

OECD/CERI ICT PROGRAMME

**Case Study of ICT and School Reform
at Banghwa Elementary School,
Seoul, Korea**

July 31, 2001

Jaeshin Song, Principle Investigator

Ju Yeon Lee, Co-Principle Investigator

**Soo Jung Jang, Ph.D. Co-Principle
Investigator**

Mi Lee Ahn, Ph.D. Co-Principle Investigator, Hanyang University

Korea Education & Research Information Service

Seoul, Republic of Korea

Table of Contents

1. Overview

1. Past: Initial Development and Application of the ICT

1. Present: Current Application of the ICT

1. Main Hypothesis of ICT Application

1. Future Prospect of the ICT

Appendix A: Research Methods

Appendix B: Teachers ICT Practices Survey Figures and Charts

Appendix C: Other Research Related Material Index

1. Overview

Fifth grade Social Science class. An inquiry-based learning activity with the topic of characteristics of industrial development is going on. The teacher asked students about learning objectives and how they would go about searching information. The class was divided into several groups. For each group, everyone contributed information, which was organized and synthesized with that of others to prepare a PowerPoint presentation. What information groups lacked, they got on the Internet and searched for it. Once the groups were ready, they presented their multimedia programs to other group members who compared the information with their own. (From a class observation).

I was somewhat disappointed when I first sent my kid to this [Banghwa] school. Although the school was not up to par with other schools in the area, I didn't have a choice since I lived nearby. However, I feel that a lot has changed since the integration of the ICT system. Now, I am satisfied with my kid attending this school. (From an interview with a parent of a fifth grader).

The Banghwa Elementary School is located at the outskirts of the Seoul city in a disadvantaged area. Many students come from the families that live in government subsidized apartments and/or in houses that are facing financial hardships. Since the International Monetary Fund (IMF) economic crisis in 1997, many more students have requested to be on the free lunch program. Now, things have changed drastically with the

integration of the ICT system, and the students have gotten used to the technology-oriented classes compared to students in other schools. The school has enthusiastically integrated ICT and is well on its way in achieving the school reform.

When a visitor enters the school through the main gate, one will face somewhat run-down buildings and dark hallways. However, one will be somewhat surprised to find personalized multimedia systems in the Computer Education Lab located right next to the faculty office. Forty state-of-the-art computers, a beam projector, a projection TV, and a screen were laid out in an efficient manner. Some Students have an after-school session in the lab. They were practicing the keyboard skills, some playing games, and others surfing the Internet. A small multimedia work area was clearly visible through the glass wall at the corner of the lab.

An open-learning classroom was located right across the hallway from the computer lab. This classroom was generally used for 3rd and 4th graders for group study. Each PC in the lab is used for groups of 6 students for surfing the Internet to gather information and for writing reports. A drastically different, in design, classrooms for 5th and 6th graders were located on the third and fourth floor of the building. These classrooms have blackboards on all sides, various bulletin boards, a schedule calendar, a supply closet, a large projection TV, and PC s for each three-desk cluster for six-student groups. The ICT was readily available to use in these classrooms.

Overall, as the entire nation recognizes the importance of integrating technology into schools, Banghwa school seemed to be one-step ahead of other schools that are just at the stage of investing funds into acquiring hardware equipment.

An opportunity for reform at Banghwa began when it received 5,000,000,000 Korea Won (approximately \$500,000) from the government for merging Ohgok Elementary School in 1999. When the school got funding, the school faced with a decision of how to best spend the money; and after discussing with the teachers and the parents, it decided to invest money into integrating the ICT and its necessary infrastructure. Also, the school voluntarily placed itself as a model school to get more government funds so it will be able to integrate better infrastructure.

The increased investment not only improved the classroom learning environment but also the school-wide reform efforts. One of the special characteristics at the school was that the two efforts were seen by the stakeholders, administrators, teachers, students, and parents as the same since the integration of the technology and the school reform started at the same time with the merger funds. The meaning of reform at the surface level was to integrate the ICT to provide standardized education for the students. At the domestic level, the meaning of the reform was to provide students with the technological skills that are necessary in the Digital Age.

Since the need for improvement in education and the integration of technology were high, the school reform and the integration of the ICT made a big step. The stakeholders started faced the circumstantial problems that arose in the reform efforts. The teachers were faced with the practical training and adoption of the system. Overall, the teachers changed the system quickly, thus the first and final adopters were getting out-of-date. The main reasons that the integration took place so fast among the teachers were due to the external pressure on the school and the teachers when the school became a model school and the infrastructure of the classrooms promoted group activities. Also, there was no apparent resistance in adopting the system although there were some at the preparation stage of developing group activity infrastructure as well as when the school volunteered to become a model school. However, with the majority of stakeholders hoping for reform, either the resistance or the opposition was minimized or ignored, especially by the administrators and the media specialists. Most teachers considered that their students would achieve higher academic ability through school innovation, and that their roles and responsibilities in the integration efforts were crucial. They recognized the pros and cons of classrooms with the ICT applications, and had pride in applying them.

For students, they felt the drastic changes taking place in the learning environments both at school and home.

With the ICT applications in the classrooms, the thirst for learning with technology was quenched, and, at home, more families were buying computers for their children. Naturally, as the access to computer increased, so did their abilities in using them. The students preferred the learning with the technology over the instructor-led directed learning. As a result of using the technology in the classrooms, the students' pride in the school increased dramatically.

The parents recognized the integration of the ICT as a major development. They are getting interested in the integration of the ICT at school and in their children's education. The school Board of Directors also showed interest and expanded its roles and activities. The stakeholders' expectation of the school was increased, as the evaluation of the teachers and the administrators was improved.

The integration of the ICT has other educational effects besides the improvement of teaching-learning environment. For example, the digitalization, development, and application of the student records database in counseling. Another example would be the development of the digital library, currently at the preparation stage, to improve children's reading ability.

As can be seen, in the case of the Banghwa Elementary School, the concept of the reform and the integration of the ICT has the same goal that is to improve education. All stakeholders will benefit from the changes.

2. Past: Initial Development and Application of the ICT

As mentioned earlier, the initial seed for the reform of the school was planted when the government provided funds for merging another elementary school. The teachers already had the desire to reform the school, which was in dire need. The result of the school-wide survey indicated that Banghwa School needed reform more than other schools. The students' basic skills level was lower than students in other schools. They were in lack of motivation, and self-study and/or explorative skills. They needed improvement in their basic skills through the extracurricular activities during after-school hours or from other diverse experiences. They didn't get any private lessons due to financial difficulties of their parents. The school needed remodeling, such as new heating and cooling system, and the staff welfare needed improvement. The faculty office had two computers, only one of which had an access to the Internet through a modem. With the current situation in the school, and lack of parents' involvement and interest in their children's education, the school was in a difficult position to achieve reform by itself.

With the current problems that were implicated from the survey, a few senior teachers got together, and ideas to integrate the ICT was discussed and fully supported. The need for the integration of the ICT was realized by most teachers. When the system was implemented the teachers were faced with the system for the first time during their mandatory sessions. Although the challenges in learning the basic skills and opening their classroom observation for others were not easy, especially when they did not have a choice, all teachers simultaneously and successfully adopted the system.

So far, most administrators and the media specialists believe that the reform at Banghwa is a success due to: 1) most teachers felt the need for a reform; 2) the government fund provided necessary money; and 3) efficient teacher development and training programs to improve the quality of instruction. However, there were other obstacles and/or resistance that had to be overcome. For the administrators, hiring supportive personnel was a problem. For the teachers, the following problems had to overcome: 1) increase workload from the infrastructure installation and computer systems including maintenance of the computers and upgrading; 2) low level of system utilization; 3) conflict between the teachers who had the ability to use the electronic communication device vs. the teachers who don't know it; 4) stress from opening the classrooms for peer observation and increased workload for being a model school; and 5) inconsistency between the ICT training and its applications in classrooms.

Staff training issues were overcome with the school-wide individual training. Some teachers who advocated and helped others in the use of the ICT as a tool also reduced the workload from the teachers. And, the desire

to improve teaching, the stress over getting behind the technological changes in the society, and the general atmosphere of the school motivated each teacher to overcome the resistance of using and other problems that were generated from the integration of the ICT.

3. Present: Current Application of the ICT

There are 170 Web-capable computers that were connected to a main and switching hubs. They are then connected to the Internet via high-speed national E1 network. As of now, firewall server and the comprehensive student database are at the final stages of development. The local area network (LAN) is completed allowing more systematic use of the technology in the classrooms and in other special operations.

The ICT can be applied in seven different learning situations:

1) As regular classrooms these classrooms for grades 1st through 4th are used to showcase model classrooms or for presentation. Each classroom has a projector in the center, a 8-nodes Internet connector, a VTR, a cassette player, a computer, an overhead projector (OHP), a printer, a teacher s workstation, and a supply closet.

2) As Internet classrooms these classrooms for 5th and 6th grades are called the Internet Classrooms because students can access the Internet for information search and for other modular activities during the class. Each classroom has a projector, a 8-nodes Internet, a VTR, an OHP, a cassette player, seven computers (one for each 6-person group), a printer, and a teacher s workstation. These equipment in the classroom allow students to access computers throughout the school days.

3) As multimedia classrooms these classrooms allow Internet search, word processing, and other software training as a part of regular class activities. During the after-school hours, the classroom is being used for Mom s Computer Class in which parents are trained in the use of technology, or as after-school extracurricular activity classroom for faculty training. Each classroom has 40 multimedia computers, a LCD panel, a projector, a printer, a scanner, a Nepia, a screen, and three teacher stations all of which are connected via the LAN to the Edunet.

4) As open-learning classrooms these classrooms for 3rd and 4th grades are used for inquiry-based Sociology classes. The open-learning classroom has six computers, two teacher s workstations, seven desks for modular activities, a projector, a printer, and a Nepia.

5) As Information Development classrooms these classrooms are used for developing multimedia instructional materials, for sharing information with peers via electronic communication devices, and for developing and using the student databases.

6) As a digital library although it is still in the development stage and is not being used actively, the plan is to allow 4th graders to use the classroom during the after-school hours.

7) As cyber-counseling classrooms these classrooms in conjunction with a comprehensive student database are used for counseling problematic students who need more attention and guidance. However, due to lack of personnel in counseling area, it is yet to be used actively. The plan is to use parent volunteers to operate the counseling room.

In order to achieve the goal of integrating the ICT system, the school needs to get more support to overcome the following:

1. **Technical expertise problem:** Immediate hiring of technical experts is needed to maintain hardware and electronic communication problems, maintaining systems, and other technical problems that were the main sources of teacher stresses, frustration, and workload.
2. **Financial problems to purchase or maintain equipment:** Current level of hardware and other physical equipment are satisfactory for now, however, with new technology everyday more funds are needed.
3. **Problem with providing software and other teaching-learning materials:** More software is needed to use with the ICT in other subject areas besides the Sociology classes. Financing development of the teaching-learning materials including subscription fees to the Web sites are needed. Also, purchase of supplies and materials for developing instructional materials are needed.

4. **Problem in system securities:** Even during the survey and observation for this study, the Internet went down a few times, so teachers could not conduct the class activities as scheduled.

In order for the ICT to be used more effectively in the classrooms, the teachers' ability to use ICT is very important. According to the Teachers' ICT Use Activities Survey, the teachers' computer usage abilities were: document production (73%), Internet use (76%), exchanging emails (70%), presentation (53%), drawing and chart making (36%), Web page development (36%), database application (43%), database development (20%), and other activities. The computer activities that the students spend the most time are searching for information, word processing, and presentations. The survey showed that over 90% teachers felt that they had good computer skills. However, the survey indicated that the teachers did not use as much of bulletin boards, discussion forums, and other technological tools that are relatively easy to use, but are effective in online communications.

The use of computers in the areas that required higher technical skills, such as graphic programs, database, spreadsheet, the utilization rate was even lower. This indicates that the teachers are not using the system at its optimal utilization to improve the teaching and learning. Instead, the teachers are using the system merely for collecting and organizing information and copying and pasting information in a word processor or for a presentation. This indicates that the system is not being used to organize information, to self-critique and/or evaluate information, and to synthesize their own ideas and opinions in an indirect way. In another words, the systems need to be used to develop higher thinking skills. The main reasons for the lack of the system usage in higher thinking skills are: 1) the system implementation is relatively new; 2) the teachers' technical skills gained is only based on the training that were provided; and 3) more time is needed for teachers to accumulate skills that would utilize the system more effectively and efficiently.

4. Main Hypothesis of the ICT Application

The purpose of this study was to find the information in the following: 1) the relationship between school reform and the ICT system; 2) to articulate the conditions that are needed for the ICT to work as a catalyst in school reform; 3) to articulate the necessary supporting resources that are needed to effectively use the ICT system to reform; and 4) to articulate, if any, the negative aspects of using the ICT in learning as well as optimization of the school function. In order to achieve the purposes of the study, the following five hypotheses and opposing hypotheses are presented and articulated to either support or reject it.

A. Hypothesis: Technology, including the Internet is a strong catalyst to reform and improve education. The opposing hypothesis is, The true improvement is found in schools which uses the technology as a supplement to their materials, not as a catalyst; and, improvement is achieved when technology is applied in a specific educational problems.

In the case of Banghwa Elementary School, the reform meant providing the students who didn't have access to the technology either at home or at school, the technological abilities to keep up with the changes that are taking place in the society. As mentioned earlier, the school was one of the typical, run-down schools in the suburban Seoul. There were many at-risk students whose teachers had difficulties in dealing with them. The school also needed to change its image to somewhat promising than what it was. The need to change its image was one of the driving reasons why the school chose to integrate the ICT system as a part of the reform (from an interview with a media specialist).

At Banghwa School, both the school reform and the integration of the ICT were developed simultaneously. For this reason, all stakeholders accept the concept of reform as the same as integration of the ICT system. The school needed improvements in all aspects of the school. In particular, the school's problem in the integration of the technology and the ability to apply it was much inferior to other schools. Most teachers felt that it was important that the students learn the necessary technological skills, and that the school should be the one to provide the skill. Thus, in a way, the decision to spend the matching funds was a simple one. The money was

spent in integrating technology, and the ICT became a catalyst in counseling students, digitalization of the library, improvement in teaching-learning methods, and other general areas in the school. Therefore, in the case of Banghwa School, the hypothesis that the technology, including the Internet is a strong catalyst to reform and improve education was accepted.

B. Hypothesis: The proliferation of the reform/improvements with the application of the ICT system is closely guided by the typical reform/improvement model suggested by Rogers (1995). The opposing hypothesis is, Technological reform works differently from the typical reform model; and, therefore, it will show a different proliferation outcome than the one obtained from the original model.

It was frustrating that the school was not able to provide technological environment for the students due to financial difficulties of the school and its community. The community members had strong conviction among the school community to provide such environment to the students. There was no resistance among the teachers in providing technological environments. Teachers realized the need to keep up with the changes that are taking place in the Digital Age. Although teachers had pressure to open up the school for observations due to being a model school, they were more committed to learn to keep up with the current development (from an interview with the director of information systems).

Teachers complained of increases in chores to beautify the classrooms and the school for the observers (from an interview with the B teacher).

According to Rogers, the process of reform is established when the stakeholders pass the word of reform to everyone involved in the system. However, in the case of Banghwa School, the process of reform was different from Rogers' argument. At Banghwa, most teachers already felt that there was absolute need for a reform. The ICT director and some senior teachers advocated ICT implementation and developed ICT-related training programs. As a result, along with the can't fail situation as a model school and the efficient and effective computer lab and network structures, almost all teachers adopted the system simultaneously. In looking at the case of Banghwa, the traditional reform model of Rogers is not confirmed. Therefore, the study supports the opposing hypothesis of Technological reform works differently from the typical reform model; and, therefore, it will show a different proliferation outcome than the one obtained from the original model.

C. Hypothesis: The successful implementation of the ICT depends on the level of teachers' ability to integrate it in their teaching-learning situation. This hypothesis states that teachers mediate the use of ICT and that the ICT's intellectual value is strongly related to the teachers' ability. The opposing hypothesis is, The successful adoption of the ICT is determined by the school's technological infrastructure and the students' ability to use the ICT rather than the teachers' abilities.

In answering the survey questions focusing on ICT in teaching and learning, and on the feasibility of conducting a class without the ICT system, teachers replied:

- Rely on the system for 50% of the time, from class preparation to applying it in teaching and learning situations. However, it's possible to conduct a class without ICT.
- Rely on it heavily. It would be inconvenient without ICT. Teachers do not have to talk all day. Since the students are able to find the information, teachers do not have to hold students' hands every step of the way.

In answering the survey questions focusing on academic achievements, and the process of achieving improvements, teachers replied:

- The key component of the class is the teachers, and, therefore, teachers need to invest much time in preparation of the class. Teachers wanted a workload cut, and they did not want to spend their time in using and/or maintaining equipments, and thought that the media specialists should take care of them (this comment was from a teacher who had a negative opinion of the ICT integration).
- School has a tendency to emphasize the use of ICT, and less on the content of the class. There is a need

to develop and apply assessment techniques to measure the success or failure of achieving the objectives for classes that used the ICT system (this comment was from a teacher who had a positive opinion of the ICT integration)

- The teachers' skills need to be improved. Every teacher needs to have technical abilities or know-how to use the ICT system. There is a great need to share information regarding development of instructional materials (this comment was from a teacher who had a positive opinion of the ICT integration).

In the case of Banghwa, the technology infrastructure was a crucial aspect of the school reform. It is too early to assess the success or failure of the reform efforts, which may be more evident when the current second implementation year is completed. During the first implementation year, while the basic infrastructure was being completed, a teaching model for Integration of the ICT for inquiry-based Sociology was developed, and was posted to the Edunet to share nationwide. However, there were many overloading personnel problems in the process of developing the teacher training, teaching material, and establishing the infrastructure.

The learning activities and achievement were a result of interactions among one another. The Internet should be used as a tool in achieving the learning objectives, not a sole activity in the classroom. The ability to use the ICT is dependent on the positive mindset of teachers, and the actual quality of lessons is dependent on the teachers' attitude and abilities. On the surface, there was no difference in negative teachers and positive ones toward ICT use. However, the learning outcomes showed a difference between negative teachers and positive ones. The negative teachers placed the value of the ICT as a useful tool in making teachers work easier while positively-inclined teachers placed the value of the system as a tool to systematically organizing, critiquing and evaluating ideas to support higher-level cognitive frameworks. Therefore, this study supports the hypothesis that the successful implementation of the ICT system is dependent on the teachers' ability to use the system.

D. Hypothesis: The gap between the haves vs. have-nots on the knowledge divide should not increase if there is an equal access to the ICT system. The opposing hypothesis is, The gap between the haves vs. have-nots on the knowledge divide should not increase if there is an equal access to the ICT system.

In answering the question whether high ability students and the low ability students would use the technology in an equal manner, the survey reports:

- At present, among the PC owning students, one-third uses modems to get online while the other two-thirds uses high speed bandwidth networks. It is evident that when an assignment given, the outcome is likely be different depending on the equipment used. In another words, the important considerations made in the access to technology that is varied depending on students' socioeconomic status.
- The school provides an equal access to the technology. Even during the class, students are given an equal amount of time on computers by taking turns. However, high ability students, even in equal access time, become more independent users of the computer and the Internet, and, as such, better uses the technology compared to low ability students.

As mentioned earlier, the unique characteristics of Banghwa School is that even though overall students have low socioeconomic status, there is a conflict between the students whose families are relatively better off versus whose families are not. Most teachers believe that the socioeconomic difference would also make a difference in the access and the use of the ICT. One of the reasons that the school actively implemented the system is to reduce the access difference between the two groups. In order to compensate the lack of access to students whose families have lower income, after-school programs and special programs for gifted students were provided. However, even with extracurricular programs, the difference in the ability levels of these two groups of students did not decrease.

The difference in the technical abilities was apparent when access to home computers was low. In general,

students from the higher-income families had more convenient access at home, as well as private tutoring through other private institutions. And, in general, parents of high skill level students show more interest and support in their children's computer education. In addition, students with lower ability generally used the computers and the Internet for playing games and chatting, whereas, higher skill level students tend to use the same for searching information and for learning. Therefore, the hypothesis that there is no difference between the students from higher-income level and the lower-income level when equal access is given is not confirmed in this study. The access to computers and other technological equipments means access from home as well as from the school. Therefore, the absolute equal access to technology is difficult to be achieved due to students' socioeconomic disparity.

E. Hypothesis: The successful operation of the ICT system in the classrooms will help students achieve higher learning skills although the quality of the instructional materials is low. The academic achievement depends on the teachers' roles and the school's expectations (goals) not on the instructional materials and the information gathered from using the ICT system. The opposing hypothesis is, The use of the ICT will lower the academic achievement due to wasted time spent on reviewing low-quality web materials.

In order to confirm that the hypothesis is acceptable, there should be an agreement of how to measure the successful implementation of the ICT. For successful learning, many conditions are required. One of the conditions is active interaction with the students. Even if high quality material is used, if it is directed by the teacher to the students, a successful learning outcome is not achieved. In fact, many teachers are using the PowerPoint to deliver lessons or summarize the lessons. The teachers who are using the system to deliver instruction consider that they are actively using the system, and did not consider the active interaction with the students as an important part of successful lessons. Also, these teachers used the CD-ROM titles to replace a teaching instead of using it as a part of an organized lesson. Students also thought that they are learning when they searched for and copied information from the Internet. They are lack of advanced skills in validating, synthesizing and analyzing information through critical evaluation. Due to classroom infrastructure, however, there were small group activities. Group members lacked collaboration and cooperation for problem solving, and the distinction between the active participants and non-active participants were clear. In this regard, the successful ICT implementation is dependent on the activities of the teachers and the expected goals of the school.

Even then, the variety and quality of instructional materials are important aspects of successful ICT implementation. Even if the infrastructure is established and the teachers' abilities are high, if the quality of the courseware is low, the students will lose academic achievements and waste time in searching for low quality information. In fact, most teachers requested support for developing instructional materials, and the ability to share the information as a part of the ICT functions. As mentioned, for successful implementation of the ICT to be achieved, many factors such as teachers' roles and abilities, school's expected goals, the quality of the ICT instructional materials, students' abilities, etc. are required. Therefore, the hypothesis is not supported in this study.

5. Future Prospect of the ICT

The school was appointed as a model school in March 2000, and the infrastructure was completed within the first year. The second year began since March 2001, and is now in the middle of the second year. The main goal of the second year is the smooth ICT operation. To achieve the goal, a number of objectives have been set up: 1) articulation of the goals of using the system; 2) clear guidance and supplementation of the Internet information in the classrooms; 3) development of the Internet information index; 4) development of instructional materials and posting that to the Edunet; and 5) increase in the computer abilities of the students by providing context-based training, engaging students in information search and Homepage development contests, issuing word processing skills certification, etc. Since the ICT implementation is taking place although the conditions were not favorable, the reform case at Banghwa should provide many informative know-how to many schools in similar cases or to schools that want to advance in ICT implementation. To continue the successful reform through the ICT implementation, more organized support in the following areas

are required.

First, an increase in the number of expert personnel is required. The increase in the expert personnel was the most requested support by the administrators and teachers. The main reasons were to provide the technical computer and Internet support, to develop programs or the instructional materials that the teachers needed, and to provide consulting for teaching-learning methods. The current technical problems that have been the source of work overload and stress will not be solved with the current teachers or volunteers. Second, continued financial support to purchase and/or maintain hardware to keep up with the changes that are taking place in the society is needed. The new developments of the hardware are quick, and there is a need to provide more equipment, structures, and upgrade. Third, continuous and practical teacher training is needed. The previous training programs focused on learning the basic ICT skills. The new training programs should focus on the effective ICT use in teaching-learning. These training programs should be provided continuously to improve the overall ICT effectiveness. Also, appropriate incentive programs to encourage teachers in voluntary involvement are required. Lastly, development of various teaching-learning materials is needed. A program to allow easy access to the subscription-based Internet sites are needed as well as a systematic approach in sharing the information among the peers is needed.

In conclusion, the systematic support described will not be established in a short time, but articulation of the needed support structure will provide an important insight for the government to consider to achieve the successful implementation of the ICT and school reform.

Appendix A: Research Methods

The research procedures and methods used at the Banghwa Elementary School are described in the following: it became a model school in a short time by achieving solid reform due to organization of the learning support system, ICT integration, and strong policy promoting ICT use. This research is a short-term school reform study focusing on the ICT integration. Three schools were selected and a three-member research team was assigned to each school. Before the actual research began, a preliminary meeting was held to provide teachers with the research introduction as well as discussing the meeting schedules for interviews and observations. With the help of the administrators and the media specialists, interviewees principal, media specialist, staff, parents, and students were selected.

The study was conducted for five consecutive days from March 27, 2001, to March 31, 2001. Research methods were classroom participation observations, outside observations, document analysis, and interviews. For interviews, the contents of the interviews were taped with the prior permission from the interviewees. The recorded tapes were labeled with the name of the interviewees, date and time, grade level, etc. The purpose of the classroom observations was to observe and to collect the evidence of how the ICT was being used during the classes. One or two observers in the classroom videotaped the whole class, and the tapes were labeled with the Classroom Observation Form. The outside observations were conducted at the principal's office, faculty office, and hallways. Information from various bulletin boards were pictured for evidence.

Besides these methods, a survey involving all teachers was conducted to find the status of teachers' use of the ICT, and school operation manual usage, Homepage, school newspaper, and other students produced ICT documents were collected. The following is the detailed schedule of interviews and observations that took

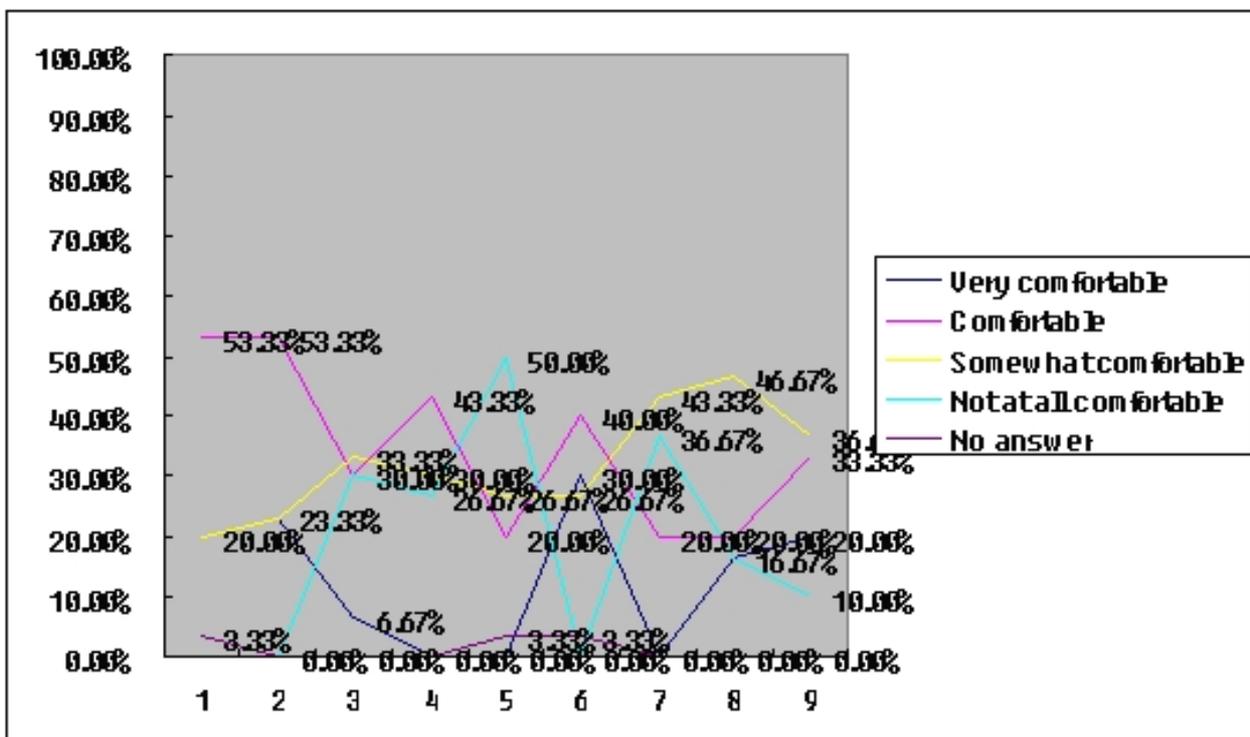
place at the school.

The following figure is the detailed data collection schedule:

| Schedule Day | Researcher | A day s program |
|--------------|---|---|
| 3. 27. Tue | Jung Heun Joo , Soo Hyun Yeon | Interview principal : Jung Heun Joo Interview 2parents 2 group : Jung Heun Joo, Soo Hyun Yeon Interview technology specialist : Soo Hyun Yeon |
| 3. 28. Wed | Jung Heun Joo , Soo Hyun Yeon | Interview(teacher) Interview 2 teacher 2 group: Jung Heun Joo Interview 2 teacher 2 group: Soo Hyun Yeon |
| 3. 29. Thu | Jung Heun Joo , Soo Hyun Yeon | ICT Practices survey for teachers : 30 persons Outside of classroom observation : Soo Hyun Yeon, Jung Heun Joo |
| 3. 30. Fri | Jung Heun Joo , Soo Hyun Yeon, Hye Kyung Park | (AM) 3, 4 Grade Observation 6 Classes (2, 3, 4 Class) : Jung Heun Joo, Soo Hyun Yeon, Hye Kyung Park (PM) Interview 6 students 2group : Hye Kyung Park |
| 3. 31. Sat | Jung Heun Joo , Soo Hyun Yeon, Hye Kyung Park | 5,6 Grade Observation 6 Classes (2, 3, 4 Class) : Jung Heun Joo, Soo Hyun Yeon, Hye Kyung Park |

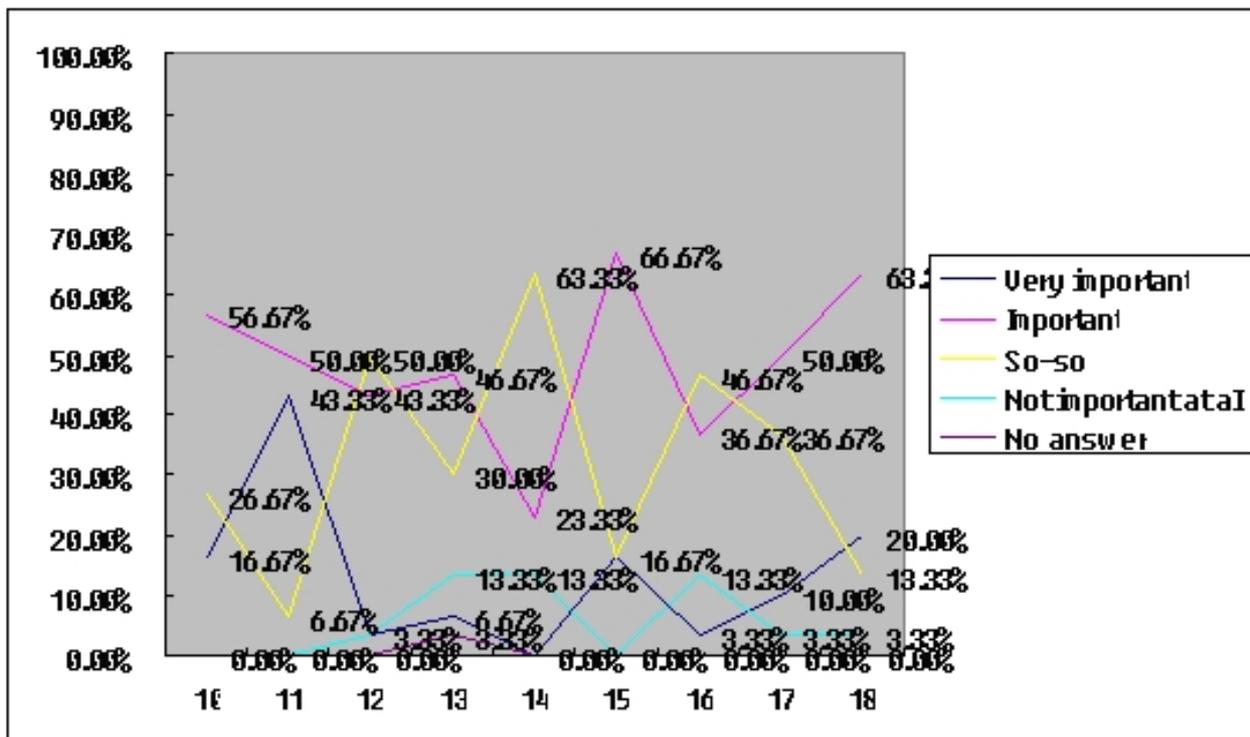
Appendix B: Teachers ICT Practices Survey Results in Figures and Charts

| How comfortable are you with using a computer to do each of the following? | | | | | |
|--|------------------|-------------|----------------------|------------------------|-----------|
| Contents | Very comfortable | Comfortable | Somewhat comfortable | Not at all comfortable | No answer |
| 1. Write a paper | 6(20.0) | 16(53.3) | 6(20.0) | 1(3.3) | 1(3.3) |
| 2. Search information on the web | 7(23.3) | 16(53.3) | 7(23.3) | 0 | 0 |
| 3. create and maintain web pages | 2(6.7) | 9(30.0) | 10(33.3) | 9(30.0) | 0 |
| 4. use a database | 0 | 13(43.3) | 9(30.0) | 8(26.7) | 0 |
| 5. develop a database | 0 | 6(20.0) | 8(26.7) | 15(50.0) | 1(3.3) |
| 6. send and receive e-mail | 9(30.0) | 12(40.0) | 8(26.7) | 0 | 1(3.3) |
| 7. write a program | 0 | 6(20.0) | 13(43.3) | 11(36.7) | 0 |
| 8. draw a picture or diagram | 5(16.7) | 6(20.0) | 14(46.7) | 5(16.7) | 0 |
| 9. present information (e.g., use PowerPoint or equivalent) | 6(20.0) | 10(33.3) | 11(36.7) | 3(10.0) | 0 |



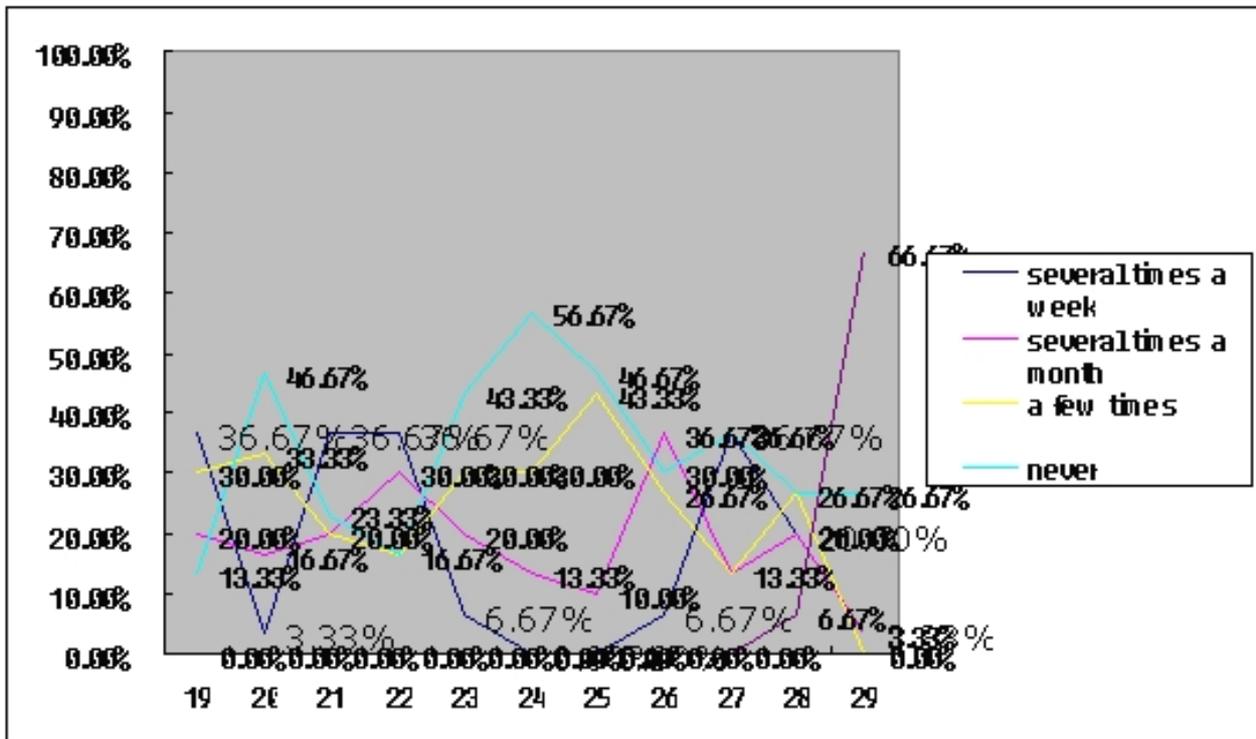
How important is each of the following computer-related skills for your teaching?

| Contents | Very important | Important | So-so | Not important at all | <u>No answer</u> |
|---|----------------|-----------|----------|----------------------|------------------|
| 10. write a paper with a word processor | 5(16.7) | 17(56.7) | 8(26.7) | 0 | 0 |
| 11. search for information on the WWW | 13(43.3) | 15(50.0) | 2(6.7) | 0 | 0 |
| 12. create Web pages | 1(3.3) | 13(43.3) | 15(50.0) | 1(3.3) | 0 |
| 13. use a data base | 2(6.7) | 14(46.7) | 9(30.0) | 4(13.3) | 1(3.3) |
| 14. develop a data base | 0 | 7(23.3) | 19(63.3) | 4(13.3) | 0 |
| 15. send and receive e-mail | 5(16.7) | 20(66.7) | 5(16.7) | 0 | 0 |
| 16. write a program | 1(3.3) | 11(36.7) | 14(46.7) | 4(13.3) | 0 |
| 17. draw a picture or diagram with a graphing/drawing application | 3(10.0) | 15(50.0) | 11(36.7) | 1(3.3) | 0 |
| 18. present information (e.g., use PowerPoint or equivalent) | 6(20.0) | 19(63.3) | 4(13.3) | 1(3.3) | 0 |



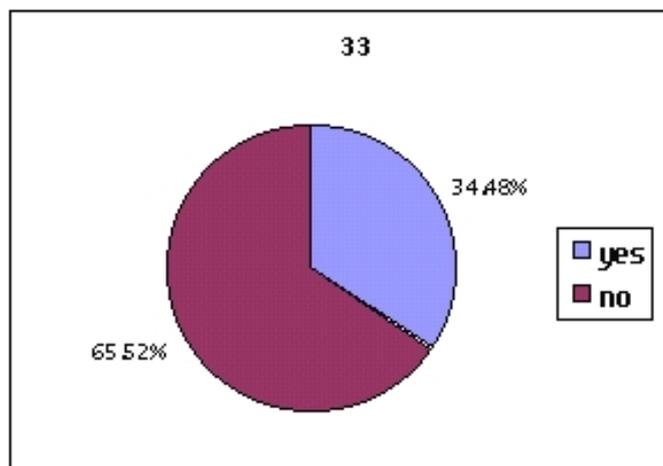
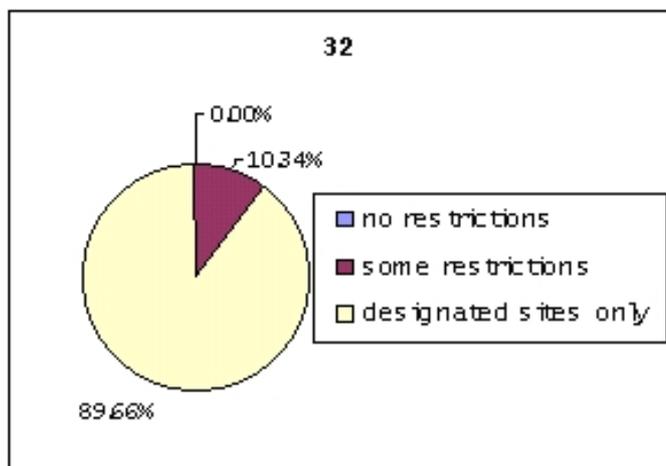
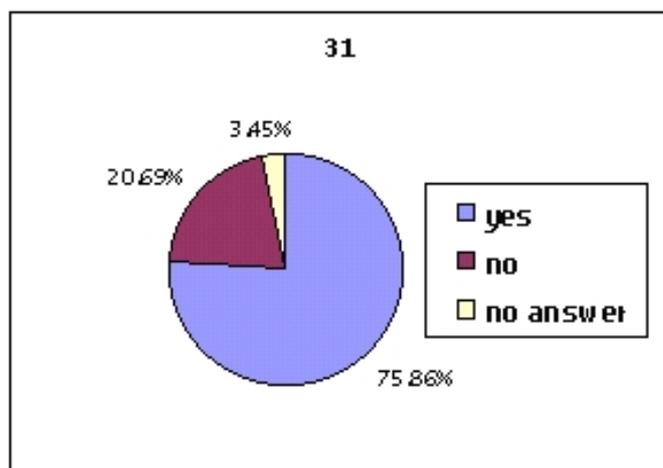
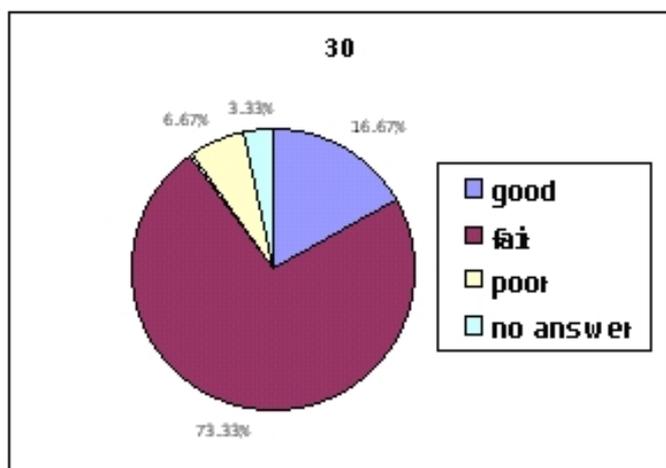
During the past school year, how often did your students on average do the following for the work you assigned?

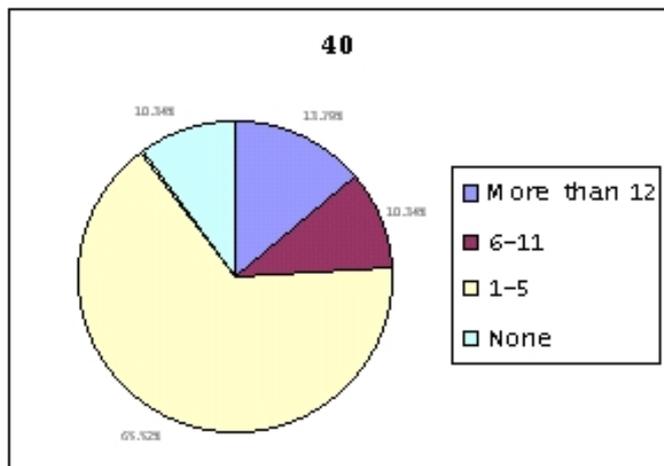
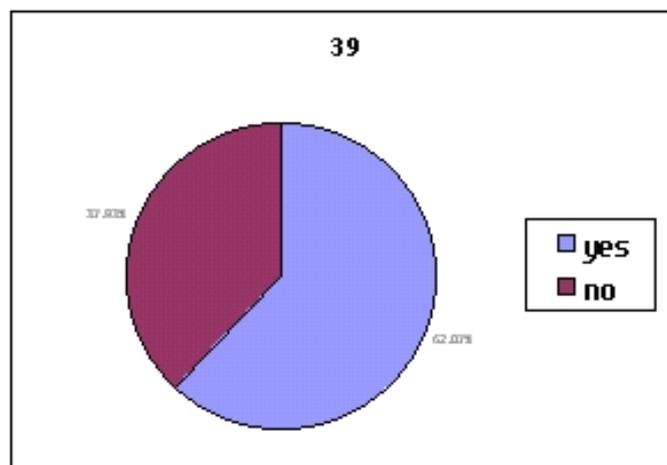
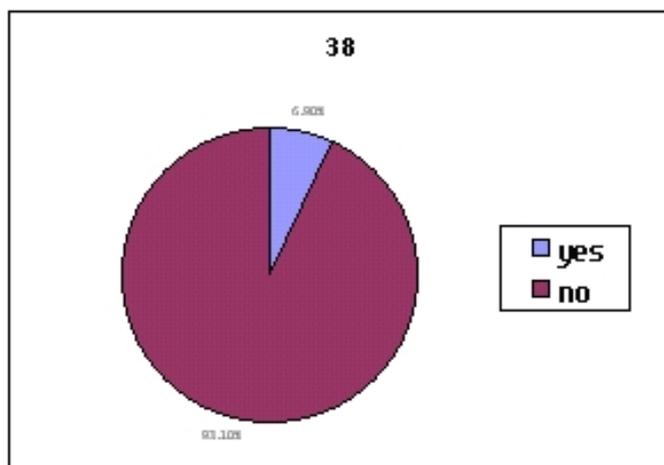
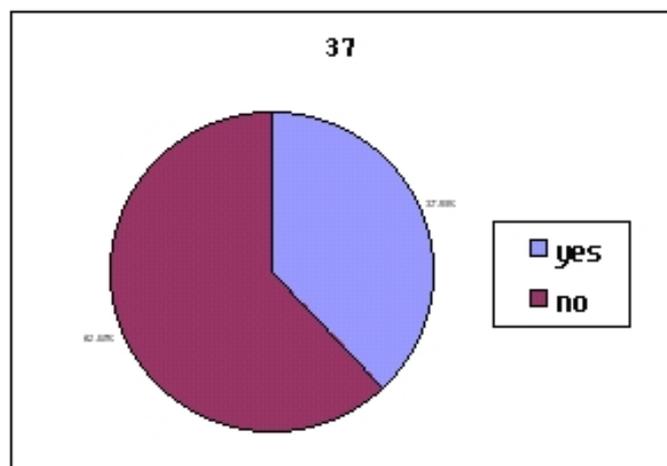
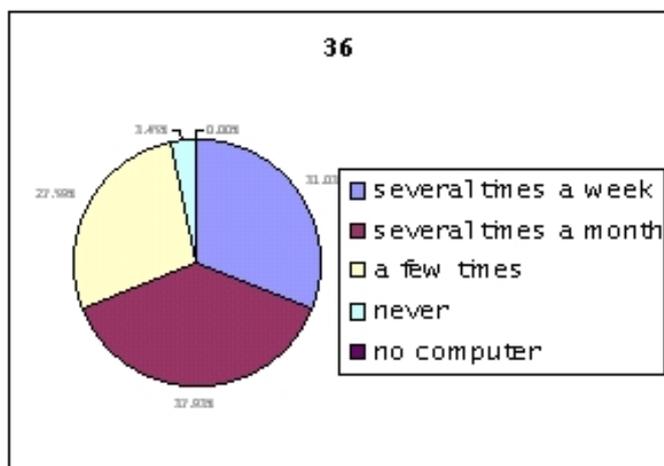
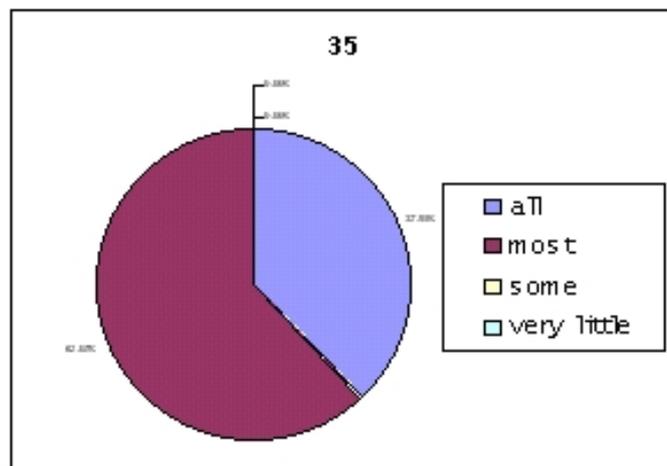
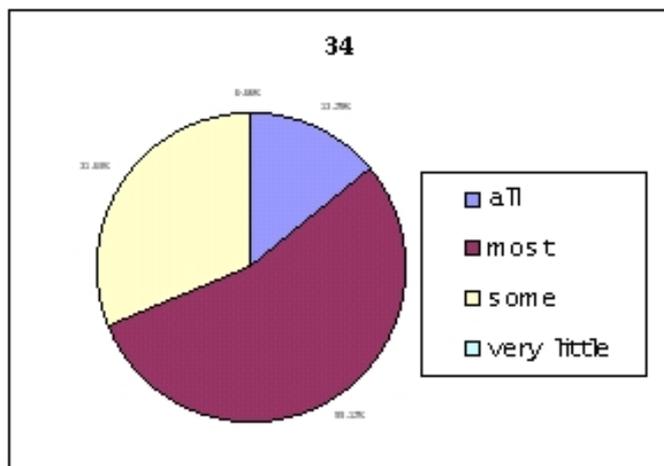
| Contents | Several times each week. | Several times each month | A few times | never | No answer |
|---|--------------------------|--------------------------|-------------|----------|-----------|
| 19. use the World Wide Web | 11(36.7) | 6(20.0) | 9(30.0) | 4(13.3) | 0 |
| 20. create web pages | 1(3.3) | 5(16.7) | 10(33.3) | 14(46.7) | 0 |
| 21. send or receive e-mail | 11(36.7) | 6(20.0) | 6(20.0) | 7(23.3) | 0 |
| 22. use a word processing program | 11(36.7) | 9(30.0) | 5(16.7) | 5(16.7) | 0 |
| 23. use a computer to play games | 2(6.7) | 6(20.0) | 9(30.0) | 13(43.3) | 0 |
| 24. use a spreadsheet | 0 | 4(13.3) | 9(30.0) | 17(56.7) | 0 |
| 25. use a graphics program | 0 | 3(10.0) | 13(43.3) | 14(46.7) | 0 |
| 26. join in an on-line forum or chat room | 2(6.7) | 11(36.7) | 8(26.7) | 9(30.0) | 0 |
| 27. use a presentation program (e.g., PowerPoint) | 11(36.7) | 4(13.3) | 4(13.3) | 11(36.7) | 0 |
| 28. use an instructional program(including simulations) | 6(20.0) | 6(20.0) | 8(26.7) | 8(26.7) | 2(6.7) |
| 29. other computer uses(specify) | 1(3.3) | 1(3.3) | 0 | 8(26.7) | 20(66.7) |



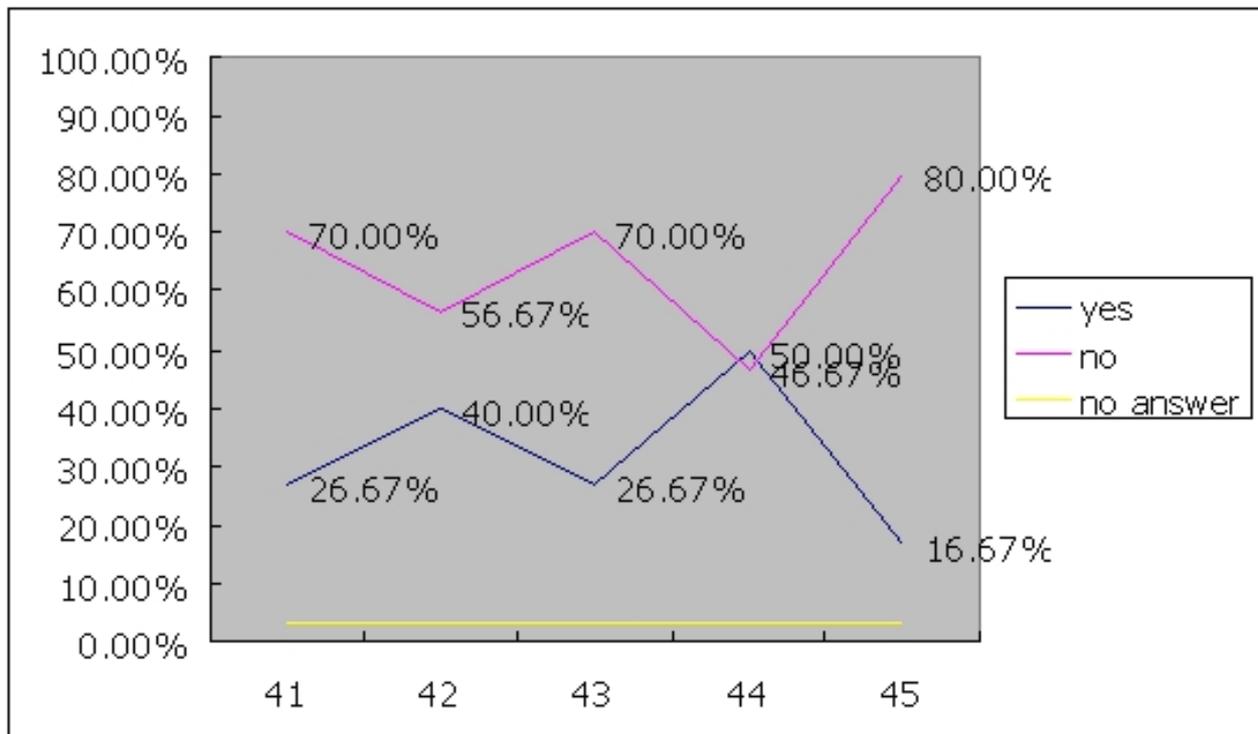
| | good | fair | Poor | No answer | | |
|---|----------------------|-----------------------|-----------------------|-------------|-------------|--------|
| 30. How would you rate your ability to use a computer? | 5(16.7) | 22(73.3) | 2(6.7) | 1(3.3) | | |
| ; Answer questions 31-38 based on experiences or policies from the last school year. | | | | | | |
| | Yes | No | | | | |
| 31. Was student computer use ever evaluated for grading? | 22(73.3) | 6(20.0) | 2(6.7) | | | |
| | No restrictions | Some restrictions | Designated sites only | | | |
| 32. If you assigned World Wide Web searching, how much freedom did you allow students in locating sites to visit? | 0 | 3(10.0) | 26(66.7) | 1(3.3) | | |
| | Yes | No | | | | |
| 33. Did you create or modify a Web site with any of the classes that you taught? (yes-no) | 10(33.3) | 19(63.3) | 1(3.3) | | | |
| | all | Most | some | Very little | | |
| 34. What portion of the computer use in your classes was directly related to the course content? | 4(13.3) | 16(53.3) | 9(30.0) | 0 | 1(3.3) | |
| 35. What portion of the computer use that you assigned was done by students individually? | 10(33.3) | 18(60.0) | 0 | 0 | 2(6.7) | |
| | Several times a week | Several times a month | A few times | Never | No computer | |
| 36. If you have a computer at home, how often did you use it for preparing for teaching? | 9(30.0) | 11(36.7) | 8(26.7) | 1(3.3) | 0 | 1(3.3) |
| | Yes | | No | | | |

| | | | | | |
|--|--------------|----------|----------|---------|--------|
| 37. Did you participate as a student or instructor in a virtual course through the Internet/World wide Web? | 11(36.7) | 18(60.0) | 1(3.3) | | |
| 38. Did you involve your students in collaborative learning over the Internet/World Wide Web with students from other classes? | 2(6.7) | 27(90.0) | 1(3.3) | | |
| 39. Are you currently using technology to collaborate with other teachers (professional chat rooms, forums, or the like)? | 18(60.0) | 11(36.7) | 1(3.3) | | |
| | More than 12 | 6-11 | 1-5 | None | |
| 40. How many e-mail messages do you send each week on average? (more than 12, 6-11, 1-5, none) | 4(13.3) | 3(10.0) | 19(63.3) | 3(10.0) | 1(3.3) |





| ; How many of the following have you ever done? | | | |
|--|----------|----------|-----------|
| Contents | Yes | No | No answer |
| 41. made changes to a computer s hardware | 8(26.7) | 21(70.0) | 1(3.3) |
| 42. updated an application program (word processor, graphics program, etc.) | 12(40.0) | 17(56.7) | 1(3.3) |
| 43. recovered a damaged file | 8(26.7) | 21(70.0) | 1(3.3) |
| 44. created a web site | 15(50.0) | 14(46.7) | 1(3.3) |
| 45. developed a data base | 5(16.7) | 24(80.) | 1(3.3) |



Appendix C: Other Related Material Index

| Item | Contents |
|---|---|
| Nomination Form for a School | |
| Lists of teacher | Lists of teacher |
| School calendar | School calendar |
| School Web Site | School web site Review the school web site |
| ICT plans | Administrator generated materials |
| School improvement plans | Administrator generated materials |
| School reports | |
| School curriculum | |
| ICT Practices Survey for Teachers Interview Form | |
| Interview | Administrator, Teacher, Technical Specialist, Student, Parent Interviews record tape |
| Observation | Classroom Observation Form Observations record tape 6 pieces |
| | Outside of Classroom Observation Form Pictures |
| | |
| Teacher generated materials | Performances criteria, Lesson plans |
| Student generated materials | Project report, Homework, Portfolio |