

Evaluation Report for empowerICT™ Thailand

Executive Summary

The purpose of this document is to present the evaluation plan and major findings for empowerICT™, an evolutionary program designed to empower teachers to integrate information and communications technologies (ICT) into the classroom. This project is the result of collaboration between Ministries of Education in Asia, local education agencies, schools (including principals, teachers, and students), Knowledge Director, a team of international and local experts, and Microsoft. The project is managed and funded by Microsoft. This paper will discuss the goal of the evaluation, the procedures for data collection, data analysis, and presentation of findings behind the evaluation of empowerICT™. The main focus of the evaluation is on documenting the successes and challenges of the project, along with improving the project and ensuring the delivery of a quality final product. Therefore, evaluation is of formative nature.

There were cases that positive impact was documented in the participating schools. This had to do with impact on the school, teacher benefits, and student benefits. The successes of the project and the factors that led to this success are summarized below.

- The project was very successfully in cases of schools where there was alignment with the school's mission and the goals of empowerICT™
- The project sparked a conversation between teachers and administrators which can facilitate education reform.
- Some of the schools saw the potential of the project and their administrators were actively involved in the process.
- Several teachers indicated that by participating in the project, helped them reflect on their work, improve their teaching, and offered them a better understanding of ICT integration in the classroom.
- Teachers expressed positive feelings about their own professional development as well as about their students' benefits from implementing this project.
- The teachers who volunteered for the project were most likely to feel satisfied with the progress achieved with the pilot.
- Teachers also improved their computer skills while working on the project.
- Students have improved their ability to express and represent their knowledge using ICT.
- Students became very active in their learning, eager to participate in the lessons, and were more concentrated and interested in working on assignments and activities, and collaborate with peers.

The challenges of the project faced by some of the schools were:

- Lack of sufficient infrastructure, computers, and internet access
- Lack of administrator support in some of the schools
- Teachers did not have enough ICT skills that prevented them from planning effective lesson plans integrating ICT

- The increased workload of certain teachers did not allow them to innovate and actively engage with the project
- Lack of time for collaborating with peers in developing effective lesson plans
- Time management and scheduling the use of computer labs

The major recommendations for improving the project are listed below:

- Reduce teacher tasks and responsibilities so that teachers have enough time to engage with the project
- Encourage administrators to support the project and offer teachers the resources needed to succeed
- Offer incentives to participating teachers
- Establish the participation in the project on a voluntary base so that teachers can choose to participate. And then, carefully select teachers that meet the predefined criteria established by the team of experts.
- Select schools with available technology infrastructure
- Continue beyond the pilot phase to enlarge the impact of the project
- Engage the ministry of Education to add more legitimacy to the project
- Include more examples of lesson plans and activities during the workshop, which will help teachers better understand the integration process.

Introduction

Schools and teachers are asked to integrate Information and Communication Technologies (ICTs) in their everyday practice. It is often argued that technology in education will make schools more productive and efficient, will improve teaching and learning, will provide authentic and engaging learning experiences, and will better prepare students for the workforce. International organizations such as the International Society for Technology in Education and UNESCO have established guides, plans, and standards for the use of ICTs in education and training.

In the Asian context, there is a great discrepancy among countries with regards to the availability of ICT for classroom use. In a recent meta-survey on the use of technologies in education in Asia and the Pacific 2003-2004, Farrell and Wachholz (2003) report several trends in the use of ICT for education. Among these trends several have to do with the ICT infrastructure, combining old with new technologies, use of mobile technology, use of knowledge management systems, development and use of learning object repositories, and a growth in open schools.

Description of the project

Overview of the project

empowerICT™ is an evolutionary programme designed to empower teachers to integrate ICT into the classroom. It provides teachers with professional development opportunities and the ongoing mentoring and support to select and integrate instructional activities that integrate ICT outcomes with subject matter outcomes. This project is a result of collaboration between Ministries of Education, local education agencies, schools (including principals, teachers, and students), Knowledge Director, a team of international and local experts, and Microsoft. The project is managed and funded by Microsoft. The project has been launched as a pilot in Thailand and the Philippines in collaboration with the local ministries of education. This report presents the preliminary findings from the evaluation of the pilot in Thailand.

Objectives and outputs

empowerICT™ is a combination of professional development and collaborative curriculum development program that focuses on preparing teachers to integrate ICT in teaching and learning in primary and secondary education.

The set of tentative goals for empowerICT™, as they have been developed thus far are:

- To empower teachers to integrate ICT into their classroom
- To promote collaborative curriculum development
- To improve teaching and learning in participating schools
- To facilitate reform in education policy, curriculum, pedagogy, and assessment
- To promote systemic, systematic, and sustainable change in education

It should be noted that the pilot will also serve the additional following goals:

- To document in detail the processes of the program, clearly define its scope, and focus it on the local stakeholders' needs
- To collect data in order to improve the project
- To develop a theoretical framework to guide future project deployments
- To establish an evaluation framework to guide evaluation of project activities
- To develop case studies that will be used to present the project and document its success and challenges

Major Components

The major components of empowerICT are discussed below.

- *Teacher professional development and support.* The focus of empowerICT™ is to empower teachers to integrate ICT in education via a blended model of training and support. Face-to-face training, continuous one-on-one and group support are available to teachers from local experts through out the duration of the project. In addition, teachers were encouraged to collaborate with peers within their school, and across schools, to exchange ideas, review each other's work, and provide feedback. An online portal was developed that also served as a mechanism for teacher continuous support.
- *Aligned curriculum, instruction, and assessment with focus on ICT outcomes.* This program is being developed in collaboration among the project team, a local team of experts, the teachers involved in the project, and other stakeholders. Teachers are provided with ideas, examples of activities, and suggestions on how activities and lesson plans can be developed so that they are in alignment with their curricula and with ICT outcomes as they were identified by international bodies (UNESCO, ISTE, EU, etc.).
- *An evolutionary approach to ICT integration.* The focus is not to completely change the curriculum but to integrate selected activities integrating ICT into classroom teaching and learning. By empowering teachers and offering them the mentoring and support they need, to succeed in the classroom, empowerICT™ attempts to establish the conditions needed for an evolutionary rather than revolutionary education reform.
- *Established on credible research and accepted by international education bodies.* The framework and research behind the project are grounded on solid research behind ICT in education experts. The ICT outcomes and standards on which the program is based are in alignment with the International Society for Technology Education standards, the UNESCO framework for ICT in schools, and several other technology frameworks defined by international bodies of experts (ISTE standards, UNESCO report on ICT in education).
- *Easily configurable and localizable for different contexts.* One of the characteristics of the project is that it is designed to be flexible so that it can be easily adjusted to the local context of the country, school, and classroom of the teacher using it. The emphasis is not on giving teachers ready-made curricula but to empower them to develop their own as they better serve their students' needs.

Implementation plan

The core framework was developed by an international team of experts in collaboration from experts in the participating countries, and it is based on research and development from international organizations like UNESCO and ISTE.

The project lasts for 20 weeks. During the first 5 weeks the international and local expert teams engage in a collaborative curriculum development process for adjusting the framework of the project, localizing, and preparing the material in collaboration with, local agencies, administrators, ministries of education, and teachers from each of the participating country. All the material are translated and localized. Once material are translated in the local language the local team of experts reviews the material and makes the final edits.

A two-day workshop was offered to teachers and principals by the local team. The goals of the workshop are to help teachers understand when to use ICT to support specific outcomes, develop lesson plans integrating ICT within specific subject matters, and develop and implement performance assessment for ICT specific outcomes. Administrators will better understand what technology can offer to their schools, how to plan for integration and how to support teachers. Upon completion of the two day workshop, teachers will have developed lesson plans and presented them during the workshop for feedback.

At the end of the workshop, the local team of experts negotiated a plan for deployment with the teachers and principals. During the 10-week implementation phase teachers develop 1 lesson plan every week and try it in their classroom (for a total of 7-10). This is a practice-based program, and it is important for teachers to try their ideas in the classroom by actually teaching the lesson plans they develop. While developing the lessons plans, teachers are encouraged to discuss them among peers, post them online for peers to comment, and the local experts to also guide them and comment on the lesson plans. Also, teachers arrange so that at least once during which they implement a lesson plan, a colleague or a member of the local expert team goes to observe them and gives them feedback on the lesson. Teachers have to reflect on the successes and challenges of each lesson using an online discussion forum and document their thoughts in an online journal. There is a discussion board which allows the teachers to post questions and discuss with their peers and local team of experts issues relating to the project. The online journal includes 3 questions for the teacher to help them reflect on the implementation of the lesson (what worked well, what did not, what will do differently), and also provide us with data for the evaluation of the project.

At the end of the 10 week period, follows the 5 week debriefing and evaluation stage during which data are collected in collaboration with all stakeholders, and a wrap up event will be organized during which teachers showcase theirs and their students' work. The local team will participate in this event and present a brief report on their experiences working on the project.

Evaluation design

Overview

After conducting a literature review of research and evaluation studies conducted in the field of evaluation of educational technology projects, and after negotiating the goals and purposes of the evaluation with all the stakeholders and the design team, the evaluation plan was implemented as described in this document. The method is based on a combination of quantitative approaches (descriptive statistics) and qualitative techniques (analysis of documents, data collected from open ended questions, interviews, observations, usability evaluations, and memos).

As empowerICT™ expands, the evaluation design and research agenda behind the project will be adjusted to ensure that the needs of the project and its stakeholders are better served. Although for the scope of the pilot, the major goal of the evaluation is define and improve the project, it is important to lay down the basic pillars of the evaluation framework. From a detailed literature review as well as based on several studies we conducted in the field of educational technology, the factors that influence technology integration in teaching and learning are presented in Figure 1.

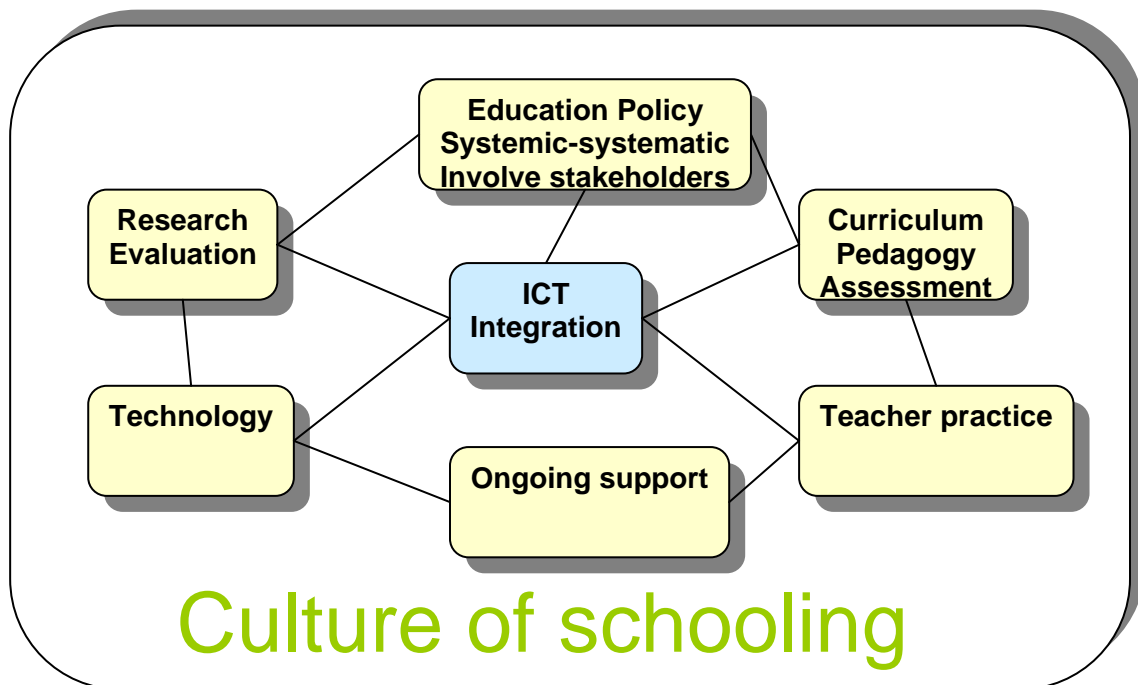


Figure 1. Factors influencing ICT integration in teaching and learning.

Some basic research questions that can guide research behind empowerICT™ are:

- What are the factors influencing ICT integration in classroom teaching and learning?
- What are the barriers in integrating ICT in classroom teaching and learning?
- What is the role of local agencies in supporting ICT integration in the classroom?

- What incentives should the teachers receive?
- What is the role of corporations in such initiatives?
- What are the attributes of effective ICT integration in the classroom?

Evaluation Goals and Questions

The evaluation of this project will be driven by the following questions:

- Does the project meet its objectives?
- Were the expected outcomes delivered as planned?
- Is the final product of acceptable quality
- What recommendations can be made about the appropriateness, usefulness, and improvement of empowerICT™?

Data Collection

The evaluation of the project will be carried out through quantitative and qualitative methods. The proposed procedures to be employed are briefly discussed below. For developing the interview protocol, observation protocols, and case study protocols, the following were taken into consideration:

- Project goals and objectives
- Teacher and student functions and needs.
- Administrators' needs and views.
- Evaluation goals as they will be negotiated and agreed upon among the partners.
- Other educational technology evaluation studies, models, and approaches
- Stakeholder input.

Instrument items were designed to collect data to address the above issues. Once the instruments and protocols were developed, they went through 2 rounds of revisions. First, during the expert review phase, the instrument was shared with experts in curriculum development and educational technology evaluation in order to receive their feedback. Once revisions are incorporated from the expert review the instruments were pilot tested with prospective users. After pilot testing the instruments and revisions were made, the instruments were sent out to the local research teams involved in the project to use for data collection.

Interviews

Semi-structured interviews with the teachers and administrators were conducted to identify the major themes and issues behind the development and implementation of the project.

Observations

The local research team observed at least 1 of the lessons for each of the teachers as they integrate ICT in their classroom. The focus of the observation was based on the observation protocol developed for this project.

Teacher Journals

The local research team collected journals kept by teachers during the project implantation. In the journals teachers reflected on the successes and challenges of integrating ICT in the classroom. In some cases the journals were not posted on the web due to technical problems, and the local team collected written reports and phone interview data from the participating teachers.

Material review

During the development of the material for the project, an informal evaluation procedure was implemented. Experts in curriculum development, ICT integration in education, and teacher education reviewed the material and collaborated with the local teams to ensure that the project meets the local schools' and teachers' needs. This material went through multiple cycles of review, development, and revisions.

Memo writing

Upon the conclusion of each meeting, detailed memos are kept by the principal investigator and local research teams. Each of the local research teams will keep a weekly log reflecting on the following questions:

- With whom did you meet (place, time, duration, scope of meeting, lesson developed, samples, etc. all these need to be documented)
- What were the major problems encountered and how did you resolve them?
- What are the major concerns and problems teachers expressed?
- How can we improve what we do?

Case study preparation

Each of the local team managers prepared case studies based on their experiences and data they collect. For developing the case studies, the research team will followed the protocol developed.

Data Analysis

For data analysis, we followed two stages: the inductive and deductive. Interview transcripts, project documents, meeting minutes, memos, log files, and survey results were all analyzed. Upon entering the inductive stage, we organized all transcripts, field notes, and documents. We used data displays, concept maps, and tables to illustrate findings of the evaluation. The inductive stage of data analysis is very open-ended, and it is the stage in which the evaluator generates assertions. After we collected and organized all the data, we read through the data three times to gain an overall understanding of the project. We wrote notes and memos about those issues and events that stroke us and begun to generate assertions. Assertions are propositional statements that indicate relationships and generalizations in the data and which the evaluator believes are true.

Findings From the Thailand Case study

Thailand setting

Four schools participated in this project. Table 1 presents the number of students and computers available at each school. Pseudonyms were used for all schools, teachers, and administrators. Some of the schools were more successful than others, for reasons that are discussed in the following pages.

<i>School</i>	<i>Students</i>	<i>Computers</i>	<i>Computer: Student Ratio</i>
School A	1322	86	1: 15
School B	2227	84	1: 26
School C	2348	54	1: 43
School D	3975	450	1: 9

Table 2 presents the number of teachers and their specialization, who participated in the project.

School	
School A	1 math, 1 science, 1 computer teacher
School B	1 science teacher, 1 computer teacher
School C	1 math, 1 science, 1 computer teacher
School D	1 math, 1 science, 1 computer teacher

Table 3 presents the number of interviews and observations conducted by school.

School	Interviews	Observations
School A	1 math, 1 science, 1 computer teacher, 1 administrator	2 observations of math and 2 observations of science
School B	1 math, 1 science, 1 computer teacher, 1 administrator	1 observation of science
School C	1 math, 1 science, 1 administrator	2 observations of math and 2 observations of science
School D	1 math, 1 administrator	1 observation of math and 1 observation of science

Table 4 presents the number of lesson plans developed per topic per school.

Table 4. Number of lesson plans developed per topic per school		
School	Math *	Science*
School A	7	7
School B	-	3 (10)
School C	5 (10)	6 (10)
School D	3 (6)	- (1 lesson Implemented without written lesson plan)

* Implemented plans only,

() total plans sent without any comments or any revisions (some plans were sent after the project ended)

Successes of the program

Overall impact on schools

During the face-to-face meetings with local and international experts, the conversations led to the discussion of how the project could facilitate education reform. The project helped spark the conversation among teachers and the school administration on how to address their needs. Issues of incentives, work load, infrastructure, and school improvement were brought about during these conversations. These kinds of conversations are essential in all kinds of education reform. The participation of all involved in the discussion and planning of innovations and participation in projects like empowerICT™ are important for the success of these projects.

For some schools, the project had an obvious positive impact. School A is the school that has obviously been the most successful in this project for a variety of reasons including the strong administrator support, alignment of the school's mission with the goals of the project, teacher commitment, and available infrastructure. The director of school A indicated the following:

“[The Project] appeared at the right time during the transformation of teaching and learning by emphasizing the use of ICT to improve the lessons conducted by teachers.”

After completion of the pilot, the Director and school administration felt that the project was a success in this school. The Director indicated during the interview that:

“After entering this project, teachers are able to apply ICT in teaching in practice, especially designing the activities in line with the learning plan, leading to learning of children. It's our hope to see the abilities of teachers in efficiently applying ICT in teaching.”

empowerICT™ came in at the right time and met the mission of the school and the school's management expectations. One of the teachers indicated that the “Director has had an idea to apply ICT in teaching before this [empowerICT™] ... His expectations were met so when the project arrived he supported teachers and the project's activities.”

The project was deployed as a pilot and there was a limit on the number of teachers who could participate during the pilot phase. The director of school A saw the true value from

empowerICT™ and planned so that the expertise gained by the teachers who participated in the project, will be shared with the rest of their colleagues at the school. This director stated specifically in the interview, regarding the three teachers (math, science, and computer teacher) sharing their knowledge with others:

“I’ve assigned the three teachers to be the school’s experts to give advice or lend assistance to their peers and share their knowledge, abilities, and experience with other teachers.”

One of the things some schools did was to relocate classrooms to facilitate their access to computer labs during the pilot phase of the project. In addition, school A supplied each participating teacher their own personal computer located in their own classrooms. In addition, the computer teacher has provided recommendations and served as a technical consultant since the date of the workshop. A math teacher mentioned that, “Because of the cooperation and assistance of the computer teacher, the activities have gone smoothly.”

It was clear that in some schools where there was indeed support, the project was successful. In school A, the school Director stated about the project: “...Yes, it’s exactly what we want. ... I ask myself the question, how to enable teachers to apply ICT in designing their lesson plans and develop their teaching styles? And this project can help”. Subsequent to the workshop during October 12-13, 2004, the school has recognized the objectives and nature of the operation of empowerICT™ in details in addition of the initial data provided by the project’s coordinator. The administrator actively supported the project implementation by holding a meeting with both selected teachers and the computer teacher to address their problems and concerns. During the interview, the Director said that

“...[Initially] there was discussion as to how we should make a plan to increase teacher efficiency and improve student learning. We’ve reached the agreement that the school would provide all equipment needed ... We started from providing tools and equipment, especially the computers to be located in the rooms of participating teachers. Then we relocated the classrooms for convenience in using computers for related activities so that it would facilitate teachers’ work and performance.”

The relocation of regular classrooms for the 4th grade students from the old building to the one where the operating rooms are located was carried out in the first week of the new semester. A science teacher indicated that “There have not been classes yet. We’re still busy with preparation. The administrator have supported the project implementation and ordered that the 4th grade students be reassigned from the other building to the one with computer rooms. The computer teacher is also assigned to assist during the classes in the computer room.” The relocation was done to facilitate teachers and students participating in the project and reduce the time which would otherwise be used in traveling from the old building to the computer rooms in another building.

Subsequent to the participation in empowerICT™, a science teacher at School A purchased a computer for personal use at home to enhance his skills and prepare lessons

in advance. Based on the interview during the later phase of the project, he commented that there was progress in the improvement of his ICT skills. The project sparked the teacher's interest in ICT and contributed to improving his knowledge and skills. In conclusion, school A and the teachers have positively responded to the project by taking the following actions:

- Held meetings with the administrator, the computer teacher, and teachers to study the problems and determine the solution to enable project implementation.
- Arranged the schedule on using the computer operating room for participating classes and relocated the concerning classrooms for convenience;
- Provided a desktop computers to participating teachers;
- Assign the computer teacher to assist in the teaching of science and mathematics;

In other schools the impact was not that strong. For example, in School B, although there was initial support by the administration, participants felt that the impact of the project was not that obvious. This can be explained in a number of ways including the challenges faced by the schools having to do with teacher workload, schedule, and curriculum structure of subject matters. These issues will be discussed in more detail at a later section. However, a known issues in educational technology projects is that impact is difficult to demonstrate with one time small pilot projects.

Benefits for teachers

After completing the project, teachers from have improved their knowledge and understanding of the contributions that ICT can make to teaching and learning. Several teachers indicated that by participating in the project, helped them reflect on their work, improve their teaching, and offered them a better understanding of ICT integration in the classroom. Teachers expressed positive feelings about their own professional development as well as about their students' benefits from implementing this project. For example, a teacher said:

“If our goal was to encourage the use of ICT in teaching and learning then I believe we were successful because more teachers use ICT now in their teaching and students use ICT to find information.”

Based on the interviews conducted with the teachers, it was found that the teachers emphasized how the project had given them the opportunity to improve themselves, develop their teaching and learning methodologies, as well as improve their ICT skills. The comments of one of the computer teachers who supported mathematics and science teachers are indicative of this:

“I think the goal of the [Project] has been achieved, as you can see from the fact that teachers are more eager now in their work, they systematically apply ICT in teaching, and they develop their own ICT skills.

Although the teachers had to dedicate a lot of time to study the new approach to lesson plan preparation, they pointed out that the project was beneficial, especially for their self-development. The comments of some of the teachers are presented below:

- “I've got additional knowledge along the process of [designing the lessons and activities] for the students.”

- “With respect to the time we need to invest on this, yes, it’s true that there is a lot of work to do, but in the process I’, gaining a lot more knowledge.”
- “...This project enabled us to reach at another level of teacher potential development.”
- “I learned to collaborate with my colleagues. Because of the cooperation and assistance from the computer teacher, the activities have gone smoothly and I feel that I’m learning a lot more things now.”

The teachers were also proud for the attention they received by participating in this project. This was an important source of motivation for them to work on this project. Such praise helped to boost the satisfaction of the participating teachers. Overall, the teachers of school C felt that they were acknowledged by their colleagues and emphasized that they had a unique opportunity to improve themselves. Moreover, by participating in this project, they pointed out that they gained a better understanding of their own teaching. They explained this by saying that they had to make up new teaching plans by integrating ICT, so they were able to review their previous teaching plans and improve them accordingly. As one of the teachers said: “The project encouraged us to think about the new teaching style through the use of computers ...and develop more knowledge about teaching and learning.”

Another example comes from school A, where both teachers were proud for the attention and significance Director has given to them by selecting them to participate in empowerICT. Their selection was part of the drive and motivation to work on this project. This was obvious during the interviews with teachers where they mentioned the support lent by the Director and the administrator by providing each of them a personal computer. In addition, the Director has periodically asked about the progress of project implementation and allowed the teachers to report the results to and discuss about the experience with their peers in the school’s meeting. As the Director indicated during the interview, “I’ve assigned the three teachers to be the school’s experts to give advice or lend assistance to their peers and expand the knowledge, abilities, and experience to other teachers.” Such praise and honoring greatly helped boost the satisfaction and motivation of the participating teachers.

There were some adjustments that needed to be made for accommodating the needs of the project in the everyday teaching practice. When commenting on the time needed, one of the teachers stated: “with regards to time needed, it’s necessary for teachers to adjust their schedules as part of the time necessary for additional computer learning. There is more work, but in the process we’ve gained more knowledge.”

The participating teachers pointed out that they greatly benefited from this project. For instance, a science teacher considered this project suitable for the Science Division, because ICT integration enabled the students to learn things that were exciting and fun to the students. She said that her intention was to continue with ICT integration in her teaching, after the project would end:

“empowerICT™ is suitable because the teaching with ICT enables students to learn something apart from the textbook. [...] I will continue doing this because it helps students learn in ways that are fun and make them feel excited”.

Teachers also improved their computer skills while working on the project. One of the teachers stated the following: “The teachers learn additional skills in the process of [designing the lessons and activities] for students. ... Based on the observation of teachers, we found that they are more eager in their work, systematically applying ICT in teaching, and develop their own ICT skills.”

Finally, although one of the teachers expressed some skepticism about the success of the project, he was hopeful and positive about the future:

“If you ask whether it’s a success, I am not sure, but if you ask whether I’ll do it, I’d say I’ll “do” it! You can’t really have the success you expect, because it’s quite difficult to achieve the goal in ten weeks. However, I am eager to continue working on this in the future.”

Benefits for the students

From the class observations and interviews with participants, it was clear to the local research team as well as to several teachers that students have improved their ability to express and represent their knowledge using ICT. One of the mathematics teachers indicated that “It’s obvious that the students can clearly express the concepts of knowledge obtained” when using ICT within class activities.

Teachers discussed the students’ benefits from participating in this project. For example, a teacher pointed out that:

“The students seem more eager now in class [...]. They are able to search for information on the internet. [...] I consider it a success that the students can search and find the information they want on the internet.”

This is an indication that the project was a reason for several students in these schools to use ICT in meaningful ways to achieve specific educational outcomes. Data collected from observations and discussions with the students, showed that students became very active in their learning, more concentrated and interested in working on assignments and activities, and collaborate in knowledge exchange. The students who faced difficulties learned to ask help from their peers. The assignments enabled students to share knowledge and support each other. Also from the classroom observations, it was found that the students were coming to class on time and were very willing to engage in their learning tasks. This was in accordance to what a teacher said in an interview about students’ behavior: “Students now seem to pay more attention, attend class on time are more excited always asking how to get the things done”.

Apart from the students’ behavior, classroom observations indicated that students learning habits might have improved. For example, in a science class, the students were asked to search for the information about a constellation which they had studied. The

students used the internet to search for the information, collected pictures of the constellation and neighboring constellations and then shared their findings with classmates.

Based on the classroom observations and the discussions with the students selected to participate in the project as well as the data obtained from the teachers' journals, it was found that the students were very eager in the study, more concentrated and interested in working on assignments and activities, and collaborate in knowledge exchange. When they were working on assignments, students who occasionally faced difficulties in using computer applications, they learned to ask for help from their classmates.

Providing students the opportunity to express their creativity and thoughts through the assignments enabled the emergence of a more exciting learning process for students. For example, in a science class, the students were given an assignment to draw a model of the solar system; they used the internet to search for information and then created computer images to create the model. As one of the students said after this opportunity, "I really liked it. A computer makes my dream come true. I want the classes to be like this every day!" The student's teacher also commented, "The obvious benefit for the students is that their computer skills are enhanced. [...] The students really like the ongoing activities and consult with me or with their friends about the use of computer applications." Another teacher added:

"It's obvious that with ICT the students can express more clearly their obtained knowledge. The students seem to enjoy doing activities by using ICT, whether in designing or doing activities based on what they learn. They're happy creating."

One of the computer teachers, supported what other teachers expressed as well; that is, students came to gradually realize that computers are not only for playing games, but they are valuable tools to be used to achieve certain goals and objectives, learn new things, and represent their knowledge using ICT. Specifically the teacher indicated during the interview: "The students have been more active in using [the computer operating room] in a quite systematic manner. It can be observed that they formerly used computers for playing games, but after they've been given ICT-related assignments, they have a clearer image in mind about their goals besides merely fun." Another teacher stated that one of the advantages is that as a new way of approaching teaching and learning, integrating ICT makes lessons more exciting and can serve as motivator for students to be eager in working with ICT within certain content areas. The teacher said that "The students really like this method of teaching and insist on using the computer lab."

As an indication of student improvement and benefits from the project, time management was mentioned as one of the areas of improvement by some teachers. One of the teachers indicated: "There has been obvious progress in time management. The students concentrate in their work and do not talk with one another in order to complete their assignment". Another mathematics teacher mentioned that "The students' eagerness to study has affected their concentration, attention, and assignments, as can be seen from the fact that they "are concerned about and pay attention to untidy assignments" and "can be observed that the students will use computers to finish their assignments whenever

they're available." Of course, this enthusiasm, might be related to what is known in the literature, as the novelty effect; that is, a new innovation in the classroom get students and teachers excited, something that diminishes over time.

A science teacher stated that

"The students manage their time for assignments by learning that spending too much time with no focus, will lead to unfinished work. This causes the students to concentrate on working and complete their assignments within the given period of time, resulting in well conducted classes and no loud chitchatting, as everyone concentrates on their own works. I can observe such changes in my classroom".

Based on one of the observations (January 5, 2004), the students paid close attention to the activities that were taking place in the class. It was found that providing students with the opportunity to express their creativity and thoughts through the ICT assignments enabled the emergence of the learning process of each of them to the clearer extent. For example, this could be seen in the lesson on finding the length of right-angled triangle (Pythagoras theorem). While the length of the two sides was stipulated by Pythagoras theory, the objective for the students was to find the length of the other side. The teacher assigned the students to make up 5 assignments by using PowerPoint to create the picture of right-angled triangle, stipulating the length of the two sides, then the students had to find out the length of the other side correctly. From the example, the students were provided the opportunity to think and create by using the knowledge obtained during lecture and express the ideas based on the lessons in the form of their own works.

Besides, from the classroom observation, it was found that the students were very eager in their study. Evidence was found that in some schools all students attended the class on time without exception. When the class finished and there was no teaching class to follow, because of the absence of the teacher, the students would ask for permission to continue using the computer (Classroom observation, January 5, 2005). However, the teacher stated that one reason which the students were very eager to study was because they wanted to play computer in the class rather than study from a text book. As a teacher indicated in an interview, "Students study mathematics happily and wish the study hour comes fast, but they will only use the computer and not listen to the teacher".

One of the issues had to do with student level of ICT skills, since not all students were at the same level. In some occasions, this was addressed by assigning the expert students to serve as the tutors for the less competent students thus increasing the peer-to-peer interaction. One of the teachers indicated that "... some students have insufficient ICT knowledge in the beginning so we assign the well-performing ones to be their tutors after class..." This was also seen during class observations. Furthermore, the project seemed to, in some cases, promote the collaboration between students. A teacher from school B stated that the use of one computer for a team of students is a good way of teaching kids collaboration skills: "One computer is available for two students. I don't want each of them to use a computer individually as it'll promote selfishness."

Most students consider their assignments significant by attempting to finish them within class. However, the teachers permit the students who are unable to finish their assignments in class to submit them later on, resulting in some students spending their available time at the computer lab. A teacher said in the interview, “The students spend their time after school or non-class hours to continue working on their assignments at the computer lab.” Aside from using computers to finish assignments at school, the students possessing computers at home use such computers in practice and working, enabling the parents to more clearly acknowledge the benefits of computers usage. A mathematics teacher at School A, has discussed with some parents and received feedback from them, as commented in the interview that: “The parents find the idea that their children have computers for use at home and more knowledge about computers usage likable. Some parents provide their children with computers at home.”

In conclusion, the significant activities or events demonstrating the achievement of the project are based on the evaluation of students. The teachers find that the students are more able in clearly expressing their views and carrying out their assignments in a creative manner and more purposeful in using computers.

Challenges

Lack of support from administration

The lack of support from the school administration in some schools (e.g. School B) made the project implementation very difficult. As a teacher from School B said:

“The management follows up the project periodically, but it does not participate in the problem solving about the schedule to use the computer room. [...] We don’t have enough computers or access to the internet most of the times and we don’t have technical staff to help us.”

Another teacher pointed out:

“The school does not provide enough support, such as the internet access, the utilization of computers. [...] The major challenge in our school is the insufficiency of computers and the issues about the use of the computer room.”

Based on classroom observations, it was found that the computers were broken or the network system was down most of the time in school B. In the 6th week of the project, a teacher informed the research team that the implementation could no longer proceed because “the modem is broken and there is no access to the internet.”

There seemed to be differences in the expectations between the administration and the participant teachers. The administration expected the teachers to design and integrate ICT efficiently and effectively so that students are empowered. The implementation in some schools was largely a process of trial and error, since the teachers were not experienced in integrating ICT. Therefore, the administration was disappointed at the fact that learning gains for the students were not as expected. As for the teachers, they wished the administration was more supportive of the challenges which they faced, not only with

respect to the technical issues but also with respect to their other tasks as well. As one of the teachers said:

“I think we should continue the implementation of this project next year, because this semester was only a trial and error; I have no doubt that this project will enable the self-development of both teachers and students.”

Change in administrative structures (replacement of Director of a school because of retirement) lead to some anomalies in the implementation of the project. The new administration did not have a full and clear picture of what the project is about and could not fully support it. The participation to the project was quite limited as the Director said in the interview. This issue has also been confirmed by one of the teachers during the interview: “Due to fact that the new management just came to this position, he still doesn't know the project objective clearly.”

Although in the management' s point of view, this project was in compliance with the needs and vision of the school, whether to seriously continue the program or not was also depended on the Ministry of Education' s policy. The director said in the interview, “I see the project has value. However, it is up to the Ministry whether to emphasize it or not. Right now, other schools haven't come to this level yet, because they still have to emphasize the use of tools, such as the computer.”

There were cases where the computer teacher assigned for support could not provide the needed feedback because of unpredicted events. For example, In school D, the computer teacher was assigned the coordinating role. Based on the phone conversation with mathematics teacher and science teacher we found that they were not getting proper attention from the administrative side. The mathematics teacher did not get any feedback from the local research team regarding the third lesson plan he developed. This was because the computer teacher who coordinated between the local research team and the mathematics teacher was out of the country for a week and did not send feedback to the teacher.

Limited use of the online portal

Teachers used face-to-face meetings and phones for communications with each other and the local experts, instead of the portal. Although the empowerICT™ team explained and recommended the portal for use in writing journals by the participating teachers, based on the examination of the portal, it was found that each participating teacher wrote their journals only once. Teachers rarely had time to connect to the internet since they have other responsibilities besides teaching. The team resolved the issue by interviewing the teachers via phone and asking them to write down the findings on the dates of observation and interview via phone instead. In school D, the two teachers who replaced their two colleagues they never accessed the internet and the online portal.

The same applied for the use of the portal for discussions. The comments of the participating teachers are demonstrated below:

- “I have some opinions on the web portal. I think it’s of little use as there aren’t any information exchanges taking place within the portal ... I don’t think it’s very useful.”
- “There should be more users, conversations, and exchanges of opinions and teaching plans more than this.”

This is in agreement with research in online discussions that shows that you need between 15-20 active participants in a forum to have the discussions go on. In this project 8 teachers, most of whom did not have regular access to the internet, could not build enough momentum for online discussions to last for the 10 week period of the program.

Several teachers from all schools indicated that using the portal was a problem because of low speed and limited access to the internet. One teacher stated the following:

“I rarely access the portal because I can’t. When I can access it, the loading speed is so slow and I have to wait for hours. As the computer and my office are in different buildings, I have to settle my work in another place. The speed should be accelerated.”

However, other teachers disagreed. A teacher from school A said: “I use the portal because the team reminds me about it and I’m curious about the conversation going on there.”

Teacher workload and lack of time

A computer teacher who served as a consultant to subject matter teachers in school B stated the following:

“The tasks of these teachers should be reduced. On the question whether reduction is possible, as the administrator said, I have to say it’s not. The problem is inadequacy of personnel and dedication. It’s not that teachers do not wish to dedicate time to the project, but they’re also engaged in other tasks, which prevents them from doing so. The teachers don’t have only teaching responsibilities but also many other ones, from the morning until the evening, and even on weekends. This is the problem.”

In some occasions, there was collaboration between content teachers and computer teachers (e.g. School A).

“I’ve consulted with the computer teacher on the search for websites relevant to the lessons. Afterwards, I searched for them on my own and let the students study the content of the selected websites.”

empowerICT™ was just a small piece of the puzzle in the daily activities and responsibilities of the teachers and students. Teachers have several other responsibilities, projects, and duties that do not allow too much time for innovation and the try-out of new things. In School D, a teacher had to attend seminars out of the country, was pursuing a Masters degree, and also had a fulltime teaching job. This disrupted the teacher’s participation to the project and ability to meet deadlines and plan around her schedule. In addition this teacher had an accident that forced her out of school for a week.

The overwhelming teaching and administrative responsibilities of the participant teachers complicated the implementation of the project. For example, one of the teachers could not be reached (either by phone or by email) for more than a month because of his other school responsibilities. This caused a lot of disruption in the ICT integration plan and the local research team was not capable of assisting the teacher in problem solving. One of the teachers said: “I teach 18 hours per week and I also have several other responsibilities. There is no time for doing everything.”

Teachers from School B expressed interest to withdraw from the very beginning of the project, for several reasons. Such reasons include the lack of ICT skills, and the lack of time to participate in educational technology projects like empowerICT.

Infrastructure

Slow internet connections, limited access to computers, and malfunctioning modems, caused complications in the deployment of the project. The unavailability of computers and network system was perhaps the most serious challenge in the schools (e.g. School B, C). For example, the computers crashed most of the times in school B and teachers were unable to enter into the web portal. Also, there were many conflicts of schedule resulting to the unavailability of the main computer lab. As one teacher pointed out:

“I rarely access the portal because I can’t. When I can access it, the loading speed is so slow that I have to wait for hours. Since the computer and my office are in different buildings, I have to settle my work in another place. The speed should be accelerated.”

The lack of infrastructure will always be an issue. When there are no enough computers and labs for teachers and students to use, complications arise. Furthermore, the lack of rooms, brings about difficulties in the availability of the schedule to move classes around. So, it makes it difficult for classes that are not “computer classes” to book the lab for a lets say math course so that they use the computer.

School D was ready in the aspect of number of classroom and the computer equipment and its computer to student ration was 1:9. Besides the computer classroom, each class also has its own computer. Although, the school was ready in terms of computer access, from the observation of a teaching class we found that there were still the challenges of the number of computers and the time to access computer. The number of the students was 57 in this particular class and number of computers in the computer lab was 15. Therefore, only one out of four students would have a chance to use the computer during the class. It also relates to the tight schedule, as one teacher mentioned during the observation of her class “The time to use computer is quite little because of the schedule to use the room is quite tight, therefore; it has to rearrange the proper schedule.”

Scheduling

As indicated above, the lack of sufficient infrastructure, and lack of enough rooms, and the large class sizes, caused problems in the implementation of the project. A teacher

from school B stated: “The first problem encountered is the conflict between the schedule for classes and that for the usage of the computer operating room so we need rescheduling.” Time management and scheduling the usage of computer rooms was an issue that faced by all schools. Since the schedule for the computer labs was usually done at the beginning of the academic year, some activities were determined to be carried out at the computer operating room in advance. Therefore, the classes under the ICT integration plan, which needs to be conducted at the computer lab, acted as a barrier and the Computer Division had to readjust the schedule. It was not always possible to follow the readjusted schedule. However, this challenge in some schools was resolved by the cooperation from the administrator, the computer teachers, and the participating teachers within the school (e.g. school A).

Lack of teacher's ICT skills

The teachers did not know exactly what ICT skills their students had, so they could not plan accordingly. But, discussing the issue with the computer teacher, he helped them understand their level of knowledge and expertise. As indicated in an interview by a teacher at school A:

“The preliminary issue faced by teachers is that they have no information on the applications that are already in students’ knowledge. It’s after we’ve inquired the computer teacher that we know...”

During the implementation, it was found that there were technical issues in collecting students’ assignments, 2-3 of which were lost. The analysis pointed to the possibility of mistake and lack of sufficient knowledge in documentation in the complex layers of folders within a computer desktop. The method of students’ assignments documentation specified by Computer Division is that the files are kept on the hard disk of the server of each operating room, categorized by classrooms and further classified into individual students who have their own folders.

Similar to the case study of School B, the case study of School D were the 2 cases which faced several challenges in implementing the program. These case studies are good examples in which the project team should be prepared to improve for the next phrase. There was lack of details in selecting the participating teachers, so unsuitable teachers who were not willing to participate have been selected. They did not possess basic ICT skills and they were replaced soon after the project was kicked off. As for the replaced teachers, they participated because they were asked from the Academic Division of the school and not because they volunteered.

Assigning teachers to the project without asking them

In some schools, teachers were not offered the option to choose to participate but they were asked to by the administration (e.g. school D). So, when teachers are not participating in the projects following a shared ownership model for the project, it is unlikely that they will bring the commitment needed for the project to succeed. The School D Director stated in the interview, “Although their [teachers] qualifications were complete, they were not willing to participate. We did not ask for their willingness.” This

is a typical problem in projects of this nature. When teachers are not actively involved in the decision making, projects will not be successful.

This is in contrast to school A, where teachers were selected based on their interest to participate. As indicated in the interview by the school A Director:

“We selected those teachers who are willing to participate, accepted by their peers and able to further relay the knowledge because some teachers may understand what they have learnt but relaying the knowledge to their peers.”

This is one of the main reasons that school A was the most successful of all schools. The fact that teachers choose to participate and were committed to making the project a success.

Discussion and Recommendations

Overall the project is promising in serving the needs of Thai schools. There were cases of schools (e.g. School A), where the project was more successful than others (e.g. School C). The reasons for this were illustrated in the discussion of the success and challenges of the program. Most of the successes and challenges identified in the Thailand pilot are issues that have been identified in several studies of technology integration programs (Vrasidas & Glass, 2004, 2005). Based on the findings of this pilot, there are several recommendations that can be made for improving the project and ensuring it meets all stakeholders' needs.

In case of School A, based on the aforementioned findings, the school has had the most satisfying achievements in implementing the project. The success of this school was mainly based on the following factors:

- Alignment of empowerICT™ goals with the school's vision
- Support and attention of the administrator in selecting the appropriate teachers to participate in the project;
- Collaboration in problem-solving between the administrator, the computer teacher, and the participating teachers concerning the schedule for the computer operating room and assigning the computer teacher to regular lend assistance in the science and mathematics integrative classes;
- Positive role of the school Director and the computer teacher in facilitating the performance of the participating teachers;
- Concentration and cooperation of the participating teachers and the local research team;
- Attention of Director in following up the performance of the teachers and the local research team, as well as motivating and stimulating the participating teachers;
- Abilities of the teachers in designing the variety of the ICT integration plans, allowing the students an opportunity to try using several applications such as Microsoft Word, Microsoft Power Point, Paint Brush, and Internet Explorer.

The implementation in school B has challenged the ongoing status of the project since there were many problems that can serve as the example of problems to be prevented and corrected in the next phase. Those challenges include the following:

- There was lack of coordination within the school and limitation in the administrator's support, resulting in the participating teachers not receiving adequate assistance and feeling isolated.
- The computer teacher did not act as a good facilitator to resolve the issues on scheduling the computer operating room for teachers to try out their lesson plans.
- The selection of teachers was not based on a voluntary model. Teachers who were assigned by the administration had several other teaching responsibilities and other service tasks within the school and prevented them to benefit the most out of the participation in the project.

School C had several successes in the project but also faced similar challenges with school B. As discussed in earlier sections, the participating teachers had improved their understanding on implementing technology in their classrooms. This success was a result of the close collaboration between teachers, administrators, and local team. However, selecting teachers with basic ICT skills would have increased the success of the project in this school.

In School D Similar to the case study of School B there were also several challenges.

- Teachers were not selected following the criteria presented by the team, and teachers were appointed to the project without their will. These teachers lacked the basic ICT skills needed and they soon resigned from the project. The teachers who replaced them were not asked to volunteer for participation and therefore, they did not have the commitment necessary for such initiatives.
- The lack of time on behalf of the participating teachers was a problem that prevented them from actively participating in the project. This also led to limited coordination with the local team of experts.
- There was lack of the coordination at the school level and limited support from the school's management. The participating teachers did not receive adequate support.

Based on the findings of this pilot, below are some recommendations that can improve the project and its impact on teachers, students, and their schools.

Reduce teacher tasks and responsibilities during pilot phase

There should be a reduction of the participating teachers' responsibilities so that they devote more time to developing lesson plans integrating ICT and development of their computer skills. Although the school provides the participant teachers with personal computers and assigns the computer teacher to assist the teacher in class, the school administrator should reduce other tasks of the participating teachers (at least in the initial phase), because the teachers are yet to be familiar with planning and teaching using ICT.

Support by school administrators

More support from the administration and the school should be provided. Although the administrators emphasized the importance of ICT integration, some of them were not very willing to support it all the way through.

Offer incentives to teachers participating in the project

More attractive incentives should be provided for the schools, administrators and participating teachers; for example, more active promotion of the project in the community; awards and other prizes to the participating teachers; and social and professional recognition for the teachers who participate. Suggestions that were provided during the initial stages of the project included the recognition of the teacher's participation in the pilot with credits for service, or credits towards a possible graduate degree.

Select schools with the available technology infrastructure

As the project is an ICT-related pilot project, the availability of computers and other ICT is a critical factor. Care should be placed on the selection of participating schools since some candidate schools may possess limited number of computers and unstable networks. The technology infrastructure was one of the major challenges faced by all schools.

Allow more time for preparation

Extend the period of coordination and teachers' preparation and allow teachers more time in creating and writing the lesson plans. This time should also be used to enable local experts to work more closely with the teachers in reviewing their work and providing teachers with feedback, before actually implementing the lesson plan in the classroom.

Offer debriefing upon completion of the pilots

Meeting between teachers and project team during the project implementation or after the end of the project should be arranged for offering conclusion, criticism, and exchange of opinions and experiences between the participating schools.

Continue beyond the pilot phase

Continue the empowerICT™ implementation in collaboration with the participating schools since the only 10-week period of implementation may not be adequate for some participating teachers. Furthermore, in order to see any real impact, this project needs to continue by serving more teachers for longer periods.

Workshop structure

The workshop should include more training about the development of lesson plans integrating ICT into subject matters with more concrete examples. Reduce the time spent on using the portal and increase the time of lesson plan development and assessment

integration. Teachers needed more examples of activities and lesson plans to help them understand the process of technology integration and assessment.

Engage the Ministry of Education

It is necessary for the project to be supported by Ministry of Education to increase its legitimacy. When the Ministry of Education is involved in the project, both teachers and administrators will feel the need to be more actively involved and support the project in ways that it will best serve the school's needs.

Selection of teachers

During the project implementation, the strict control must be put upon the implementation by the selected teachers. The local team may discuss with the teachers to participate to serve as indirect examination of their qualifications and not allow the schools to proceed on their own in this part. For instance, in case of School D, the participating teachers had to resign from the project because of their limited ICT skills. This caused a delay in the specific school and impacted the school's ability to benefit from the project. Another suggestion, and which is based on the findings from School A, is that it will be good to pair the subject matter teacher with computer teachers. In this way, computer teachers can be valuable sources of support for teachers with limited ICT skills and help them improve their skills as they are integrating ICT in their classrooms.

Scheduling for the pilot

The implementation should take place in the first semester rather than the second one since there are more holidays in the second one, which affects the continuity of the project. Besides, it will be more convenient for the teachers to prepare the lessons since they have already planned the lessons in the second semester since the beginning of the first one. Moreover, based on the information given by some teachers, it was found that the contents in the first semester are more appropriate to link with the integration.