks on the electronic whiteboard. All notes and marks the instructor made would be recorded on the RCMS and could be replayed anytime.

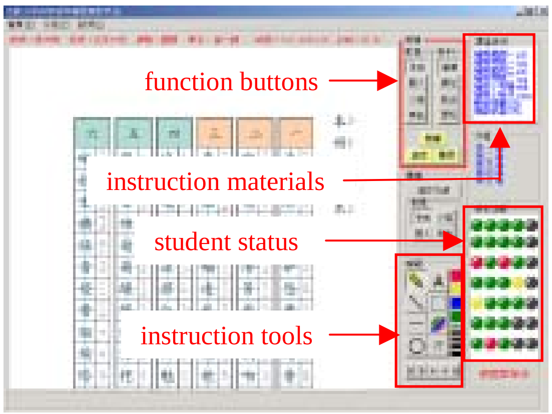

Figure 2. Interactive instruction control center support useful functions for instruction.

There is a learning status area located on the right lower corner of the IICC panel. The color signals in the area instantly reflect students' status that green stands for normality, yellow stands for lagging, black stands for abnormality, and red stands for help requesting. The instructor could respond to the requests when red signal turns on. As yellow signals shows on the panel more and more, the instructor should slow down his/her instruction pace. The learning status area is also an interface that instructor could pick a number and switch the IICC panel to the student's working frame. It is useful especially when individual practice carrying on. As the designated student's frame displayed on the IICC panel, teacher could make notes directly on the electronic whiteboard and all the notes would be saved on the RCMS together with the student's learning portfolio.

4.2. Interactive Learning Center for students

ILC is installed on the WDLA, which is a hand-written based wireless communication device. Basically, WDLA hardware is a WEBPAD with 10.4 inches TFT-LCD touch panel, build-in 802.11b wireless LAN card, and running Windows CE operating system. WDLA is the major device for students to learn, exercise, and participate activities. Therefore, multimedia capability and percussion protection are equipped as basic facilities.

In the ILC, there are six components, including shell, task controller, broadcast viewer, interactive assessment tools, freestyle drawing tools, and web browser. Figure 3 shows the system architecture of ILC. The shell is the interface between user and ILC. The web browser is embedded as content displaying component, which displays multimedia and web pages. Freestyle drawing tools support vector and raster tools to let students do their exercises and take notes. All the metadata they generate in the ILC would be recorded and send to the RCMS through ICS. Interactive assessment tools are the major assessment component to let students participating both synchronous and asynchronous formative evaluation activities in the classroom. The broadcast viewer coordinates with IICC to synchronously display instruction frame, URLs, and application programs broadcasting from IICC. Conversely, IICC could also catch the appointed ILC frame and broadcast to the rest of other ILC in the classroom.

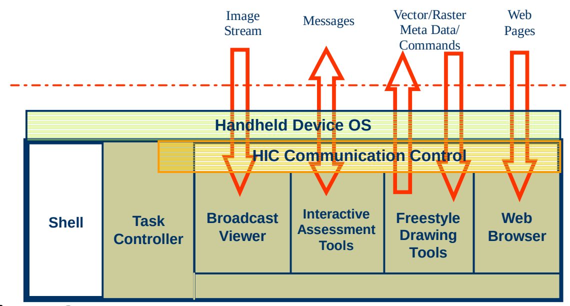

Figure 3. System architecture of interactive learning center for student.

To support highly interactive activities in the classroom, a design called HIC communication control keeps track all communication messages students made on the WDLA by performing ILC functions. All the recorded messages would be constantly transmitted to ICS and stored on the RCMS as individual portfolio. The HIC communication control also receives messages, image stream, commands, as well as instruction materials sent from IICC and dispatches to related component of ILC for further processing. As IICC sends a command that forces the ILC synchronously to display a designated frame or file content, the task controller would switch the system to corresponding component.

5. Highly Interactive Classroom Servers

The server side, including RCMS and ICS, of the HIC with WDLA handles resources and interactivities. RCMS stores instruction and learning resources as well as activities content. Furthermore, students' learning portfolios and teacher's instruction records are also stored on it. ICS keeps track of individual operations as well as coordinates the student-teacher and peer interaction. The separation of content and interaction services functions for load sharing and system extension consideration.

More than one classroom could share the same RCMS. However, the more students participate in classroom activities, the more interactions would be generated. Hence, each single classroom should equip an ICS in order to guarantee real time interaction.

5.1. Resource and Class Management Server

RCMS is the content and activity center in the classroom. All of the instruction materials should be arranged on it before class and could be used in class. After class, students could review in-class records the instructor made on the electronic whiteboard or do the exercises assigned by the instructor. The server provides essential tools, such as quiz authoring and instruction materials sequencing, for teacher to prepare course content. The well arranged instruction materials, including pictures, videos, audios, homepages, and presentation files, would be accessed by IICC. Furthermore, quiz would be consumed in or after class via ILC. Besides content and activities management, RCMS is the class member manager as well. The instructor sets up students' profiles, including names, class IDs, E-mail addresses, etc., in the RCMS. Students' records generated in classroom activities are stored on it. Each student could login to the server and review what he/she had done in class.

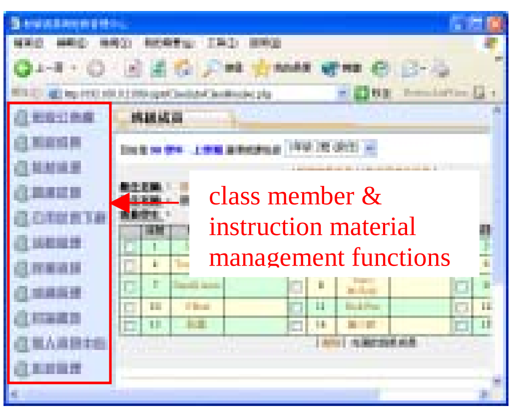

Figure 4. RCMS supports content and activities.

5.2. Interactive Classroom Server

ICS coordinates activities and contents during instruction no matter instructor's lecturing or individual student's practicing. ILC will automatically log in the ICS once WDLA boots up or carries into the classroom by a student. Successive operations of ILC will be under ICS monitoring. All the operations, such as drawing and clicking on WDLA, would be transformed to messages and commands. ICS parses messages and commands to perform corresponding functions. For instance, a student requests for a specific quiz on ILC, the requesting command will be sent to ICS. As ICS receiving the command, it tells RCMS the ILC ID and quiz name. The requested quiz would be transmitted to the ILC. After finishing the quiz, responses for each item would be automatically recorded on the student's portfolio. Figure 5 shows the role of ICS in the HIC.

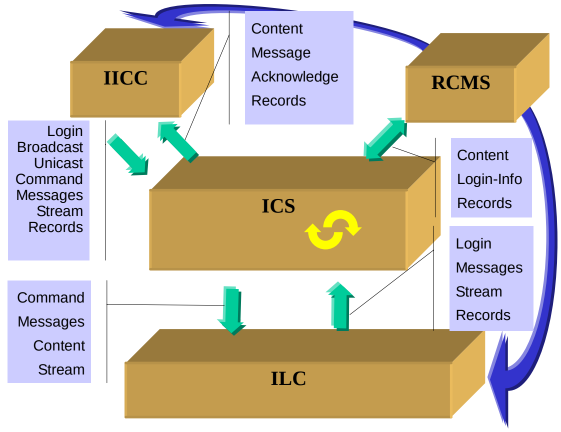

Figure 5. ICS is the coordinator of activities and content

Operations on the IICC are also under ICS governing. IICC requests instruction content to ICS and the requesting command will be sent to RCMS. After receiving the command, RCMS transmits the requested content to IICC directly. On the other hand, once the instructor activates the broadcast function, ICS negotiates with HIC communication control design of all ILC in the classroom and has them display the IICC instruction frame or record instruction operations on the RCMS.

The needed content of instruction and learning could be transmitted to IICC and ILCs directly or indirectly through ICS depends on the types of activities. Most broadcasting and uni-casting operations are centrally controlled by ICS. Therefore, content transmission should be through the medium of ICS indirectly. Otherwise, ICS processes commands, messages, and records only. Content should be directly transmitted from RCMS to IICC and ILCs. Overall, the present HIC design is a new attempt to integrate the four types of classroom interactivity described earlier, benefiting students from providing a number of instructional tools to enhance student-teacher and peer interaction and thus to effect students' learning.

6. Embedding Highly Interactive Learning Environment with Pedagogical Models

Among the four types of interaction mentioned earlier, each one has its limitations and thus reduces the capability to enhance instructor's teaching and students' learning. While the application of computer technologies to classrooms encourage students' involvement in the class, students' interaction via computers may loss something important, such as nonverbal cues or emotional tone. Moreover, traditional wired computer infrastructure has confined students to specific space such as classrooms or computer labs. In considering both the efficiency of personal interaction and usability and applicability of facilities, there is a better pedagogical and classroom design – to integrate wireless instructional devices into traditional appropriate pedagogical approaches. To explore how such integration can best effect students' learning, this study is going to conduct an experiment in Nan-Hu Elementary School in Taipei, Taiwan, applying the JigsawⅡModel to the HIC learning environment with WDLA. Cooperative learning is highlighted here because it promotes positive interdependence, verbal, face-to-face interaction, and social skills. [14]

The JigsawⅡModel is used when students are assigned narrative materials to read and listen. Its central idea is to give each team a unique topic to learn together and each team member a subtopic, instead of having all teams study the same material. This instruction method consists of five steps described as following: [14]

Step 1 – Introduce Jigsaw Ⅱ. The instructor provides a short explanation regarding the process of the JigsawⅡ and its function. If necessary, the instructor can present pre-authored contents, such as PowerPoint files or web pages, which are retrieved from the RCMS. The selected contents on specific frames will be broadcasted to all students, multi-casted to assigned group members, or uni-casted to an assigned individual student in the classroom under the ICS coordination. The Web Browser is embedded in the ILC as a content displaying component, which supports the display of multimedia and web pages. The Broadcast Viewer in the ILC coordinates with the IICC to synchronously display instruction frames, URLs, and application programs broadcasted from IICC. Meanwhile, individual students can obtain information from their own WDLA.

Step 2 – Assign Heterogeneously Grouped Students to Study Teams. The instructor assigns students to heterogeneously grouped teams and determines team membership by numbering the students from one to the expected number of groups and putting students with group one, group two, and so on. After the teams are assembled, each team member reads the specific text chapter, assisting each other in reading as necessary. During the process of reading and discussion, individual students can take notes or do their exercises on their own WDLA with the support of Freestyle Drawing Tools in the ILC. Team members can show their notes to other members to assist in understanding specific reading materials.

Step 3 – Assemble Expert Groups. After completing the reading, each student in a study team is assigned an expert topic. When team members find some questions regarding their topics, they can search for online information with their WDLA. After having a clear understanding of their own topic, team members can exchange their notes and share individual perspectives face-to-face. Meanwhile, they need to plan teaching strategies for presenting the information to other members in the class for the next step.

Step 4 – Experts Teach Their Study Teams. After exchanging individual understandings, study teams are resembled and each member in a group is reassigned to different group. When reassembled teams are formed, the experts teach their topics in turn. To enhance other members' learning, the experts can use their WDLA to transmit their information in the form of PowerPoint files, web pages, and multimedia, or poses questions, which are immediately shown on other members' WDLA with the support of Broadcast Viewer in the ILC. Spontaneously, other members can also answer the question or provide their opinions with their own WDLA.

Step 5 – Evaluate and Provide Team Recognition. On completion of JigsawⅡ, every student is asked to take self-evaluation and peer-evaluation in order to identify what must be retaught, to assign grades, and to calculate team grades. With the support of Interactive Assessment Tools in the ILC, students are allowed to participate either synchronous or asynchronous formative evaluation activities. Members in each group can employ the electronic whiteboard to display their achievement of group and individual work. Meanwhile, members in other groups can use their own WDLA to grade assigned presentation. The score of each group as well as the whole learning portfolio during the process of the JigsawⅡ instruction are completely recorded and reserved in the RCMS for further processing.

In sum, the highly interactive learning environment design coupled with the Jigsaw Ⅱ aims at facilitating students' active learning by supporting and promoting any type of interaction as necessary, and further ensuring that expertise is distributed across the members of the classroom. Everyone in the classroom, including instructor and students, could be an expert responsible for sharing his/her expertise with others. Students in such learning environments are capable of complex and deep thinking.

7. Conclusion

Recently, there are a number of ongoing research projects that focus on the pedagogical effect of wireless instructional devices. However, few studies explore the difference between wired and wireless educational technology and the significance of the wireless educational technology. As such, the present study attempts to explore how advanced computer technology, including computers, Internet access, and wireless digital learning devices, affect the instruction and learning processes, particularly the interaction between members in the classroom.

Gay et al provided an insightful interpretation to the effect of wireless technology: "learning activities are complex systems of interactions, and the benefits of ubiquity and mobility [of wireless technology] can easily be lost if that complexity is not appreciated and understood." [4] Indeed, despite that the introduction of new educational technology, such as GPSS, ITS, and CSCL, has potentially transformed instruction and learning in terms of the interaction between members in the classroom, there are still many challenges faced by educators and researchers. New types of new educational technology as well as the interaction models they have presented have different limitations. For instance, computer-assisted instruction and the human-computer interaction it represents cannot allow students to interact with their peers. Computer-mediated interaction cannot allow every student to respond to the instructor at the same time. In an effort to eliminate the limitations and provide the most effective way to promote the interaction between members in the classroom, this study presents an alternative pedagogical and classroom design to demonstrate to interpret the powerful use of integrating wireless instructional design and a traditional cooperative learning approach. This particular design integrates the advantages of the four types of interaction depicted above and thus can benefit students by allowing them to experience real-time or anytime learning and to interact with each other either in the virtual classroom (in the Internet) or physical classroom (face-to-face).

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