Complexity of Integrating Computer Technologies into Education in Turkey

Sadegül Akbaba-Altun
College of Education, Başkent University
Bağlıca Kampusü, Eskişehir Yolu 20.Km., 06530 Ankara, Turkey
Tel: +90 312 234 10 10 Ext. 1131
Fax: +90 312 234 1174
akbabas@baskent.edu.tr
akbabasl@hotmail.com

ABSTRACT

Integrating Information and Communication Technologies (ICT) into a centralized education system such as Turkey's depends on its successful design and application, which is an expensive and complex process. The aim of this study was to identify the issues related to integrating computer technologies into a centralized education system. Data were collected from seventeen school principals, fifteen computer coordinators, and one hundred and fifty one elementary education supervisors. The sources of data included semi-structured interviews and a survey. By using content analysis, the following ICT implementation issues were identified: infrastructure, personnel, curriculum, administration, and supervision. By improving these areas, IT classrooms will be more effective.

Keywords

ICT integration, Principals, Computer coordinators, Supervisors, IT classrooms

Introduction

The Context

Turkey's centralized education system began using computers began more than twenty years ago. In 1984, Turkey's Ministry of National Education (MNE) first introduced computers to secondary schools. Then in 1991, national policy included computer-aided instruction. More recently, in 1998, the MNE received a loan, equivalent to 600 million US dollars from the World Bank to invest in a two-phase National Basic Education Program (BEP), which is still being implemented. As a comprehensive educational investment project, the objectives of the BEP are to expand 8-year compulsory education, to improve the quality of education, and to make basic education schools become learning center of the community. In order to improve the quality of Turkey's education, one of the objectives of this development program is to ensure each student and teacher becomes at least literate in Information and Communication Technology (ICT). Phase I was completed in 2003 and Phase II is being prepared for implementation. The phases are described below.

Basic Education Program Phase I (1998-2003)

As ICT initiatives, the following activities were completed within Phase I:

- MNE created 3188 IT classrooms in 2802 elementary schools (K-8) and equipped them with computers, printers, scanners, TVs, videos, multimedia software and slides. All schools had the same number and type of IT tools, except for the number of computers.
- A total of 56,605 computers were distributed to 26,244 rural area elementary schools.
- 1630 laptop computers were supplied to 3000 primary education supervisors who were then trained on computer literacy, active learning, and teaching strategies.
- 25,000 elementary school teachers were trained on computer literacy in various in-service programs provided by the MNE. In addition, 15,928 elementary school teachers received advanced computer training by the contract firms who supplied hardware and software to those schools.
- 2308 computer coordinators were trained on using projectors and 18,517 schools were sent overhead projectors (MEB, 2004).

Since the full implemtation of Phase I has been fairly recent, empirical research reports on the effectiveness of Phase I are limited but all suggest that the IT classrooms are not being used effectively. Akbaba-Altun (2004) explored the school principals' roles related to IT classrooms. In addition, the regulations sent by MNE report that IT classroms are not being used effectively (Reg No: 13, 2002), and suggest some precautions to supervisors and administrators. In another research, Karagöz (2004) interviewed computer coordinators and principals and

also found that IT classrooms are not being used effectively. Another research study was conducted with elementary school supervisors by Akbaba-Altun (2005). She reported that elementary school supervisors also observed that IT classrooms are not being used effectively.

Basic Education Program Phase II

Upon implementation of Phase I, Turkey and the World Bank signed a loan agreement for Phase II on 26 July 2002. According to this agrement, the objectives in Phase I were expanded. Within Phase II, preschool education and special education programs were added to the genereal objectives; consequently, the following inititiatives were added to the BEP:

1. Develop an educational web portal site and provide ICT equipment to approximately 3,000 more elementary education schools
2. Provide educational materials to 4000 additional elementary schools
3. Train more teachers, principals and supervisors
4. Continue program implementaion support
5. Continue program progress and evaluation activities.

Integrating computer technologies into education is a large investment that will continue despite research showing that IT classrooms are not being used effectively. Yet, because of the continual large financial investment into ICTs, the question of how can those IT classrooms be used more effectively becomes extremely vital. Understanding the obstacles that have so far prevented effective IT classroom use will not only facilitate the successful implementation of Phase II but will also provide a framework for policy makers to retool the program, raise practioners' awareness toward integrating information technology at their schools, and increase awareness that the ICT issues in culturally different contexts can contribute to Turkey's own understanding of technology transfer. The purpose of this study is to examine the problems and issues in the integration process of ICT from the perspectives of principals, computer coordinators, and supervisors.

ICT use in education: complexity and integration

Educational institutions increasingly emphasize IT as a technical aid in the development of new models of teaching and learning. According to Zandvlift & Straker (2001), IT use is increasing in nearly all facets of life in the developing world and its use is now progressing rapidly in many schools. However, some researchers assert that schools have been slow to adopt such technological change (Todd, 1999; Pelgrum & Plomp, 1991). This contradictory evidence shows that what ICT promises for a community may not guarantee its successful integration into schooling.

The successful integration of technology is not simple because it depends on interlinking variables. In their literature review, ten Brummelhuis & Plomp (1991) describe the introduction of computers in education as a complex innovation in which many obstacles need to be overcome before one can speak of successful innovation. In addition to being time consuming and expensive, technology may confuse, intimidate and frustrate learners and users (King, 2002) resulting in slow adaptation. In addition, educators have additional needs in this learning process as they are urged to immediately and proficiently bring the new learning to significant educational applications in their classrooms. Consequently, successful technology integration depends on overcoming issues with staff development (e.g., Holland, 2001; Cooley, 2001; Swan, Holmes, Vargas, Jenning, Meier, Rubenfeld, 2002; MacNeil & Delafield, 1998), investment in hardware and software (e.g., Casey, 1995; MacNeil & Delafield, 1998), leadership (e.g., MacNeil & Delafield, 1998; Todd, 1999; Leigh, 2000;Turan, 2002; Akbaba-Altun, 2004;), curriculum (e.g., Hakkarainen et al., 2000; Schuttloffel, 1995), teachers' and principals' attitudes (e.g., Casey, 1995; Swan, Holmes, Vargas, Jenning, Meier, Rubenfeld, 2002), and teacher commitment (Schuttloffel, 1995).

MacNeil & Delafield (1998) found that the main inhibitors to implementing technology in the classroom are lack of financial resources for hardware, software, and infrastructure, and lack of time for professional development and planning. Supporting these findings, Pelgrum (2001) asked practitioners from 26 countries what were the main material and nonmaterial obstacles for ICT implementation. Ten most commonly cited obstacles were the following: insufficient number of computers, teachers lack knowledge/skills, difficult to integrate in instruction, scheduling computer time, insufficient peripherals, not enough copies of software, insufficient teacher time, not enough simultaneous access, not enough supervision staff, and lack of technical assistance.

One of the problems with technology integration is the barriers teachers face. In their research, Jenson, Lewis & Smith (2002) summarized these barriers as limited equipment, inadequate skills, minimal support, time constraints, and the teachers' own lack of interest or knowledge about computers. Aduwa-Ogiegbaen & Iyamu (2005) reported the effort of ICT usage and obstacles to use ICT in secondary schools in Nigeria. They claimed the obstacles for ICT use in secondary schools as cost, weak infrastructure, lack of skills, lack of relavent software, and limited access to the Internet. According to Warshauer (2003), on the other hand, there are contradictions between the rhetoric of reform and the reality of school practice. Warshauer (2003) found that technology integration is constrained by political, cultural, and economic factors.

To conclude, in order to improve the teaching and learning processes, both policy makers and practitioners should be aware of the fact that principals, teachers and computer coordinators are the central actors in the implementations of computers' educational practices. Hence, human involment is an essential component of ICT integration.

Methodology

ICT-related studies have mainly applied quantitative paradigms (see, ten Bummelhuis & Plomp, 1991; Hakkarien et al. 2000; Pelgrum, 2001). This study utilized a qualitative framework in collecting and analyzing the data to gather more feedback on the actual success of the programs through the participants' voices. The data were gathered from computer coordinators, school principals, and supervisors.

The Site

This research was conducted in a city at the West Black Sea Region of Turkey. Eighteen schools, of which fifteen were in towns and three were inner city schools, were selected. The distance from the towns to the city centers ranged from 37 km to 88 km. In addition, in order to ensure the reliability and validity of the findings and to observe how common these issues were country-wide, 151 supervisors from 8 different-sized cities (about 10 % of the total cities) from different regions of Turkey participated in this study.

Participants

Since technology integration is a complex process involving many actors, principals' leadership has been described as one of the most important factors affecting the effective use of technology in the classrooms. According to Kincaid & Feldner (2002) administrative modeling seems to be a key to integrating technology. Beside principals, other actors are computer coordinators who are the change agents (Lai, Trewern & Pratt, 2002) and the pioneers of change (MNE, 2001) in the integration process. Supervisors, on the other hand, are the least articulated partners; yet, they help the educational system improve by providing on-going feedback to the system. Consequently, since the primary goal of this initiative was to prepare educators toward technology integration, school principals, computer coordinators and supervisors were the main players in this study.

The participants included 17 school principals, 15 computer coordinators, and 151 primary education supervisors. One central office computer coordinator and one regional representative were asked to participate as key informants since they worked very closely with the computer coordinators and school principals. The selection of key informants was based on purposeful sampling with no gender-specific selection. The logic and power of purposeful sampling lie in selecting information-rich cases for studying in depth. People can learn a great deal about the issues of central importance to the purpose of the research with purposeful sampling (Patton, 1990). By choosing the key informants purposefully selected, the researcher had the opportunity to gather information-rich data.

The majority of school principals in Turkey are predominantly male; therefore, it happened to be all male participants in this research. They come from different educational backgrounds; fourteen of them were classroom teachers, one Religion and Ethics teacher, one Social Studies teacher, and one English teacher. Their job experience ranged from 13 years to 35 years. The average job experience for school principals was 25.5 years with the standard deviation of 6.32 years. Their administrative experience ranged from 2 to 25 years, with 2 to 9 years of computer experience.

The computer coordinators included 13 classroom teachers, one part-time computer programmer, and one graduate of computer education. Their job experiences ranged from 1 to 25 years. They reported to have been

using a computer between 3 to 9 years. Most of them also mentioned that their first experience with using a computer started with the BEP through in-service training sessions.

The supervisors were selected from eight different cities. The majority of them were males (90.1%) with work experience between 11 to 25 years. However, a remarkable percent of them (42.4%) had only 1 to 5 years of experience in supervision, while two of the supervisors had a doctoral degree in education.

The central office computer coordinator and the regional representative were the key informants in the study. The central office coordinator, K.A., was working at the National Education Directorate. He has been working as a computer teacher since 1988. After 1990, he began installing computer labs in public schools. Mr. K.A. was selected as a key informant because he works closely with computer coordinators and school principals.

The regional representative, T.A., was responsible for technical maintenance and assistance as part of the warranty for the IT equipment. Another key informant, the regional representative, was mainly responsible for providing support for computer coordinators. This support included repairing and maintaining the equipment and providing software. He was responsible for four other cities in the region.

Data Collection

The data were collected from March 2003 through July 2004 from various city centers. The primary sources of the data included semi-structured interviews, and a survey instrument. The interview data was gathered from principals and computer coordinators in one city, which had 18 IT classrooms in various districts. Supervisors from eight different cities were included in the survey data.

During the interview, principals and computer coordinators were asked the following:

- Could you please explain the IT implementation process?
- What kind of problems happened at your school related to IT classrooms?
- What kind of problems you observed/faced or experienced after IT classroom implementation?
- What else would you like to add?

The majority of the participants allowed tape recorder use. When a tape recording was not permitted, notes were taken. Interview sessions were held with school principals in their offices and, in their classrooms with the computer coordinators. The interviews with key informants were conducted at the researcher's office. Each interview took about 25 to 35 minutes and was tape-recorded. Supervisors answered two open-ended questions which were, (1) What kind of problems you faced/observe related to IT classrooms? and (2) Is there anything else you would like to mention/add?"

Data Analysis

Interviews were audio taped and regularly transcribed. Data were indexed, labeled, and coded according to the major topics. The data were analyzed by content analysis. By using the content analysis, the discourse was systematically observed based on various coding categories. While doing content analysis, first, data were read many times to ascertain any patterns. A matrix was developed according to the given answers to each question. In order to understand the general category, open coding was used. Furthermore, in order to see the related sub-categories, axial coding was applied. Finally, the major issues that emerged from open coding were related infrastructure, personnel, curriculum, administration, and supervision (See Figure 1). These categories and their sub-categories emerged from axial coding are presented as data display in the findings section (See Figure 2).

The following coding scheme was applied on analyzing the data: CC for computer coordinators and P for Principals, followed by the participant row number. For the supervisors, the first letter of their city (K, KN, I, D, DZ, Z, O, E) followed by their row number was used.

Triangulation

Triangulation of sources and of methods was accomplished to ensure the validity and reliability (Patton, 1990). Different sources of data (semi-structured interviews and documents) were compared and contrasted. In addition, key informants were interviewed to validate what informants narrated. Finally, two outside researchers were asked to analyze the same data separately as reviewers. Based on the recommendations from outside reviewers,

the data were revisited several times and re-analyzed to ensure agreement among reviewers. In addition, participants' own voices were included in the findings.

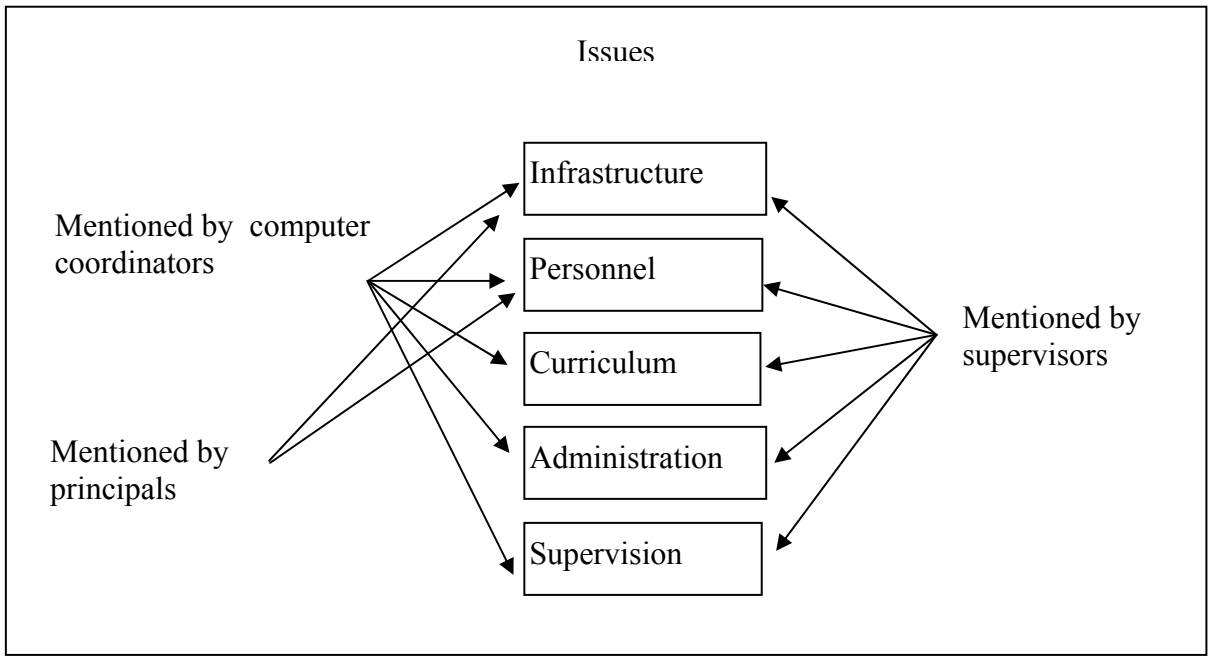

Figure 1. Computer technology integration issues mentioned by principals, computer coordinators, and supervisors

Findings

School principals, computer coordinators and supervisors identified infrastructure, personnel, curriculum, administration, and supervision as main areas of difficulty in IT classrooms. The findings are displayed in the following chart. Each of these categories will be discussed below.

Infrastructure

Infrastructure was the common category voiced by school principals, computer coordinators and supervisors as problematic. The identified issues with infrastructure included the physical setting, equipment, breakdowns, security and maintenance.

Physical settings

Schools were not designed with an IT classroom plan when they were built. Therefore, school principals had problems finding a suitable place for IT classrooms from the very beginning of this project. Almost all participants mentioned that IT classrooms are neither large enough nor suitable for students. For example, one supervisor said that "...there are no appropriate physical settings at schools; we have small classrooms with heating, illumination, and cleaning problems (I6)". Several computer coordinators also add that there is a need for a second wide (CC1, CC2) and large (CC4) IT classroom. Supervisors from various school districts recognize the lack of classrooms (for example, D15, K1, E3, E5, E8). These statements indicate that transforming old classrooms into IT classrooms would not be the ultimate solution. When designing new school buildings, these needs should also be considered to ensure better physical environments.

Equipment

One of the issues raised by the participants was the scarcity in the number of computers and computer parts in IT classrooms as can be inferred from following statements.

- "We do not have enough number of computers" (K6,K11,E5,E8, DZ3,O9, P4, P5, CC1 CC2, CC5, CC3, CC9, CC10, CC14).
- "We need replacements for some parts, such as modems" (E7).

- "We need data show and projection panels in classrooms" (CC1, P18).

Another issue regarding to the equipment was the technical support. This support included both computer-related issues and electrical wiring in the building. For example, one supervisor mentions that "electrical wiring in the building was not designed for many computers in the room. Therefore, these issues are inevitable" (KN8). In addition, due to the inconsistencies in electrical current, operating systems in the labs crash (E13) (E14), and they cannot get technical support quickly (O11, CC12). Moreover, school principals mentioned that they could not get them fixed since they did not have an adequate budget (E1, CC1). Consequently, these computers were no longer functional (O11) (Z6).

Security

All participants in this study consider security as an important issue with IT classrooms. Security is also one of the school principals' responsibilities. This situation leads to anxiety among school principals (e.g., KN5, CC10), and decreases effective use of these classrooms (e.g., P8), especially when a few computers were stolen from the schools.

Breakdowns

When IT equipment breaks down, repair is often delayed. Sending broken materials to the city for repairs takes a long time (two weeks to six weeks). According to the three-year warranty agreement, repairs should be completed within at most five working days; yet, they may take longer due to geographical and weather conditions. As a result, the number of working computers is reduced, often requiring three or four students to use one computer. Schools have to call the warranty firm and ask them to repair the computers or the equipment, otherwise, schools are responsible for the equipment repairs. Because of the warranty agreement, schools have to wait for the firm.

- "Broken parts are not replaced quickly" (E3)
- "Computers get broken all the time. We do not get them repaired quickly" (DZ8)

School principals and computer coordinators are frustrated due to their limited knowledge on dealing with breakdowns. When a defect or failure happens, computer coordinators cannot find anybody around them to help and as a result, they call the central office for help. Due to the computer coordinators' lack of technical knowledge and their feelings of incompetence, most of the time they do not understand what the person on the phone says from central office.

> "When problems occur, we try to get help on the phone. But, we are not always successful. When we call for help from the central office, they do not want to come here [to the school] since it is far away from them. We sometimes have to send the machines, which inevitably takes some time." (CC1).

Maintenance

Maintenance refers to upgrading the hardware and software, repairs and need of technical support. Schools are responsible for finding financial resources to maintain those IT tools. Therefore, many chain problems occur since elementary schools do not have their own budget. Consequently, all participants emphasized that integration is not possible without ensuring ongoing support (e.g., Z6, KN9).

Personnel

coordinators and the issues related to other instructors in IT classrooms. On the other hand, "the scarcity of personnel" (E1, E5, E13, KN9, Z11) and the "lack of qualified teachers at schools" (D14, K10, I9) are the two important issues raised by the participants regarding the personnel.

Computer Coordinators

Computer coordinators' problems are related to the insufficient in-service training they receive, the ambiguity of their basic rights as State employees, and existing heavy workload. Depending on the on-going changes in computer technologies, computer coordinators are seldom invited for in-service training for their professional development. Yet, even if they take the courses, they are problematic. First, the quality of trainers is questionable (e.g., CC5, E1). Secondly, these courses were not designed for adult learners (CC7, KN5). Thirdly, these in-service courses were not geared toward hands-on practice with computers (e.g., CC1, CC7).

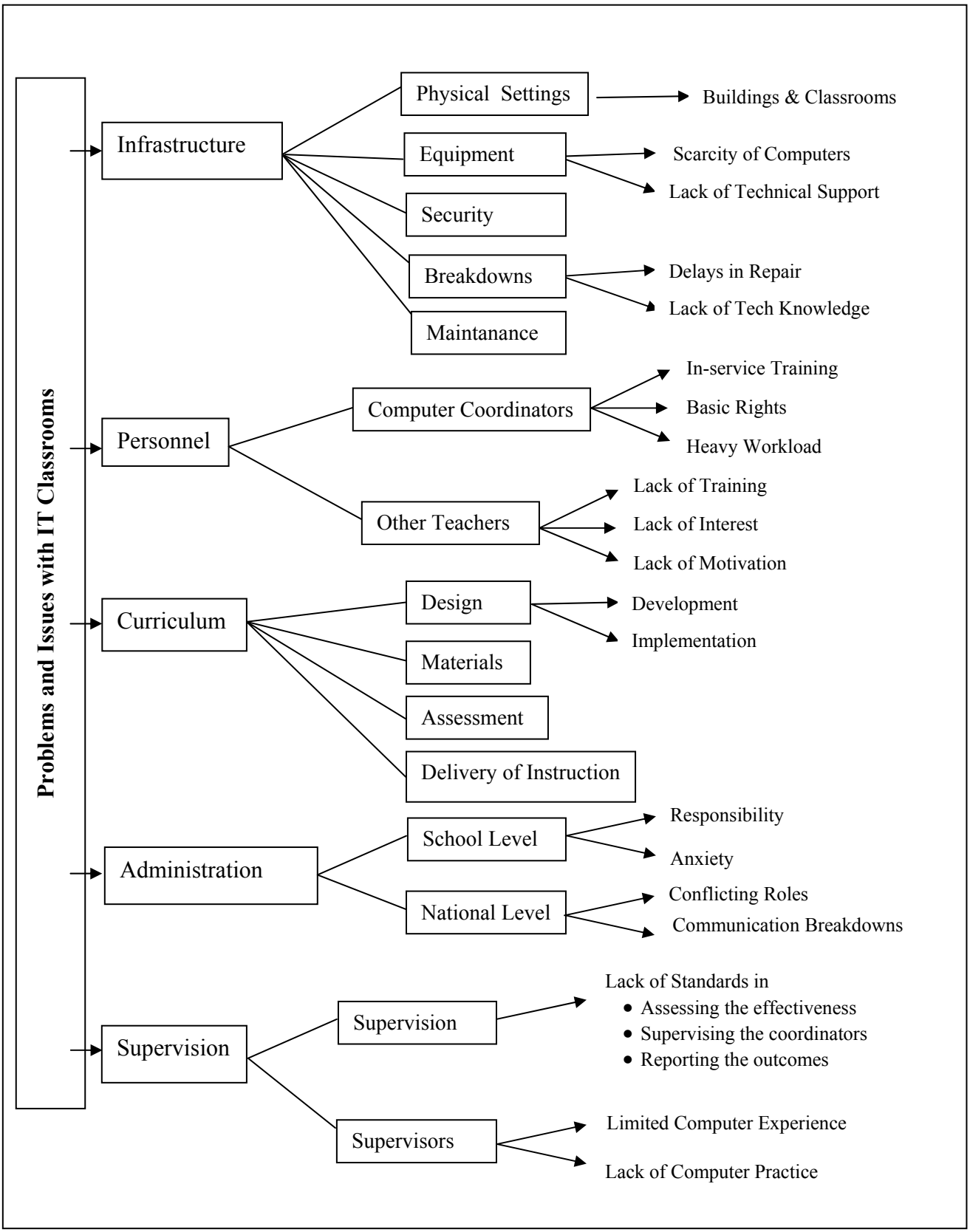

Figure 2. Multi-faces of integrating computer technologies into education

Another problem is related to the ambiguity in basic rights. Computer coordinators were selected among content teachers. Once they start working as computer coordinators, their salaries decrease because they are no longer content area teachers (e.g. CC5, CC6). When schools are in need of content area teachers, the school

administration requests computer coordinators to teach their content classes as well. Furthermore, supervisors evaluate computer coordinators' performance according to their field of graduation (e.g., CC3, CC5). Based on this problem, computer coordinators tend to give importance to their content area, rather than valuing their time as a computer coordinator (e.g., CC3, CC6). This conflict in roles also leads to lack of motivation due to not having the same rights as other teachers in the regulations (e.g. CC6, CC3).

Computer coordinators have heavy workloads at schools (e.g., CC1, CC5). In addition to teaching computer courses at schools, they have to plan the IT classroom schedule (e.g., CC1), be responsible for the maintenance of IT classrooms (e.g., CC5), help other teachers to use the computers for their courses (e.g., CC5, CC14), and prepare in-service training for their peer teachers and the public (e.g., CC14, P17).

Other Teachers

The participants also commented on issues related to other teachers in IT classrooms. Lack of interest, technical knowledge, and training are the main issues raised by supervisors, computer coordinators, and school principals.

Computer coordinators complain that teachers are not mutually supportive (e.g., CC5, CC6, CC14). For example, these teachers may not be willing to have individual e-mail accounts by themselves. Computer coordinators go further to add that these teachers expect them to do basic operations for them (e.g., CC14). Such examples clearly indicate that content area teachers do not reflect enough interest in learning to use these technologies.

According to supervisors, some teachers have a lack of technical knowledge to operate these tools in their classes (e.g., D15, I1, O9, DZ4, and DZ8). Consequently, these tools are not being used effectively and integrated into main content areas (e.g., D15, KN9, O7, and DZ9).

Supervisors and computer coordinators point out those teachers did not have adequate training to be able to use these IT tools. Although it is the responsibility of computer coordinators to train those teachers, it is not at all convenient for computer coordinators to do continuous in-house training.

Curriculum

Design

The participants consider curriculum as an important issue both at the development and implementation levels. Computer coordinators and supervisors agree that students' needs were not analyzed well during curriculum development. Hence, the curriculum content overlaps between grades, causing the lack of motivation and interest of students. This also brings up another issue for instructors at the implementation level, since they teach the same content over the years to the same students. The following statements summarize what computer coordinators and supervisors see as problems:

- Students' needs were not considered and analyzed thoroughly (e.g., CC11).
- The content for 4th, 5th, 6th, 7th, and 8th grades is identical. Since we need to keep up with the official curriculum, we find ourselves repeating the same thing every year (e.g., CC5).
- The curriculum should be redesigned, because the framework is the same for 4th graders and 8th graders (e.g., E5).

Materials

Schools have been provided software and videocassettes, in addition to the hardware tools in IT classrooms. Yet, these materials constitute another issue for schools. Firstly, most software titles are designed in English; therefore, instructors cannot use them in their classes. For example, one of the computer coordinators observed that, "The medium of instruction in software programs makes it difficult for my computer coordinators, since they are not good at English" (CC1). Another computer coordinator noticed that only English language teachers use these programs whereas the others refrain from using them (CC5).

Secondly, the selection of CD titles does not match with other content curricula. The schools were provided CD programs for Kindergarteners, 4th graders and 5th graders; yet, there are no software programs for 6th, 7th and 8th graders (CC1). A supervisor raised this issue when he said, "There is a lack of quality and content covered in

the software programs. These issues make it difficult for teachers to use them in their classrooms" (e.g., KN10, KN16). Videocassettes, another valuable resource in IT classrooms, are also considered to be an issue in the schools. Most of the videocassettes had dubbing problems. Both Turkish and English voices were overlapped, which lowered the sound quality (e.g., CC5, CC1).

Assessment

One of the issues related to curriculum is assessment. Assessing student level of computer use was considered problematic by supervisors. According to supervisors, there is a gap in curriculum since the goals and objective were not clearly stated (e.g., I8, E8, CC11). Consequently, there are not established criteria or standards to assess students' level of computer use (e.g., E4). Although this issue is directly related to curriculum, it was not included in the curriculum.

Delivery of instruction

The nature of computer courses creates problems for the effective delivery of instruction. First of all, the total amount of time devoted to these courses is limited to two hours a week as an elective course (e.g., DZ3, O4). Secondly, overcrowded classrooms in which there is only one computer per 3-4 students, makes it difficult for instructors to deliver instructions and manage the classrooms. These issues led instructors to focus on delivering theoretical information rather than allowing students hands-on practice. Thus, this information cannot be transformed into practical use (O9).

Administration

School level issues

Administrative issues were mainly raised by supervisors and computer coordinators. These issues are related to levels of responsibility and anxiety. Administrators have certain IT roles, assigned by regulations from the MNE. However, when administrators perform these roles based on their experiences rather than based on the regulations, they cause other problems in schools (for example, CC1, CC12, D9, KN12).

- We have problems since school principals do not have enough knowledge about computers (CC12). When we ask for something, we are often neglected since she/he does not understand its importance.
- Some school principals perceive IT classroom as a burden on their shoulders (D9).
- Since school principals act unwillingly toward IT classrooms, they fail to motivate students and computer coordinators to use the IT classrooms (E8, D9).

School principals feel anxious about the IT classroom materials in their schools. All these expensive materials are the responsibility of school principals if they were stolen or broken. Consequently, school principals tend either to be overprotective and oversensitive or less motivated and less interested in letting others use these materials. Yet, such anxiety causes various issues emerge in the schools.

- When school principals feel anxious about these materials, they keep these laboratories locked and do not open them for use (O9). We have principals who have the fear of breakdowns (D9, E6, O7, and O8).
- Some school principals carry the fear of burglary in IT classroom (D13, KN5).

National Level

MNE is the responsible upper-level organization for policy making and for ensuring IT classroom policies are realized at the school level. Supervisors report that necessary regulations were not carried out on time. For example, official regulations (Regulation #s, 13, 53) were sent to schools in 2001. Yet, the project had started back in 1998 and finished in 2000. Consequently, school principals, computer coordinators, and supervisors were left in confusion with their roles and duties during that period of time.

- Since the organization of IT classrooms was determined by the MNE, the necessary regulations were not received by schools on time (Z7).

Another issue at the national level is the communication one. School principals experience communication barriers due to one-way communication channel, from the Ministry to the school. For example, the MNE wants

all schools connected to the Internet, but it does not cover the internet connection expenses. Therefore, school principals feel under pressure.

- Experiencing conflicts between the requests of the Ministry of National Education and schools' own local opportunities. The Ministry of National Education asks school to log on to the Internet and be connected all day, but do not meet the expenses. Due to this problem, schools cannot pay the Internet expenses, and their telephone lines get cut off (e.g., P17, P10, P13, and CC13).
- Since the educational system is centralized, communication flow is usually one way. Sending orders from the Ministry, without a priori knowledge about the issues at schools, creates problems at schools (e.g., CC11).

Supervision

Issues related to supervision were mentioned by supervisors and one of the computer coordinators. These issues can be categorized under two headings: Issues related to supervision and supervisors. At the supervision level, supervisors report that there is not a specific criterion to assess the effective use of these classrooms, supervise the coordinators, and report on the students' work.

1. We have a set of criteria to assess classroom teachers. But, this set of criteria is not compatible with supervising computer coordinators in IT classrooms. We either need a new set of criteria, or to modify the current need (E8, D8, K2, I1).
2. There is not enough time for supervision in IT classroom (KN3, O17).

Supervisors are aware of their limited level of computer use (e.g., D14, E9, E11, and I2) and confess that they are not well-trained to supervise IT classrooms and student work (Z9, KN23, KN11). They go further to add that they have lack of practice in using computers, which is necessary to better supervise computer coordinators (DZ8, E9, KN1).

Discussion and Conclusion

Integrating computer technologies into education requires successful development of infrastructure, personnel, curriculum, administration, and supervision, which can also apply to general education development. These issues are difficult to be separated from general education problems and issues. We can argue that the more problems and issues general education has the more problems and issues we are to face in computer integration. Consequently, there needs to be an integrated organizational approach, where every level of the central organization shows a collaborative effort in integrating computer technologies into schools.

The findings of this study suggest that there are too few computers, slow Internet connections, insufficient software in the native language, and a lack of peripheral equipment at schools. Investment in hardware and software is also mentioned by Casey (1995) and MacNeil & Delafield (1998) as computer integration issues. ICT investment is important initial step as mentioned in the literature.

The IT classrooms at schools were placed in existing older classrooms that were not designed according to the needs of IT classrooms at schools. Future schools should be designed with adequate wiring, ergonomics and security in IT classrooms.

Another finding of this study indicates that in-service training courses for teachers are insufficient, especially in content areas. The participants indicate that courses are given by unqualified trainers and are not geared towards preparing them according to their needs and levels. These in-service training courses also have a lack of hands-on activities and are not offered for school principals and teachers. These issues were also similar to various studies related to staff development and professional development (see, Holland, 2001; Casey, 1995; Cooley, 2001; Swan et al., 2002; MacNeil & Delafield, 1998).

Curriculum problems generally stem from the available software programs at schools. According to the findings in this study, these software programs were not considered to be suitable for the students' grade levels by the participants. One of the reasons may be that a needs analysis was not conducted prior to sending these materials to schools. Moreover, the suggested curriculum for 4th to 8th graders is almost the same and upper grades do not build upon their knowledge. In addition, since software prices are relatively high, it is difficult for schools to purchase. Except for in English courses, other content teachers do not use multimedia software and videotapes.

Similar curriculum issues are also mentioned in different studies (Hakkarainen et al., 2000; Schutloffel, 1995). Consequently, a nation-wide comprehensive needs-analysis would help decision-makers understand how actual users benefit from these materials; pre-designed handbooks and/or guidelines would also guide actual users on how to benefit from these materials.

School principals' lack of technical knowledge, their interpretations of regulations according to his/her own will, and their lack of support pave a way for the given problems and issues. The principals' technological leadership is an important starting point in integrating technologies into education (MacNeil & Delafield, 1998; Todd, 1999; Leigh, 2000; Turan, 2002, Akbaba-Altun, 2004). In addition, since they mostly do not take necessary precautions at their schools for IT classrooms in particular, computers are not protected against burglary. Providing security is one of the roles of the principals related to IT classrooms (Akbaba-Altun, 2004).

Supervisors are in a position to have a significant effect on improving the educational system by providing feedback from the schools to the Ministry. The findings of this study indicate that supervisors do not consider themselves as competent enough to be able to supervise IT classrooms. There needs to be a priori training and support before supervisors are sent to schools. Moreover, more empirical research and case studies are needed to better understand how supervisors can provide effective supervision.

Integration of computer technologies into education is a reform in the Turkish education system which is aiming at leading toward a knowledge society. However, without providing well-planned and up-to-date training programs for supervisors, school administrators, computer coordinators, and teachers, this process will continue to be problem-ridden. Although there is a rich source of literature on cross-cultural experiences about IT integration (i.e., Hakkarien et al., 2000; Pelgrum, 2001; Warschauer, 2003; Aduwa-Ogiegbaen & Iyamu, 2005), further studies aiming at bringing solutions to these problems and issues in computer technologies integration would definitely contribute to our understanding of best practices in technology infusion. Moreover, each issue should carefully be examined from cross-cultural perspectives to further suggest a schematic framework for policy makers and practitioners.

Investment in human capital is as important as investment in technology. The findings of this study suggest that integration technology is not only an investment but also a human resource management issue. To conclude, policy makers need to develop and implement a comprehensive vision and mission in order to minimize problems and issues at school and national levels, especially in those countries with a centralized educational system.

References

Akbaba-Altun, S. (2004). Information technology classrooms and elementary school principals' roles: Turkish experience. *Education and Information Technologies, 9* (3), 255-270.

Akbaba-Altun, S. (2005). Bilgi teknolojisi sınıflarında denetim. *Eurosian Journal of Educational Research, 5* (18), 1-16.

Casey, P. J. (1995). Presenting teachers with a model for technological innovation. *Technology and Teacher Education Annual,* 855-858.

Cooley, V. E. (2001). Implementing technology using the teachers as trainers staff development model. *Journal of Technology and Teacher Education, 9* (2), 269-284.

Hakkarainen, K. (2000). Students' skills and practices of using ICT: Results of a national assessment in Finland. *Computers and Education, 34*, 103-117.

Holland, P. E. (2001). Professional development in technology: Catalyst for school reform. *JournaI of Technology and Teacher Education, 9* (2), 245-267.

Jenson, J., Lewis, B., & Smith, R. (2002). No one way: Working models for teachers' professional development. *Journal of Technology and Teacher Education, 10* (4), 481-496.

King, K. P. (2002). Educational technology professional development as transformative learning opportunities. *Computers and Education, 39*, 283-297.

Karagöz, İ. (2004). *İlköğretim Okulu Müdürlerinin Ve Formatör Öğretmenlerinin Bilgi Teknolojisi Sınıflarının Kullanılmasına Yönelik Görüşleri*. Basılmamış Yüksek Lisans Tezi. A.İ.B.Ü. Sosyal Bilimler Enstitüsü.

Kincaid, T., & Feldner, L. (2002). Leadership for Technology Inegration: The role of principals and mentors. *Educational Technology & Society, 5* (1), 75-80.

Lai, K., Trewern, A., & Pratt, K. (2002). Computer coordinators as change agents: Some New Zealand Observations. *Journal of Technology and Teacher Education, 10* (4), 539-551.

Leigh, G. (2000). Key markers in Victoria's information technology journey into the knowledge age. *Australian Educational Computing, 15* (1), 7-12.

MacNeil, A., & Delafield, D. P. (1998). Principal leadership for successful school technology implementations. *Paper presented at the 9th International Conference of Society for Information Technology and Teacher Education*, March 10-14, 1998, Washington, DC, USA.

MEB. (2004). *Temel Eğitim Projesi, II Faz Başlangıç Semineri*. Ankara.

MNE (2001). *Ministry of National Education Projects*, retrieved November 10, 2005, from http://projeler.meb.gov.tr.

Aduwa-Ogiegbaen, S. E., & Iyamu, E. O. S. (2005). Using Information and Communication Technology in Secondary Schools in Nigeria: Probelms and Prospects. *Educational Technology & Society, 8* (1), 104-112.

Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2nd Ed.), Newbury Park, CA, USA: Sage.

Pelgrum, W. J., & Plomp, T. (1991). *The use of computers in education worldwide: Results from the IEA 'Computers in Education" survey in 19 educational systems*, Oxford: Pergamon.

Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: results from a worldwide educational assessment. *Computers & Education, 37*, 163-178.

Schuttloffel, M. J. (1995). A handbook for technology implementation. *Technology and Teacher Education Annual,* 859-862.

Swan, K., Holmes, A., Vargas, J. D., Jenning, S., Meier, E., & Rubenfeld, L. (2002). Situated professional development and technology integration: The capital area technology and inquiry in education (CATIE) mentoring program. *Journal of Technology and Teacher Education, 10* (2), 169-190.

Todd, R. J. (1999). Transformational leadership and transformational learning: Information literacy and the World Wide Web. *NASSP Bulletin, 83* (605), 4-12.

Brummelhuis, A., & Plomp, T. (1991). The relation between problem areas and stages of computer implementations. *Paper presented at the Annual meeting of the American Educational Research Association*, April 3-7, 1991, Chicago, USA.

Turan, S. (2002). Teknolojinin okul yönetiminde etkin kullanımında okul yöneticisinin rolü. *Eğitim Yönetimi, 30*, 271-281.

Warschauer, M. (2003). The allures and illusions of modernity: Technology and educational reform in Egypt. *Education Policy Analysis Archives, 11* (38), 1-25.

Zandvliet, D. B., & Straker, L. M. (2001). Physical and psychosocial aspects of the learning environment in information technology rich classrooms. *Ergonomics, 44* (9), 838-857.