From the Traditional Classroom to the ICT-based Geography Lab: The Growth of a Junior High School’s Geography Teaching (TW006)

Taiwan

Part I: Innovation Description

A. Descriptive background information

Gen-Kuo Junior High School is at a medium-sized city in a suburban county near Taipei. It has a student population of 1800 spread over grades 7, 8, and 9. The technology-enhanced innovation was formally initiated by a geography teacher in 1998. But the informal trial to infuse technology into her teaching has been undergone for many years before 1998. Her commitment to teaching had garner support from Ministry of Education and from local technology coordinators to create an unique ICT-supported geography teaching lab for her daily teaching. In that specific lab she grouped students into eight groups, each group has four students, and each group has one Internet-connected multimedia computer. Her teaching materials were prepared using PowerPoint and web pages. She constructed her own web site to support students’ activities. At the time of this case study, eleven classes (grades 7, 8, and 9), with more than three hundred students, used that lab. Students’ reactions toward her teaching are highly favorable. They thought her teaching is motivational, interesting, and unique.

B. Summary of the Innovation

The innovation is not mature until 1998 when the Ministry of Education granted her the necessary hardware (computers, network, broadcasting system, LCD projector, printer, scanner) and the local authority and the school also supported other required resources. She integrated her originally creative teaching with the strength of technology to move her teaching to the student-centered and the thinking-oriented level. The goals of the innovation were to motivate students to learn geography by using technology as mind tools and to help the teacher change teaching style.

There are several significant characteristics of the innovation. Firstly, the whole hardware infrastructure of geography teaching was changed. An Internet-connected and multimedia-enriched geography teaching lab was set up. This lab might be the first one in Taiwan’s junior high schools. Secondly, the case teacher modified her teaching styles significantly. Group projects, activity sheets, online activities, and other student-oriented activities were used. These kinds of learning activities were not commonly implemented in the past. Thirdly, students favored the ICT-based innovative teaching. They said they leaned many things from attending the geography
classes. Internet skills, computer skills, cooperative attitudes, and geographical knowledge were embedded in the geography classes. And fourthly, a teacher’s beliefs about technology integration changed the whole teaching reality. She has been working on the track of using technology to support her teaching for many years before 1998. She had frustrations in the exploration of applying ICT into her classes. But her persistent beliefs about technology integration and her performance in sophisticatedly applying ICT in her teaching finally induced the grants from the government and open the new opportunity to explore more innovative ways of technology integration.

The lab was dedicatedly used by the case teacher to teach geography classes for 7, 8, and 9 graders. She collected unit-related materials from Internet or printed resources, organized them, and posted them onto her own web site. Students were asked to finish their group or individual activity sheet during the class time. Most assessment items were posted on the web site for students’ reference. Her lab was supported by a server-controlled broadcasting system and a LCD projector. She had eleven classes at the time of this case study. Each class has two-hour geography lessons per week, so she had twenty-two teaching hours per week. All teaching was carried out in that unique lab.

Part II: Analysis

A. Meso-level context of the innovation

A1. School background
Gen-Kuo Junior High School has grade levels of 7, 8, and 9. It is a county-supported public school with one thousand and eight hundred students. It is located at a developing city in the north part of Taiwan and about 30 kilometers away from Taipei city.

A2. School culture
The junior high school system of Taiwan is under the pressure due to two newly announced policies. The fist one is the new nine-year curriculum policy for elementary and junior high schools (grade levels 1-9). Under this new curriculum, formerly independent subjects were integrated into seven learning areas (Languages, Mathematics, Science and Technology, Arts and Humanities, Heath and Physical Education, Social Studies, and General Issues). Teachers were forced to adjust to teach in the new learning areas. Schools were asked to design their own school-based
curriculum by using interdisciplinary themes. The new curriculum also requires ICT competency cultivation to be embedded into all learning areas.

The second one is the cancellation of the joint high school entrance exam. Junior high students now can apply to attend their favor high schools. Exam-led junior high schools’ teaching was a norm in the past. This policy tries to break the knowledge-test-dominated phenomenon and to move the school teaching toward more open and creative directions.

In the current stage of policy changes, schools were also asked to help students build up high-level thinking and creativity. The vision of teaching at the case school is moving from teacher-dominated knowledge transmission to student-oriented meaningful learning, although the pace is still slow. Currently, the teachers’ beliefs or visions about teaching are still quite diversified. It is in the stage of transition.

The case school had good reputation in technology applications. The county’s technology center for junior high schools is located in that school. Its innovation toward technology has been highly regarded for the past years.

The former principal was famous for his support of technology integration. The current principal is in a position of neutrality. But he does show preference to technology integration in his talk about ICT.

In the case school, teachers had the concepts of integrating technology into their teaching, but they found the hardware infrastructure for their classrooms not being ready. And they are not well prepared. At the present time, the integration of innovation into school culture is rare. Teachers are still working independently.

Many teacher professional development programs were held in and out of schools. Technology integration was the priority policy in the Ministry of Education. Therefore budgets were allotted to county’s professional development programs. Since the case school is the hub to the Internet of the county, there were many ICT-related teacher programs in each academic year.

The superintendent’s attitude toward technology integration is the key to upgrading the county’s technology innovation. For the past years, the county had problems in dealing with the technology grants that came from the Ministry of Education. At this moment, a new superintendent was assigned. Teachers are hoping that he will support
the technology integration program.

**A3. ICT in school and beyond**
Principal, technology coordinators, and teachers were aware of the necessity of infusing ICT into school. But the vision of why and how should ICT be integrated into practical teaching is still not clear in teachers’ minds. The case school has several experienced technology coordinators. They are the persons who have the clearer vision about technology innovation.

The case teacher was quite a unique case. She worked with the technology coordinators. But she seldom worked with other teachers. She has done a great job. But her impact on other teachers was minimal. The use of ICT in school was not popular.

There were 184 multimedia and Internet-ready PC for students in the school. Students can also access the scanners and the color printers. There were also some PCs in several teachers’ offices.

The Ministry of Education is the most influential authority in the movement of technology innovation. It financed almost all the hardware and the software in each school.

**A4. ICT support structure in the school**
The case school has 184 full-loaded multimedia and Internet-ready PCs in the computer labs. The geography teaching lab has 8 multimedia and Internet-connected PCs, color scanners, color printers, broadcasting system, and LCD projector. For the convenience of getting technical supports from technology coordinators, the ICT-based teaching lab was placed next to the school technology center (it is also the county’s technology coordinating center for junior high schools).

The case school has four full time technical specialists. The case teacher worked satisfactorily with the technical specialists. The technical specialists are responsible to hold ICT-related teacher training programs for the whole county’s junior high schools. In the past, technical training was the main part of the training. Currently, technology integration has become the main focus. FrontPage was taught to help teachers understand the development of instructional web pages. Integration cases were demonstrated to make teachers aware of the benefits of technology integration. The case school usually holds 4 or 5 ICT-related training programs during an academic
Other teachers in the case school mentioned that they also would like to try the similar technology-supported teaching if they could have the similar lab as the case teacher. This opinion reflected the hardware infrastructure is not ready for a school-wide implementation of technology-based innovations.

B. Macro-level context of the innovation

B1. National and state/provincial policies
Several ICT-related national policies affected the innovation. The ICT National Infrastructure for Education policy provided the necessary hardware and software for all K-12 schools. The National Educational Resource Center program created a content base for teachers and teaching. The Internet to Schools program linked every school to the Internet. And currently the central government is planning the Blueprint for Information Education. It tries to push the technology integration as a normal teaching activity.

Teacher’s ICT competency test is implemented in several counties in 2001. Teachers are required to pass the designated test. And the test outcome of each school will affect its ICT-related budget appropriation.

In addition to the ICT-related policies, the Nine-year New Curriculum for compulsory education declared that technology should be integrated into every learning areas and subjects. This new national curriculum policy will definitely change the direction of technology integration.

C. Thematic analysis of the innovation

C1. Curriculum content, goals and assessment
For the past three years, the case teacher has developed many ICT-related innovative teaching materials and related learning activities. Her innovation focuses on Geography. Many lesson units were integrated with technology.

Before starting a unit, the case teacher will collect related printed materials, scan the instructionally necessary maps, pictures or graphics, and posted them onto her teaching web site. She browsed the Internet to find the related resources, and posted them onto the web site. In addition to the web site materials, she will prepare her own
teaching presentations by the PowerPoint software. Learning activity sheets were also prepared.

During the unit teaching, she presented the teaching materials with LCD projector, and controlled the students’ display monitors by broadcasting system. For helping students see the map clearly, she will broadcast the map to students’ monitor screens. (this method is better than the use of traditional map that was hanged in front of the class). During the activity time, students usually have to go online to search information to finish the designated learning tasks.

She clustered students into eight groups. Each group has four students and one computer. Groups were classified by students’ knowledge proficiency. Each group contains both higher and lower proficient students.

As described by the case teacher, the goals of her setting up the geography teaching lab and her geography teaching were:

- To help students learn geography happily
- To cultivate the capability of cooperating with others
- To promote problem solving proficiency via learning activity

The case teacher has noticed the importance of high-level thinking.

In the traditional classroom, no teaching and learning tools were provided in addition to the blackboard and textbooks. In the dedicated geography lab, the case teacher has a variety of tools to help her prepare and execute the teaching plan. The ICT-supported environment help changed the teaching context and strategies. Students were motivated. The content was enriched. Many new learning were embedded into the lab-supported learning. As some of her students said:

I felt sleepy while I was in the ordinary classroom, but I was motivated here in the lab.

I didn’t learn how to operate a computer before. Here I learned those operations. That was great.

The case teacher was trapped involuntarily by the traditional assessment system that is paper-dominated. She is trying to overcome this problem, such as giving credits to projects, question-asking, activity sheets. Test has a long history in Chinese culture. The case teacher still has not figured out how to match her assessment strategies to her innovative teaching goals. The case teacher mentioned that her students sometimes had lower scores in the paper and knowledge-dominated tests. And these lower scores sometimes would activate additional problems, such as parents’
challenge of the new ICT-supported teaching strategy.

**C2. Teacher practices and outcomes**

The case teacher did many things for her teaching. Without passionate commitment, she could not have done that. She searches for information, organizes them, and transforms them into PowerPoint presentation and web pages. She prepares the activity sheets for students’ doing their work on the lab. For example, for motivating students to know North American, the case teacher used NBA as the motivator. She asked students to identify the locations of NBA teams, to know the NBA divisions, to find the MVPs on each team, and to explain why players enter the NBA. Students loved the project.

For carrying out the teaching activities and related procedures in the lab, a teacher should possess the following competency:

- **Technology competency**: the teacher should know how to operate broadcasting system, LCD projector, Presentation software (PowerPoint), web page development tools (such as FrontPage, Deamweaver), browsers (Internet Explorer, Netscape), e-mail software (Outlook Express or others), scanner, printer, and graphics software. Server maintenance, network management, Internet connection, and other hardware issues should be handled by technology coordinators.

- **Pedagogical competency**: the teacher should change the test-preparation and knowledge-dominated teaching mind-sets into the learner-centered and project-based ones. As the case teacher pointed out: “I made mistakes in operating computer in front of my students, and I asked for their helps. I felt great that I demonstrated the reciprocal growth between the students and the teacher. Students appreciated my attitude.”

- **Personal commitment**: the teacher should commit to the ICT-related chores. There are so many things to be finished before starting a new lesson unit. Without dedicated commitment, a teacher might wonder why should she or he do this kind of extra job. (Note: every junior high school teacher gets the same annual salary in Taiwan).

The case teacher was strict in classroom discipline. Students were not allowed to use the computer if they had disruptive behaviors. But she also is quite open in letting students search the Internet resources to complete their activity sheet.

She usually taught the unit at the beginning using PowerPoint presentation and LCD
projector. The students’ monitors were locked by the broadcasting system during the teacher’s presentation period. While a map was necessary to help students understand concepts, maps were delivered through the broadcasting system to students’ monitors. She operated the LCD projector and the broadcasting system smoothly. Sometimes she played video on a TV (the lab has a TV set) to help students get more information into their mind schemata.

There were the group activities after the teacher’s presentation. Each group had to complete the activity sheet designed by the case teacher. One of the touching class stories was: “there was a lower capable student in a group. Group members found a way to let him participate in the group activities. They asked that student to do the keyboarding task. Other members recited the words slowly to let that student type the answers into the sheet. Although the process was slow, other members still encouraged that student to finish the job. They revealed the spirit of cooperation and consideration.” (Note: the case teacher required each group being composed of both higher and lower capable students). The case teacher watched each group progresses during the activity sheet period.

In this case, the case teacher demonstrated that she was a material searcher, an organizer, a designer, a presenter, a guide, a lab administrator, and a motivator. She played several roles that the traditional classroom teacher didn’t play. The ICT played important role in facilitating the role-change of a teacher.

The interactions between the case teacher and the students were quite good. Students loved the geography classes. Sometimes they posted message on the web site to show their favorite toward the geography classes.

The case teacher is a veteran with twenty-years of teaching experience. She was famous for her unique teaching style during the non-ICT years. It was her teaching creativity that guided her to find out the opportunities provided by the ICT.

After the setup of ICT-supported geography teaching lab, the case teacher asked the business sectors to provide some materials (especially maps) for her teaching. She established some connections with the out-of-school institutes. Her teaching was broadcasted by a national TV program.

The case teacher was invited by the governmental organizations to demonstrate her ICT-supported teaching to other teachers every year since 1998. She was invited as
one of the national members to promote the integration of network into classroom in 2001.

It is obvious that ICT already become the personal tool of the case teacher. Her teaching has integrated the ICT.

**C3. Student practices and outcomes**

The main student activity was the project designated by the case teacher. Usually projects were completed by finishing the activity sheets. Each group had to use the search engines, such as Yahoo and Google, to find related information.

Student presentation and discussion of their projects were not common due to the time constraint. (Note: only two periods per week allotted to geography teaching, 45 minutes per period). After class projects were also uncommon. The students told that only one half of their classmates had home computers. And the ratio of home connection to the Internet was lower that one half. In Taipei city, the ratio of students’ home computer and its Internet connection was more than eighty percent. The digital divide phenomenon does exist.

This case showed the possibility of embedding ICT competency into subject-based teaching and learning. Students mentioned that they learned how to operate technology through the geography classes. The skills they learned from the ICT-supported lab are transferable to other contexts.

Sometimes students’ paper test scores were a little bit lower than those non-ICT classes. (Note: junior high school students have to go through three centralized exams per semester. Each student has to take the same test on each subject). No higher-level thinking skills were verified. According to the case teacher’s talk, she mentioned that her students were more active in asking, reflecting, and challenging questions. And she believed that those capabilities were quite important for her students’ career life.

As one of the students said: “some questions on the activity sheet had to be solved by the group effort. They were too much loading for one student to work it independently. So we shared the responsibility and divided our labors.” This kind of sharing and cooperating was one of the characteristics of the lab class.

**C4. Kinds of technology and ways they are used**

Technology used includes a web site, a teacher server, a broadcasting system, a LCD
projector, color printers, scanners, Internet connection devices, a TV set, a projector screen, presentation software, web page development software, graphics software, word processing software, e-mail software, and digital camera. The consuming materials and related expenses were covered by the budget of the technology center. The ICT-supported geography teaching lab was created by the teaching requirements of the case teacher. Therefore the lab is well equipped for geography teaching.

**C5. Problems and solutions related to the innovation**

After many years’ personal effort, the case teacher finally garners the support and established her own subject-specific ICT lab. It is a lab created by a subject teacher. It is teacher-needs guided lab. Her teaching and her lab demonstrated one of the best models using the existing technology. She obtained the reputation she deserved. But some barriers do exist.

Barrier #1: *The lab is only used by the case teacher only.*

Other teachers indicated that they would also like to have a similar lab or to share the lab. But it is apparent that their expectations would not come true in the near future.

Barrier #2: *The county education authority does not have clear vision of technology integration.*

Technology integration is a new educational movement in Taiwan. On the central government level, vision for technology integration is quite concrete. But on the local level, the vision is still fussy.

Barrier #3: *The case teacher’s frustration*

The administrator in the Ministry of Education who was in charge of the technology integration policy for several years showed us an e-mail she responded to the case teacher’s e-mail. On those e-mails we found the frustration of the case teacher. Her frustrations came from working alone and had to deal with many chores by herself. We think some of those frustrations are still there.

These barriers indicated that “context” is one of the most influential factors in the process of technology innovation. Without proper context, teacher’s personal effort might not sustain.

**C6. Sustainability**

On the national level, technology integration is already a national policy. National budget was allotted to it. Therefore it is sure the technology integration movement will sustain. And this national policy will definitely give our case teacher an opportunity to have budget and to sustain her ICT-supported teaching lab. The goals
of integration are already stated on several governmental documents. So the goals are not fussy any more. Teachers are getting more information about technology integration.

Other teachers’ attitudes toward innovation are not clear. We do not have survey data to depict teachers’ attitudes. Basing our judgment on our contacts with junior high schools, we felt the Nine-Year New Curriculum, which requires schools to integrate technology, is driving the teachers to know more about integration. The case school is not exceptional.

On the local level (county level), factors are more complicated. The depressed local educational budget, the tension among local government, principals, and teachers, and the social economic status of parents attribute impact factors into the possibility of sustainability.

This case is one of the best models in Taiwan at current stage. It is also a more expensive model. This model is definitely a good model for a richer community. For the poorer ones, they have to find other alternatives.

**C7. Transferability**

The case teacher was invited by the ministry of Education to disseminate her experience to teachers at other counties since 1998. Her strategy has been recognized nationally. Her case is truly transferable to other school districts.

Teachers at the case schools also pointed out that they have little difficulties in implementing similar integration if hardware and software were ready. It seems the teachers there are confident of doing similar projects.

As we mentioned somewhere in this case report, Taiwan’s education is still quite centralized. The most powerful influence comes from the Ministry of Education. Since the technology integration is already a national policy, it is believed that technology integration will flourish from now on.
Appendix
1. The Picture of the ICT-supported Geography Teaching Lab

2. The Picture of Students’ Class Activity