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# UNDERSTANDING PERSPECTIVES OF TEACHERS IN THAILAND TOWARDS INFORMATION AND COMMUNICATION TECHNOLOGIES INTEGRATION IN THE CLASSROOM

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**by**

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# Dedication

To my parents, my first teachers

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# UNDERSTANDING PERSPECTIVES OF TEACHERS IN THAILAND TOWARDS INFORMATION AND COMMUNICATION TECHNOLOGIES INTEGRATION IN THE CLASSROOM

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The purpose of this research is to explore Thailand teachers' perspectives towards the integration of ICTs into the teaching and learning process in order to better understand how teachers use technology for classroom instruction and their perceptions of the factors that influence their use of ICTs. The study applied Interactive Qualitative Analysis (IQA) approach to draw a systems thinking of teachers and to provide in-depth perspectives of teachers about their implementation of ICTs in the classroom. Eighteen computer teachers and twenty-two mathematics teachers participated in a focus group interview. Fifteen computer teachers and fourteen mathematics teachers were invited to participate in an individual interview.

Results from the data analysis based on the IQA approach showed that teachers' perspectives on their integration of ICTs encompassed several components including School management and administration, Content and curriculum, Teacher, Information and Communication Technologies (ICTs), Student, Environment, Time, and Parent or

guardian. The results also revealed a systems thinking of teachers that showed the interrelationships of the affinities. The statistical analysis comparing the perceptions of two teachers groups showed that there was only one affinity, which was “Student”, found to be significantly different at the .049 level. This could be because of difference in teacher perceptions of students. For other affinities, the results showed that both groups of teachers did not perceive their work experiences in a significantly different way.

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# Chapter 1: Introduction

## A TRUE STORY

In January, 2008, I had an opportunity to interview a teacher who has been teaching at a small-size school in Prachinburi province, in the east of Thailand. He is the only computer teacher who also teaches music and similar to many other computer teachers in Thailand, he also is responsible to a non-teaching job and an administrative job. His story will help us to better understand what it is like to be a computer teacher in Thailand.

> I have been teaching for 11 years. At the school, there are about over 100 students. I earned my Bachelor degree in music. I am good in music. I teach music for 8 hours per week. For the computer subject, it is 12 hours per week. I actually knew how to use computer since I was at the college and later I learned more by myself. When the school decided to open computer subject, they tried to recruit a computer teacher, they first tried to find one from the teachers in the school and so they asked me to teach. Since then I have tried to improve my computer knowledge and attended the training. I had an opportunity to work with the Institute for the Promotion of Teaching Science and Technology (IPST) and became one of the leadership of computer teachers. I learned more about teaching strategies and techniques. My work as a computer teacher became more obvious since then. I try to manage my working schedule. However, it is hard because sometimes I have a job that is urgent and it affects my teaching. For example, when I have to work on an evaluation of the school's work, which is one of my responsibilities, I cannot fully focus on my teaching and sometimes I have to leave the students in the class and have them study or work on the practice sections. It happened occasionally. Right now the teachers from different departments cannot help me teach but we already provided training for them so that they know how to use the computer like basic application. I hope they can learn more and are able to use it for their work. However, I am not sure if they can teach but for sure I think they can use it.
>
> There are about 30 students per class and we have a sufficient number of the computers for the students. We used to have a problem because of an insufficient number of the computers. It was not enough so I had the students sit and share the computer. It was like two or three students worked together on one computer. Two students worked together seemed to be fine but three students; it became a problem because some did not pay attention to their work. Later, we

have more computer machines and the students can use the computer individually. However, I think there still is a problem because when they can use the computer individually, they tend to do something else like listening to the music and playing games. I have to observe them more closely, to check what they are doing now.

The internet at our school, it used to be a dial-up system and the problem was that it was very slow and it was down whenever the students accessed the internet at the same time. Now it is Asymmetric Digital Subscriber Line (ADSL) system. It is faster but I think there are both benefits and drawbacks. The benefit is a high speed access and the students can access to information and get their works done faster. However, the drawback is that the students just use it for fun. They can go to different websites in a short time and now they can listen to the music and watch video clips. It is faster but still there is a drawback.

Usually I teach Information Technology, which is a required course in the 7th grade, and then the 8th and 9th grades I open elective courses. The content actually is adapted from the national curriculum. The elective courses are developed based on the student's capability. I mean it is necessary for them to know basic software application like Microsoft Office, the Internet, and Webpage development. At least they should be able to develop a webpage by using HTML. After they know about HTML as background knowledge then I introduce them about the use of webpage development tools.

I focus more on the use of technology to support the synthesis of their own knowledge. I would ask them to develop a webpage but they have to do a research study and synthesize the contents and then create a webpage. They can select their own topic and they can also use it for another course as well. The point is they need to learn how to do research, synthesize, and deliver through a webpage.

Actually I think it is easy in my case that I teach by myself and so I can just make my own decision. The school leaders do not intervene in my teaching but they would like to see students receiving awards. They just love to see when the students received awards. As long as the students got awards, they would not bother with my teaching.

For the past 11 years, I think most of the school leaders had pretty much the same vision. They tried to support the technology improvement in the school but it was not the only thing that needed to be improved. They had to support other things as well. Although the school district board realized this issue, they could not help us or make a complete change.

Overall, I would say that the students in the previous generation paid more attention to their learning and their behaviors were very easy to handle. However, the students in this generation can work on the computer individually but they do not pay attention on their learning. They want to know how to use it but not for their learning. They want to play. They know how to access to the internet but they do not use it for studying. When there are many more students like this, it is hard to increase their learning achievement. I do not think that this problem happens only in any particular school but I think most schools have this issue.

> Where does this come from? I think it is because of the external factors. One is that the Ministry of Education set up a policy to protect the students and now the teacher cannot hit the students and the school cannot throw out the students. The students know all about this policy and even if they failed the test several times they knew that the teachers would help them get through that situation. They will graduate no matter what or how bad they do. I think that this policy just misleads students. They do not have to be responsible for their study because they know that they will not fail or if they fail, they still can graduate.
>
> My role as a teacher is to teach students so they have knowledge as well as moral and positive thinking. Overall I am not quite satisfied with the learning outcome. Only a particular group of the students that received awards and I think part of it is because the students are ready to learn. They put a lot of effort on their learning and that makes it easy for us to help them. However, I am concerned about the majority of the students and would like to improve their learning.

The above quote from a teacher in a pilot study conducted by the researcher provides some perspectives on the context and barriers perceived by this teacher in using computer in the classroom. The barriers this teacher encountered are shortage of teachers, lack of support, and heavy workload, for instance. It should be noted that Thailand has a wide array of educational contexts such as small and large, rural and urban schools. One can see a huge difference in many aspects (e.g., school environment, resource availability, student-teacher ratio) between schools in Bangkok and small rural areas. Thus, this study will underscore the needs to better understand how teachers from different contexts in Thailand implement Information and Communication Technologies (ICTs) in the classroom. Such information will enrich and facilitate policy maker and other stakeholders involved in educational system in Thailand to develop an effective plan to support teachers' integration of ICTs.

The narrative story above provides insights into how teachers, not only a group of computer teachers but also teachers who teach different subject areas, experienced and perceived situations in their computer and technology usage in classrooms. After the interview, I realized how little I knew about teachers' lives. There are a number of

computer teachers who did not graduate from a computer related field but have been teaching computer classes. They learned to use computers based on their personal interest. They have been using the prescribed curriculum and course content and activities for years. After the National Educational Reform Act of 1999, teachers now are responsible for developing the school curriculum and are required to apply a student-centered learning approach. Furthermore, teachers in different subject areas also are required to integrate computers and technology in classrooms. Thus, the computer teachers in many schools have to provide staff training and technical support to their colleagues. Moreover, with the rapid development of technology, it is not only computer teachers, but also teachers in different fields who need to keep learning about and be able to adapt to new technology in order to improve the teaching and learning processes. So, it is important to understand whether the factors identified in the above story are common among teachers who use computers around the country, and particularly, to understand how computer teachers and teachers in different fields view their situation related to the integration of technology in their teaching process.

## BACKGROUND

"Technology, in general, and the internet in particular, has been enthusiastically embraced as a medium for diminishing spatial, social and political inequalities," said Servon (2002, p. 222). Because of the rapid change from the industrial to the information age, many countries have been increasing funding for the infusion of Information and Communication Technologies (ICTs) in education. It is increasingly recognized that technology can support the use of a constructivist learning theory-based approach to learning, including student-centered learning and inquiry-based learning approaches, as

part of national educational reform efforts. However, simply investing in installing computers and other tools in the classroom is not sufficient to make a change in instruction. Without professional development and support, teachers will use ICTs to support traditional practices (Niederhauser & Stoddart, 2000). Many studies have found that teacher's beliefs and prior experiences (e.g. Kagan, 1992; Ertmer, 2005) are the key factors affecting how teachers implement ICTs in their instruction. According to Niederhauser & Stoddart, teachers tend to use technology in ways that are consistent with their personal perspectives and beliefs about curriculum and instructional practice (2000).

However, Fang (1996) and Ertmer (2005) noted that it is difficult to measure beliefs and that "beliefs do not always inform practice" (Belland, 2009, p. 355). In the qualitative multi-case study conducted by Andrew (2007), the researcher interviewed four pre-service mathematics teachers regarding their conceptions and plans for classroom instruction. Although the participants claimed that they taught based on a constructivist approach, the observation data found that they applied a variation of approaches based on teacher-directed learning methods. Although beliefs can determine one's action, Belland (2009) mentioned that not all actions are executed as beliefs, in fact, "all cognitive behavior (as opposed to involuntary behavior like breathing) requires mental activity" (p.3). According to Belland (2009), a cultural setting acts as life conditions which influences any cognitive behavior. As we have seen from the "true story," there were a number of conditions perceived by this teacher that impacted his use of ICTs in his teaching practices. It underscores the needs to better understand the perspectives of a wider group of Thailand teachers across a wider range of school contextual conditions and from different subject areas in order to more effectively use ICTs to enhance learning for students in Thailand.

## STATEMENT OF PROBLEM

The educational reform in Thailand, the National Education Act of 1999, aims to provide quality basic education 12 years and to rate the quality of education to ensure Thailand is able to compete internationally. The National Information Communication Technology (ICT) plan expected that by 2004, 80% of secondary school teachers will attain ICT knowledge and skills (Ainley, Arthur, Macklin, & Rigby, 2002). The Institute for the Promotion of Teaching Science and Technology (IPST), an organization under the Ministry of Education, has developed a master plan for training teachers in the subjects of Science, Mathematics, and Information Technology. The Computer Department, focusing on supporting teachers who teach Information Technology subject, has developed and provided instructional materials and professional development program for the teachers. However, the situation is not simple. Pitiyanuwat and Sujiva (2005) mention that the quality of education in Thailand is critical and there is a downward trend in students' seeking knowledge, ethics, morality and disciplines and Thai culture values. There is also a gap between those who have access to technology and those who have not, which in fact has a huge impact on education. In addition, Pitiyanuwat and Sujiva (2005) indicate that "the teaching and learning processes still focus on transferring academic knowledge and memory-based learning" (p. 67). The government of Thailand provided the funding on the installation of computers, however, it did not manifest in student's learning. Chiangkool (2006) mentioned that the investment in hardware was only a superficial aspect of an improvement. The government should find a way to improve teacher's quality based on the systemic point of view. The problems have accumulated and make the situation more complicated to transform the teaching and learning process. How the teachers view the situation and self should be examined in order to make better decisions for supporting the teachers.

Even though the reports by the Office of the National Education Commission (ONEC) indicated situations relevant to improving the education system in Thailand (e.g. Fry, 2002; Stamper, 2002), there is still a lack, particularly, of qualitative research to understand how teachers think about their implementation of computer and technology in the classroom.

## PURPOSE OF THE STUDY

This study seeks to understand the conceptual thinking and perceptions of teachers in Thailand towards computer and technology use in the classroom. The study involves two groups of teachers: teachers who teach computer subject and teachers who teach mathematics subject. In particular, the study applies Interactive Qualitative Analysis (IQA) approach to draw a systems thinking of teachers and to provide in-depth perspectives of teachers about their implementation of ICTs in the classroom.

## RESEARCH QUESTIONS

The following are the research questions addressed in this study:

1. What factors comprise teachers' perceptions of, and reactions to, integrating ICTs in the classroom?
2. How do these factors relate to each other in a perceived system of influence or cause and effect?
3. How do the two groups' (computer teachers and mathematics teachers) experiences of ICTs integration in the classroom compare to each other?
4. How does the individual's experience of ICTs integration in the classroom compare to that of the group as a whole?

## SIGNIFICANCE OF THE STUDY

Several studies examined the implementation of computer technology in the classroom focusing on the correlation between teacher's belief and teaching practice (e.g., Anderson & Maninger, 2007; Ravitz, Becker, & Wong, 2000), barriers and motivation factors to use technology (Drent & Meelissen, 2008), and how teachers use computers and internet technology (O'Dwyer, Russell, & Bebell, 2005; Wallace, 2004), there is very limited research that examined teachers' perspectives on their work conditions (e.g., Zhao, Pugh, Sheldon, & Byers, 2002). This study aimed to explore teachers' perspectives towards their use of ICTs in the classroom. Particularly, none of the previous studies compared the perspectives between teachers who are experts in computers and those who are novices or are not required to extensively use the computers in the classroom. The perspectives of these two groups of teachers would provide insights to their perceived realities in teaching with computer and technology.

# Chapter 2: Literature Review

The purpose of this study is to explore how teachers in Thailand perceive the computer and technology use in classrooms. After the fourth movement of the educational reform in Thailand, the teacher is perceived as a key person in improving students' learning and increasing the achievement of students' abilities in academic competitiveness at an international level. Teachers are required to apply student-centered learning approaches and to integrate computer and technology, which require that teachers change their pedagogy. This chapter reviews relevant literature to establish a conceptual framework for this study. The review is divided into three sections. The first section provides information related to the education system in Thailand. The second section discusses research related to the integration of ICTs in instruction. The third section presents a review of previous studies on factors relevant to ICTs adoption.

## EDUCATIONAL SYSTEM IN THAILAND

### Educational system: General information

Thailand, known as Siam throughout its history until 1939, is a small country in Southeast Asia. The majority of Thais are Buddhists. Thais experienced a big change in educational system as King Chulalongkorn (Rama V) transformed Siamese education from a religious-based temple system to a modern system. The monarchy was replaced by an authoritarian military rule from 1932 to 1973. In October, 1973, a fight between university students and the military lead to a democratic system, under the constitutional monarchy. During that time, there was a shift from an agricultural-based to industrialized economy. In 1977, educational system was changed from a 4-3-3-2 structure to a 6-3-3

system in which six years of compulsory primary education is followed by three years of lower secondary school and by another three years of upper secondary schooling, which is still in use these days (Ministry of Education).

The population in 2008 was approximately 65.4 million people (World Factbook, 2009). There are approximately 600,000 teachers responsible for the education of around 12 million students (Charupan & Leksuksri, 2000). 85 percent of teachers work in public schools while the remaining 15 percent work in private schools. The student-teacher ratio is one major indicator of the internal efficiency of an educational system. In Thailand, the student-teacher ratio during 1997-1998 in general was below the standard set by the Teachers Civil Service Commission (TCSC). For example, the student-teacher ratio in primary schools was 18:1 lower than the standard of 25:1 and in upper secondary schools the ratio was 18:1 equal to the standard set by TCSC. Another report in 2001 indicated that student-teacher ratios of 19:1 in primary schools is lower than the standard of 25:1, 21:1 in lower secondary is slightly higher than the standard of 17:1, and 21:1 in general upper secondary and 31:1 in vocational upper secondary slightly higher than the standard of 18:1 (ONEC, 2001, p. 58). However, one must keep in mind that these figures include all administrative personnel in Bangkok, regional and district offices and schools. Wallace (2003) pointed out that the average student-teacher ratios she had observed in the city of Chiang Mai in northern part of Thailand, and also in some nearby suburban and rural schools, were closer to 45:1 rather than student-teacher ratios cited in the report by Office of the National Education Commission (ONEC). Thai classrooms are generally very overcrowded.

About 25 percent of the government budget is spent on education (World Bank, 2008), however, Atagi (2002) lamented that less than one percent of the funds support teacher training. Thai students, age 12-14, receive much less instruction time in science

and mathematics (167 hours a year) than students in other countries such as Australia (251 hours a year) and South Korea (204 hours a year) (Atagi, 2002). According to the International Association for the Evaluation of Education Achievement (IEA), out of 38 countries that participated the competition, Thailand ranked 25th in International Science Achievement and ranked 27th in International Mathematics Achievement. Yuthawong (1997) noted that science and mathematics are core subjects related to technology development, which directly affects innovation and productivity. Thus, this could be a major issue to improve Thailand in such a competitive world.

**Educational reform in Thailand**

The National Education Act B.E. 2542 (1999) was approved and became effective in August 20th, 1999 (Charupan & Leksuksri, 2000). The Act was expected to be an apparatus of education reform for a better Thailand. The National Educational Act 1999 is composed of 9 chapters, namely Chapter 1 General Provisions: Objectives and Principles, Chapter 2 Education Rights and Duties, Chapter 3 Educational System, Chapter 4 National Education Guidelines, Chapter 5 Educational Administration and Management, Chapter 6 Education Standards and Quality Assurance, Chapter 7 Teachers, Faculty Staff, and Educational Personnel, Chapter 8 Resources and Investment for Education, Chapter 9 Technologies for Education, and Transitory Provisions (ONEC, 1999). There are two parts of the teacher reform sections. The first part relates to the teaching profession reform, stressing the teacher and administrators license; the decentralization of the personal affairs administration; the new scale of the salaries, remuneration and other benefits for teachers and the promotion and development of teachers by giving them recognition, incentives and R&D projects on teaching reform

(mentioned in Chapter 7). The second part is concerned with the quality of the teacher in terms of the reform in learning and teaching (mentioned in Chapter 4).

Kaewdang (1999), the Secretary General of the Office of the National Education Commission (ONEC), proclaimed that to reform teaching and learning; both teachers and learners must change their roles. "Teachers must change from a "teller" to a "facilitator", while learners should be able to learn by themselves, provided that they are assisted by teachers how to learn, where to get information, and how to make use of it," mentions Kaewdang (1999). The following table presents a comparison of the teaching process between teacher-centered and student-centered:

| **Issues** | **Teacher-centered** | **Student-centered** |
|---|---|---|
| Unit of learning | Individual | Individual/group |
| Emphasis | Contents | Learning process |
| Learner's role | Listen, memorize, passive, silent | Participate, interact, experiment, analyze |
| Teacher's role | Teach, tell, lecture, direct, evaluate | Facilitate, guide, plan, advise |
| Atmosphere | Formal, closed, distant, stressful | Informal, fun, inspiring, friendly |

Table 2.1: Comparison of teacher-centered and student-centered approaches [1]

The characteristics of the student-centered approach are new to Thai teaching and include a teacher's ability to create an environment that encourages students to construct knowledge and to use research as part of the learning process. In addition, a teacher should make sure that students are able to develop skills in discovering information and creating knowledge on their own, that students practice self-evaluation and are interested

[1] From "Learning for the New Century," by R. Kaewdang, 1999, Retrieved January 3, 2009, from http://www.edthai.com/reform/dec16a.htm.

in life-long learning. Taken together, these new characteristics closely reflect international standards and best practices in teaching (Wallace, 2003).

**Thai culture VS critical thinking**

Generally Thai people are friendly and hospitable. Rooted from the feudalism system in the past, social hierarchies are quite strict in Thai society. It is based on age and gender as humble younger people are supposed to respect the older ones and males are more likely to receive a better opportunity in education and work. The older ones, in return, provide support to those younger people. Wallace (2003) described:

> This means that the long-used patronage approach is the acceptable way of business, politics and education. A politician will give contracts to people he knows. A school will feel obligated to admit the children of alums. A business owner will hire people he or she knows. (p. 3)

As such, any disagreement can be easily perceived as not being respectful to others. This sensitivity to disagreement, in turn, can be a barrier for critical thinking, which is one of the important skills in student-centered learning approach. Wallace (2003) conducted a study in three schools in the Northern part of Thailand to investigate Thai teachers and the perception of quality teachers. The study found that Thai people perceived quality teachers as equal to "moral parent" (p. 14) teachers. Only 30% of the interview data were found to be relevant to teaching. One of the reasons would be that Thai people believe in "Karma" or doing good things, getting good things in return and vice versa. As such, Thai people consider that being smart or successful in work does not mean or promise that one will also be a good person. This is reflected in the view of a good teacher as a moral parent with teaching effectiveness as secondary consideration. Wallace (2003) concluded that the characteristic of moral parent teachers, a social value

in Thailand, often worked against the attempt of improving critical thinking of both teachers and students in Thailand.

**Computer and technology integration in Thailand**

After the educational reform, Malaivongs et al. (2001) conducted a survey study in 1999 to investigate the readiness in using the ICTs in secondary schools in Thailand. Two major issues included a shortage of teachers, particularly those who teach mathematics, science and computer, and a lack of computer and limited access to the internet. For the small size schools that had less than 300 students, there were only about 1-4 teachers who taught mathematics and science subjects. For the large size schools that had more than 2,000 students, there were more than 11 teachers in mathematics and science departments. In the computer subject area, about 43 percent of the schools had only 1 computer teacher and about 21 percent of the schools had about 2 computer teachers. Moreover, only 54 percent of the computer teachers received a degree in a computer related field. 90 percent of the computer teachers mentioned that they also had to be responsible for non-teaching jobs.

Related to computer and internet access, 88 percent of the schools had computer desktops for the students to use for learning. The small size schools mostly had about 10 machines, while the large size schools had about 50 machines provided for students' learning. Only about 44 percent of the schools had access to the internet.

However, in 2000, Ministry of Education provided approximately 190,000 computers to schools, and more than 150,000 of which were used to support the learning process (Belawati, 2003). In those schools with computers, most have integrated the use of computer in the curriculum such as word processing, spreadsheet, and hypermedia for

publishing work on the internet and searching for information via the internet (Belawati, 2003). Unfortunately, there is a lack of research evidence regarding how teachers are integrating ICTs in the classroom.

**Major issues after educational reform**

Chiangkool (2006) mentioned that six years after the reform, Thailand still encountered several issues regarding quality teaching. Although the government of Thailand has provided a large amount of funding to purchase computers and other peripheral tools, the investment in technology helped solve only a small part of the teaching and learning issues. He pointed out that the most critical issue that the government should focus on is teacher development. With the limited and short duration programs of training and workshops, teachers in general were likely to teach in the same old way. Particularly, the policy that allowed in-service teachers to automatically receive and renew a teaching certificate just reduces the motivation of teachers to seek training to update their knowledge and skill and thereby improve the quality of teaching. Moreover, the low salary of the teaching profession in an economic crisis has caused a shortage of teachers particularly in mathematics, science, English, and computer literacy and programming.

In addition, the entrance examination and the standardized tests have reinforced education as a competitive system and encouraged the emphasis on rote learning. The student's learning goal is to pass the entrance examination rather than to be a life-long learner.

## ICTs Integration in Classrooms

As new technologies, particularly the internet, grows rapidly, people need new skills such as appropriation, judgment, and networking to be able to wisely apply new tools in ways that are meaningful to them (Jenkins, 2006). New technology becomes a part of students' life in the 21st century (Solomon and Schrum, 2007). Although a large amount of budget has been invested in communication infrastructure and computers, ICTs have not been widely and effectively implemented in the classroom instruction (Aviram, 2000; Cuban, 2001). Why did the schools fail to integrate new technology in teaching and learning activities? What are the key factors influencing educational change? Many studies that focused on these questions tried to examine the situation by applying different frameworks. For example, Senge (2000) proposed that we need to consider schools as a system consisting of cultures and values. According to Banathy (1973), the school is a part of the society and is influenced by the society. The school is viewed as "an open system, but it is not completely open" (p. 13); there are relationships among "inputs" or what schools and stakeholders such as school principals, teachers, and parents can provide, "constraints" or limitations within schools and difficulty perceived by stakeholders , and "outputs" or students' attainment. Thus any decision to bring in new ideas or innovations would be based on a consideration of these inputs, constraints, and outputs. Linking to the conception of school as a system, Rogers (1995) proposed a theory explaining a process of innovation adoption in an organization. Acknowledging that people tend to adopt innovations at different points in time, he mentioned that it depends on the characteristics of adopters and communication channels available for adopters. The innovation diffusion theory has been applied as analytical framework to understand adoption of educational technologies in many studies (e.g. Dooley, 1999; Frank, Zhao, & Borman, 2004; Huff & Munro, 1989). However, recent research has

started to focus on teacher's transformation and how teachers who adopted new ICTs change their practices.

In the section that follows, I will discuss innovation diffusion theory and its relation to the transformation of teachers' computer technology implementation.

**Innovation diffusion**

Rogers defined an innovation as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (1995, p. 11). An individual may make a decision either to adopt or reject an innovation. Any decision-making can be conceptualized into five stages: (1) knowledge, which is the first stage when an individual receives or seeks for information, (2) persuasion, which happens as an individual has either favorable or unfavorable perceptions about new technology, (3) decision, which happens when one makes a decision to either adopt or reject new technology, (4) implementation, which occurs when an individual applies new technology, and (5) confirmation, which happens as one routinely applies and reinforces the use of new technology. In Dooley's (1999) study, the researcher categorized participants into groups based on their competence in computers (high, middle, and low) and then examined their innovation-decision stages on adopting computer technology. The decision of the group of participants with low computer competence was in the range between knowledge and decision, while the decision of those who had high computer competence was in between implementation and confirmation.

In general, people tend to adopt different technologies at different points in times. This is because of different characteristics of adopters including: (1) socioeconomic status, (2) personality values, and (3) communication behavior. For example, those who

are considered as "earlier adopters" are more likely to have higher socioeconomic status, positive attitude towards change, and more often participate in social activity than "late adopters." (Rogers, 1995, p. 269). Communication, in fact, plays a key role in reducing resistance to innovations (Dooley, 1999). When people communicate with others who share the same experience, it is more likely that persuasion will be more convincing. In the Frank, Zhao, and Borman's (2004) study, they found that communication within schools influences individual's perception in implementation of an innovation. They mentioned that at an individual level, one may perceive the potential of technology differently, but when an individual interacts with others' expertise, one will gain "informal help" and "social pressure" (Frank, Zhao, & Borman, 2004, p. 151) and will be more likely to implement a new innovation. As such, concepts about innovation-decision process, characteristics of adopters and communication will be useful for understanding diffusion of educational technology and developing a plan to increase an innovation adoption.

**Teacher's transformation for computer and technology use**

Teachers increasingly need to be able to consider the role of technology in teaching and learning. However, Whitesel (1998) mentions that "Technology does not teach students; effective teachers do" (p.1). In Wallace's (2004) study, three teachers taught with the Internet differently. There was no common form for the internet implementation in the classroom. Their use of the internet depended on various factors. Among those were the available resources, knowledge and skills, pedagogical beliefs, and perspectives on educational goals.

Cuban (2001) examined six preschools and five kindergartens classes. The study focused on frequency of computer use in the class and level of integration based on Sandholtz, Ringstaff, & Dwyer's (1997) work in Teaching with Technology. Levels of Technology Integration are as follows:

- Entry level: Teachers are beginner users of computers.
- Adoption level: Teachers generally use text, lecture, and conventional approaches but also introduce lessons to teach students how to use keyboard, mouse, and elementary applications.
- Adaptation level: Teachers still apply conventional ways of teaching but spend one fourth or more of their time to use computers for homework and daily class work.
- Appropriation level: Teachers integrate technology regularly into the curriculum.
- Invention level: Teachers find new ways to connect students and use project-based and interdisciplinary approaches to instruction. (p. 53-54)

Cuban found only two classroom teachers who effectively integrated computers in the classroom. The others only adopted the computer and had the children choose to use the computer during a specific time.

In Hughes's (2003) study on teachers' technology learning, various degrees of technology adoption were found and categorized in three types of technology integration: replacement, amplification, and transformation. Teachers adopted technologies by using it to replace or amplify their teaching and learning activities. For example, the teacher used spreadsheet or mind map software instead of paper. Although these kinds of integration demonstrate time-efficiency and improvement of material development, Hughes mentions that "When this occurred, there were no qualitative changes to curriculum, instruction and/or student learning - just the use of a different medium (e.g., using a computer-based worksheet instead of paper) or amplifications (e.g., accessing

more materials more efficiently)." Teachers integrated technologies in a way that supported their existing pedagogical beliefs.

Nevertheless, teachers also adopt technologies and transform teaching and learning activities to derive the benefits from the integration of technologies. By realizing the important roles of technology, teachers may transform curriculum, instruction, and the student learning process. However, as Hughes mentions, "Transformative technology adoptions were much less common and also required much more time to develop" (2003, p. 15).

## FACTORS RELEVANT TO ICTS ADOPTION

### School Culture and ICTs Adoption

The context of school includes availability of human infrastructure, technological infrastructure, and social support (Zhao, Pugh, Sheldon, and Byers, 2002). The school context should also provide both "social pressure" and "informal help" (Frank, Zhao, & Borman, 2004, p. 151) to members or teachers in the school. The school needs to provide support in terms of technological infrastructure such as computer hardware and software, human infrastructure such as technical staff, and an organizational culture that provides positive motivation as well as pressure to foster a change in the school system (Zhao, Pugh, Sheldon, and Byers, 2002). Frank, Zhao, and Borman (2004) argued that decision making within schools is more complicated than decision making in other types of organizations which have simple hierarchical structures. Fullan and Smith (1999) mentioned that the culture of the school, in fact, is a key factor in motivating changes in teaching and learning. Restructuring the organization by itself will not guarantee a change in the long term. Fullan and Smith (1999) proposed the process of change in the

school context as “reculturing” (p.10), rather than restructuring. In the process of reculturing, a collaborative community must be promoted and three conditions must be met: (1) focus on student learning; (2) link knowledge of student learning to changes in instructional practices; and (3) work together to assess teachers and school leadership to make improvements.

Teachers’ lives are mostly explained in many studies as autonomous isolation (Goodlad, 1984, cited in Fullan, 2007; Rosenholtz, 1989, cited in Fullan, 2007). A teacher that usually works individually lacks an opportunity to share ideas and information about teaching and learning and thus is independent in making decisions in classroom teaching. This can cause difficulty in changing or adopting new teaching and learning concepts. Teachers’ practices and beliefs are most likely to change when teachers have opportunities to formally and informally interact with other teachers in professional communities (Becker and Riel, 1999, cited in Ertmer, 2005).

Moreover, “teachers burn out because of the emotional and physical energy that they must expend to maintain their authority every hour of every day” says Haberman (2003, p. 242). Moreover, if the situation described by Haberman (2003, p. 249) that “Each constituency (school administrators, teacher, and parent) defines its own responsibilities as narrowly as possible to guarantee itself “success” and leave to others the broad and difficult responsibility for integrating students’ total education,” what should we do to make it better? Probably, understanding the issues is only the beginning stage, as Popkewitz says: “Reconstruction is a pragmatic problem that emerges situationally and contingently through action, and that theory can help to point to “errors” but cannot provide answers to practice” (1998, p. 137).

**Teacher's mental model: Cognitive and Sociocultural Constructivist views**

Human behavior and perception are shaped by prior experiences. Piaget (1950) believed that learning was a process of transforming conceptual understanding through individual's existing knowledge and experiences. When learning occurs, an individual's schema becomes more complex as it assimilates and accommodates with existing knowledge. What resides in our minds including belief and expectation interacts in such a complicated way and mostly it is tacit and difficult to examine (Senge, 2000). Many researchers have studied schemas focusing on reasoning and understanding based on mental representations called mental models (e.g. Gentner & Stevens, 1983; Johnson-Laird, 1983, cited in Greeno, Collins, & Resnick, 1996). Mayer identified two properties of mental models as, "(1) representations of objects in whatever the model describes and (2) descriptions of how changes in one object effect changes in another" (1992, p. 431, cited in Winn, 2004, p. 90). Mental models thus allow us to "see" a representation in the causal relations (Winn & Snyder, 1998). Mental models help explain teacher's learning as prior knowledge and experiences about classroom teaching influence their perception and interpretation on new pedagogical ideas (Putnam & Borko, 2000).

Although learning in cognitive theory focuses on an individual's mental models and a change process "in the head" (Hoban, 2002, p. 51), it does not explain knowledge construction in social interaction and learning new knowledge in which no prior knowledge exists (Solomon, 1994; Schoenfeld, 1999, cited in Hoban, 2002). In contrast to Piaget's individual knowledge construction, the sociocultural constructivist approach, including situated cognition (Brown, Collins, & Duguid, 1989) and situated learning (Lave & Wenger, 1991), emphasizes the socially and culturally situated context of cognition (Cobb, 1994). According to Vygotsky (1978), learning occurs through the use of "tool" (physical and externally oriented) and "sign" (psychological and internally

oriented) as mediated ways (p. 55). Both tool and sign help foster a transformation or learning as an individual mutually interacts with other members in a community. Duffy and Cunningham (1996) mentioned that culture creates the tool, but the tool changes the culture. Participants in the culture appropriate these tools from their culture to meet their goals and thereby transform their participation in the culture. In a study on teacher learning, Putnam and Borko (1997) found that the teachers learn as they socially interact and engage in discourse communities in which they are members. Many educational applications developed based on the sociocultural constructivist approach, such as collaborative learning and problem based learning, emphasize group discussion activity as a way to help students manifest the effective behavior of a community (Duffy & Cunningham, 1996). Popkewitz (1998) studied the norms, patterns of practice, and systems of ideas constructed by the teacher. He called the way we think a "system of knowledge" and a reproduction of systems of knowledge rarely changes. Interestingly, he argues that the pedagogical discourses in fact are reproduced within the school system (Popkewitz, 1998).

Both cognitive and sociocultural constructivist perspectives inform a particular situation in learning as the cognitive perspective focuses more on internal mental models while the sociocultural constructivist perspective emphasizes a transformation of the practices happening in social interaction. Some researchers argued that both perspectives help us to better understand the complexity of learning and behavior (e.g. Cobb & Bowers, 1999).

**Teacher's belief**

Ertmer (2005) mentioned that the teachers' beliefs are reflected in their teaching practices and sometimes they are not aware of such beliefs. Researchers (e.g., Fullan, 2001; Kagan, 1990; Pajares, 1992; Richardson, 1994) indicate that teacher beliefs are difficult to examine. Teacher beliefs are contextualized where many factors are related and inseparable (Kagan, 1990). Thus, to examine teacher beliefs, Kagan (1990) and Pajares (1992) suggested that one can infer them from teachers' discourse and actions rather than observation or direct evaluation. Following Pajares's suggestion to examine discourse of the teachers, in this study the researcher will explore how teacher' beliefs are reflected in their general perspectives about using ICTs in their classrooms.

**Teacher's technological pedagogical and content knowledge**

How teachers use technology resonates with their pedagogical beliefs, which are grounded in experiences (Ertmer, 2005). Traditionally, content influences a decision on a selection of technology and pedagogy for classroom teaching. Shulman (1987) introduced a concept of pedagogical content knowledge (PCK) emphasizing teacher's subject content knowledge and pedagogy, and this PCK should be included in teacher education programs to improve teacher's quality. Now that technology has become commonplace, Mishra and Koehler (2006) argue that technological knowledge should be included with PCK. The technological pedagogical and content knowledge (TPACK) approach represents three components of knowledge: technology, pedagogy, and content knowledge. An interaction among the three components occurs in "a state of dynamic equilibrium" (Mishra and Koehler, 2006, p. 1029) and it represents the concept of good teaching with technology as shown in Figure 2.1. Their approach considers all possible

interactions between any two constructs: Pedagogical Content Knowledge, Technological Content Knowledge, and Technological Pedagogical Knowledge as well the intersection of all three together.

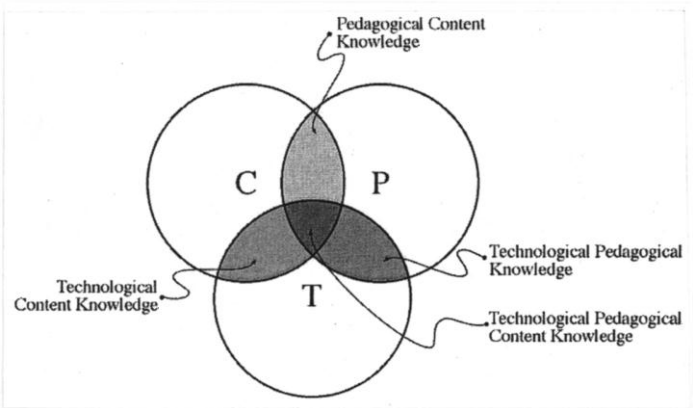


Figure 2.1: Technological Pedagogical and Content Knowledge[2]

> TPCK is the basis of effective teaching with technology and requires an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge and to develop new epistemologies or strengthen old ones. (Mishra & Koehler, 2007, p. 7)

Based on Mishra & Koehler's (2007) statement, teachers who integrate technology in teaching and learning activities should acquire TPACK. The researchers proposed a "learning by design" approach to enhance teachers learning while working as curriculum designers in the team, interacting with experts, and encountering problems similar to the real world situation. Such learning helps the teachers develop TPACK.

[2] From "Technological Pedagogical and Content Knowledge: A Framework for Teacher Knowledge" by P. Mishra and M.J. Koehler, 2006, *Teacher College Record*, 108, p. 1025.

**Teacher's perception towards students' learning ability**

Teacher's perceptions and expectations affect students' learning. In 1968, Rosenthal and Jacobson conducted an experiment "Pygmalion in the classroom." In the study, teachers, when provided with the information that certain students were smarter than others, developed expectations and thus acted in ways that supported students' learning achievement. Teacher's behavior thus influences students' motivation and perceived competence. Rhem (1999) noted, "This influence can be beneficial as well as detrimental depending on which *label* an individual is assigned."

Generally, students are categorized into groups. The students are classified and placed in "a set of distinctions and differentiations that function to divide the children into (discursive) spaces," says Popkewitz (1998, p. 6). In his study, Popkewitz applied ethnographic methodology to examine a discursive practice and normalization which reveal issues of educational inequalities between students in urban and rural. He mentioned that the words "urban" and "rural" actually were used to describe qualities of the students and community who belongs to that space. Senge (2000) mentions:

> Thousands of teachers in public schools today are unwittingly operating out of a deficit perspective when teaching poor children. Consciously or not, these teachers have adopted the "bell curve" mental model – that student performance should be distributed across a bell-shaped curve, with some students destined to be below average. …We generally expect wealthy children to perform better on the curve than poor children, and white children to perform better than black, brown, and red children. Related to this model is the pervasive mental model that children's brains are separate from the rest of their lives. (p. 386)

To help improve teacher's awareness about student's individual differences and increase student's learning achievement, Rosenfeld and Rosenfeld (2008) examined changes of teachers' expectation after attending the professional development program focusing in different learning styles, mediation in the group discussion, and self-

reflection. After a year-long program, teachers in general became more conscious about a learner's relative preference for different learning styles and widened their causal perceptions about student success and failure. The researchers recommended that concepts about teacher's expectation and student's individual learning differences should be stressed in teacher's professional development.

## CONCEPTUAL FRAMEWORK: UNDERSTANDING TEACHERS' PERSPECTIVES

Becker, Geer, Hughes, and Strauss (1961) defined the term perspective as "a coordinated set of ideas and actions a person uses in dealing with some problematic situation" (cited in Richardson & Placier, 2001, p. 915). An attempt to understand teacher's perspective can be done through the storytelling (Elbaz, 1990), which will help us comprehend the teacher's personal knowledge that is formed by experiences and beliefs which are usually kept to oneself (Grumet, 1987). Such information will then provide insights about one's action based on perceived realities.

Below is the figure presenting a relationship of teacher's mental model, teacher's belief, TPCK, perception of teachers towards students' learning abilities, and teacher' life conditions.

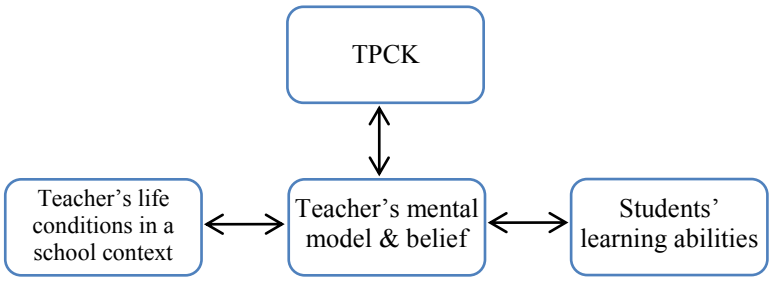


Figure 2.2: Conceptual framework to understand teachers' perspectives

Figure 2.2 shows how a teacher's mental model and belief are influenced by conditions in the school context, the teacher's TPCK, and his or her perception towards students. In contexts in which a school cannot provide technological support for teaching and learning, teacher's lack knowledge about effective teaching with technology (TPCK), and teachers perceive that the students are unable to use complicated technology, then the teachers may negatively perceive the potential of technology to improve learning for their students. The mental model and belief of the teachers hence influences their actions and, when provided with professional training, it is often difficult for them to transform their teaching practices.

## SUMMARY

The educational reform in Thailand advocated student-centered learning and skills for life-long learning development; however the cultural values and situation did not allow teachers to transform their classroom situation. For teachers to effectively teach with technology in innovative ways, teachers may have to first change their belief and teaching practices. However, the way the teachers view the world is assimilated and accommodated in their mental models, and their perception of this world influences their practices. Effective use of technology for learning involves the teacher's knowledge of technology and its enabling conditions, pedagogical belief and technology compatibility, and knowledge of the organizational and social culture of the school (Zhao, Pugh, Sheldon, and Byers, 2002). Understanding teachers' perspectives towards their use of ICTs in the classroom will provide insights into the perceived realities of teachers. Such insights can be useful for identifying elements involved in teachers' perspectives and to develop an effective plan for ICTs implementation in the classroom.

# Chapter 3: Methodology

This study was designed based on the constructivist perspective and applied the Interactive Qualitative Analysis (IQA) as the analytical framework for the investigation. This chapter includes six sections: 1) analytical framework, 2) overview of the IQA research flow, 3) IQA research design, 4) participants, and 5) data collection and ongoing analysis.

## ANALYTICAL FRAMEWORK

The constructivist perspective and Interactive Qualitative Analysis methodology were applied in this study based on the characteristics of the research focus and the study purpose which is to understand the perspectives of computer teachers and teachers in different subject areas in Thailand towards the use of ICTs in the classroom. The focus of this study was to understand the problems perceived by teachers related to the use of technology in their teaching and how they think about and attempt to solve the problems. The study attempted to understand not only teachers' thinking and perceptions but also the contextual settings that the teachers perceive as the conditions related to the integration of ICTs in their teaching. The following are the research questions addressed in this study:

1. What factors comprise teachers' perceptions of, and reactions to, integrating ICTs in the classroom?
2. How do these factors relate to each other in a perceived system of influence or cause and effect?
3. How do the two groups' (computer teachers and mathematics teachers) experiences of ICTs integration in the classroom compare to each other?

4. How does the individual's experience of ICTs integration in the classroom compare to that of the group as a whole?

**Constructivist perspective**

According to Guba and Lincoln (1989), the constructivist perspective mainly focuses on relativism. They mentioned that, "What is real is a construction in the minds of individuals" (Lincoln & Guba, 1985, p. 83.). In other words, reality is a product of the processes by which social actors negotiate the meanings of and for actions and situations. Thus, there are multiple truths based on the interpretations about the world from the point of view of someone else (Sipe & Constable, 1996). Knowledge is accumulated or articulated based on our experiences since we were born and became a member of a community.

This study adopted the constructivist perspective to better understand individual meaning-making and to understand the meaning of what others do as expressed in their own terms. In this study the researcher is identified as the primary instrument. The inquiry begins with issues and/or concerns related to participants and attempts to unfold situations through a "dialectic of iteration, analysis, critique, reiteration, reanalysis, and so on that leads eventually to a joint (among the inquirer and respondents) construction of a case (i.e., findings or outcomes)" (Schwandt, 1994, p. 129).

**Interactive Qualitative Analysis Methodology**

Interactive Qualitative Analysis (IQA) is a system approach to qualitative research developed by Northcutt and McCoy at The University of Texas at Austin (2004). McCoy (2003) mentions:

> IQA reconciles quantitative Total Quality Management (TQM) rigor to a qualitative design of data collection and analysis. IQA seeks to capture the lived reality of people, actively involving participants in the mapping of their stories. IQA identifies relationships among self-identified components of an issue. IQA integrates the identification of the nature of the problem with solutions, even when you are not sure what the problem is. IQA builds consensus among the focus group participants. IQA builds strategies around the nature of the problem. (p. 61)

The IQA approach allows a group of participants to reflect on their experiences and to create its own "interpretive quilt and then to similarly construct individual quilts of meaning: together, the two levels of meaning are used by the researcher as the foundation for interpretation" (Northcutt and McCoy, 2004, p. 43). In most cases, the IQA approach prompts the participants to examine issues with respect to a phenomenon important to them:

- What does this mean to you?
- What led to this?
- What are the results? (p. 43)

In the IQA approach, data collection and analysis protocols from the focus group help minimize researcher involvement and subjectivity in interpretation. In the focus group, participants are asked to generate ideas or data and write into cards; such data are called affinities. Then they are asked to organize their affinities into categories and analyze positions and relationships of affinities based on their perceived influence of the affinities. Later, the affinities and system developed by the group are applied as an interview protocol for the individual interview.

The role of the researcher is to create a process that invites the participants to produce the most data while minimizing the influence of the process on the content. The researcher facilitates the group by teaching the participants the process and guiding them

to generate and analyze their own data with minimal external influence. The role of the researcher later is to conduct an individual interview with the participants.

## OVERVIEW OF THE IQA RESEARCH FLOW

Figure 3.1 shows a diagram of the IQA research flow:

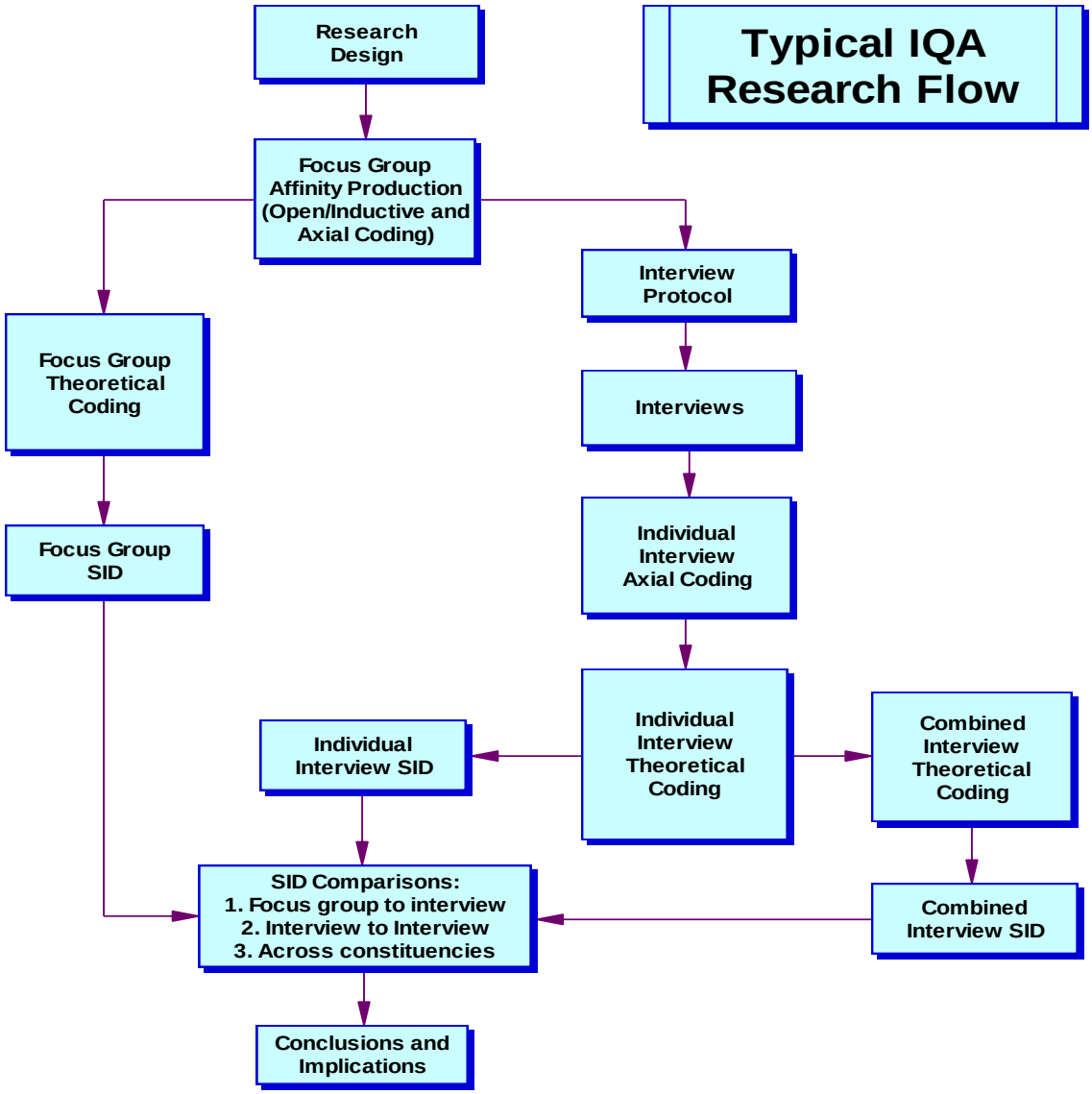


Figure 3.1: Typical IQA Research Flow[3]

According to Northcutt and McCoy (2004), IQA research flow consists of four stages: (1) research design, (2) focus group, (3) interview, and (4) report. In the research design stage, the researcher will articulate problems, identify constituencies or

[3] From *Interactive Qualitative Analysis: A Systems Method for Qualitative Research* (p. 45), by N. Northcutt and D. McCoy, 2004, California: Sage Publications.

participants, and to create research questions based on the problem statement. IQA then uses focus groups to identify the affinities that represent the group's experience. The group next identifies the relationships between each of the affinities. Affinities defined by the group are then used to develop a protocol for interviews, which allow the researcher to explore the meanings of the affinities and their systemic relationships. A comprehensive system diagram is developed from the interviews to explain the phenomenon. In the final report, the researcher describes the affinities and their relationships, makes comparisons among systems and individuals, and makes inferences or predictions based on the systems.

## IQA RESEARCH DESIGN

Northcutt and McCoy (2004) indicate that IQA research design process begins with stating a problem, finding participants or constituencies, forming issue statements, and finally developing research questions. The researcher goes through this design process in order to generate a logical research idea.

As mentioned above, IQA research design starts with an identification of a problem. In most cases, the problem is by its nature complicated and difficult to find a solution. To identify the constituencies or participants, two factors are considered: (1) distance and (2) power. By distance, the researcher analyzes how close this participant is to the problem; and by power the researcher analyzes how much power this participant has over the phenomenon. From this analysis, the researcher can make a tentative selection of participant(s).

After identifying the participants, the researcher determines what issue this participant may encounter. It should be noted that different groups of the participants may

encounter different issues (either in terms the lived experience with the phenomenon or power over it), and therefore may differently respond to the issues.

The last step of IQA research design is to create research questions. McCoy (2003) says,

> Any IQA study answers at most three "generic" (standard inquiries possible of any system) research questions: If the study has only one participant group, the first two are as follows:
>
> 1. What are the components of the phenomenon?
> 2. How do the components relate to each other in a perceptual system?
>
> If more than one participant group comprises the study, a third systemic inquiry is possible:
>
> 3. How do the systems compare, both in terms of components, intrasystemic relationships, and intersystemic relationships? (p. 77)

## PARTICIPANTS

Following the IQA research design, the participants or constituencies that might be involved in the problem relevant to an integration of ICTs in the classroom teaching are shown in Table 3.1 below.

| **Constituency** | **Distance (Close to Far)** | **Power (High to Low)** |
|---|---|---|
| Computer teachers | Very close | High |
| Teachers (other subject areas) | Close | High |
| Students | Close | Medium |
| School principals | Far | High |
| Professional development trainers | Far | Low |
| Parents | Far | Low |

Table 3.1: Identify the constituencies

The constituencies involved in the issues can be categorized based on distance and power. Distance and power help determine how close or far the constituency is to the

problem and the level of power they have to influence the problem. In this study, the key actors included two groups of teachers: teachers who teach "computer" as a subject and teachers who teach in different content areas. As most of the computer teachers in Thailand are mainly responsible for teaching computer skills to the students and providing other support to the school, such as computer maintenance and training to other teachers, they are the key constituency in this study. The study also included mathematics teachers who use computers in their teaching.

Thus, participants of this study included these two groups of teachers: (1) the computer teachers and (2) the mathematics teachers, who integrate computers in their classrooms instruction. These two groups of participants were purposefully selected based on two criteria: (1) their experiences in using computers in the classroom and (2) the researcher received permission to conduct the study from the Institute for the Promotion of Teaching Science and Technology (IPST).

## Procedures for the participants recruitments

### *Focus group participants*

With the permission of the IPST, the researcher was allowed to participate in two workshops. The first one was a workshop for computer teachers conducted around the end of February 2009 by the Computer Department, IPST. This workshop focused on creating materials and preparing trainers for a computer training program. The second one was a workshop for mathematics teachers conducted around the end of March 2009 by the Information Technology Support Department, IPST. This workshop focused on using a handheld graphing calculator. Both workshops lasted for about five days. The researcher participated in the workshop conducted by the Computer Department as a staff

member, working with the teachers during the workshop. However, in the workshop conducted by the Information Technology Support Department for mathematics teachers, the researcher only observed the training. Although the role of the researcher during the workshops was different, the participation in the workshops helped the researcher become familiar with the participants before the data collection.

The researcher spent time in the evening after the training to conduct a focus group session with the participants. At the beginning of the focus group session, the participants were introduced briefly to the study and information to obtain their informed consent. Eighteen computer teachers attending the workshop by the computer department and twenty-two mathematics teachers attending the workshop of the Information Technology Support Department, consented to participate in the focus group session. The focus group sessions generated the affinities or themes used as an interview protocol for the individual interview, which will be explained later in this chapter.

***Individual interview participants***

Twenty-nine teachers were invited to participate in an individual interview. There were fifteen computer teachers and fourteen mathematics teachers. As the researcher lived in the United States while the participants were in Thailand, all individual interviews were conducted over the phone via Skype. The researcher used Pamela software to record all the interviews. The consent form was collected via both mail and email. Below is the table showing the demographic data of the twenty-nine participants.

| Pseud-onym | Subject | Gender | Age | School | Grade | Location | Regions |
|---|---|---|---|---|---|---|---|
| C1 | Computer | Female | 29 | Midsize, Opportunity expansion school | 1 - 9 | Sub-district | North |
| C2 | Computer | Female | 57 | Large, Secondary school | 7 - 12 | Provincial | West |
| C3 | Computer | Male | 42 | Large, Secondary school | 7 - 12 | Provincial | Central |
| C4 | Computer | Female | 38 | Large, Secondary school | 7 - 12 | Provincial | Central |
| C5 | Computer | Female | 29 | Midsize, Opportunity expansion school | 1 - 9 | Sub-district | East |
| C6 | Computer | Female | 27 | Large, Secondary school | 7 - 12 | District | North |
| C7 | Computer | Male | 50 | Large, Secondary school | 7 - 12 | Provincial | North |
| C8 | Computer | Male | 43 | Midsize, Secondary school | 7 - 12 | Sub-district | Central |
| C9 | Computer | Male | 47 | Midsize, Secondary school | 7 - 12 | Sub-district | North |
| C10 | Computer | Male | 35 | Large, Secondary school | 7 - 12 | Provincial | South |
| C11 | Computer | Male | 43 | Midsize, Secondary school | 7 - 12 | Provincial | Central |
| C12 | Computer | Male | 29 | Large, Elementary & Secondary school | 1 - 12 | Provincial | Central |
| C13 | Computer | Male | 30 | Midsize, Secondary school | 7 -12 | District | Central |
| C14 | Computer | Female | 27 | Midsize, Opportunity expansion school | 1 - 9 | Sub-district | South |
| C15 | Computer | Male | 28 | Large, Secondary school | 7 - 12 | Sub-district | South |
| M1 | Math | Male | 28 | Small, Secondary school | 7 - 12 | Sub-district | North |
| M2 | Math | Male | 29 | Small, Secondary school | 7 - 12 | Sub-district | South |
| M3 | Math | Male | 29 | Small, Secondary school | 7 - 12 | Sub-district | North |
| M4 | Math | Female | 36 | Midsize, Secondary school | 7 - 12 | Sub-district | Central |
| M5 | Math | Male | 24 | Large, Secondary school | 7 - 12 | Provincial | Central |
| M6 | Math | Female | 48 | Large, Secondary school | 7 - 12 | District | North |
| M7 | Math | Female | 41 | Large, Secondary school | 7 - 12 | District | Northeast |
| M8 | Math | Female | 26 | Large, Secondary school | 7 - 12 | Provincial | South |
| M9 | Math | Female | 48 | Large, Secondary school | 7 - 12 | Provincial | North |
| M10 | Math | Female | 28 | Large, Secondary school | 7 - 12 | Provincial | East |
| M11 | Math | Male | 30 | Small, Secondary school | 7 - 12 | Sub-district | East |
| M12 | Math | Female | 29 | Small, Secondary school | 7 - 12 | Sub-district | South |
| M13 | Math | Male | 30 | Large, Secondary school | 7 - 12 | District | South |
| M14 | Math | Female | 28 | Large, Secondary school | 7 - 12 | Provincial | South |

Table 3.2 Demographic Data

## DATA COLLECTION AND ONGOING ANALYSIS

### Focus group affinity production

In each focus group session process, the researcher started by giving the IRB consent form and providing the participants with information about the research and the

interview process. After collecting the IRB consent forms, the researcher distributed note cards and markers to each participant.

The groups were asked to brainstorm silently about their experiences in using ICTs in their classroom teaching. What thoughts, emotions, or impressions did they have? What ICT tools did they use and how did they feel about it? Then, they were asked to write their thoughts on note cards, one thought per card. After producing as many cards as possible, the focus group was asked to tape the cards along a wall. The researcher read each card and the group came to a consensus as to the meaning of the card, thus the foundations were laid for constructing, through discourse, a shared reality among group members. The researcher then asked the group to silently organize the cards into groups of meaning, an activity referred to as inductive coding. Grouping was followed by the affinity naming and revision phase (axial coding), which consists of giving a name to the group (affinity) and sorting any cards that may have been miscatagorized into the proper group. During affinity production, the participants were given an opportunity to reflect upon their experiences and then express their thoughts and feelings. The thoughts of the group as a whole were combined and organized into common themes or affinities by the group itself with the aid of researcher. The group collectively named the affinities and helped the researcher create a detailed written description or definition of each affinity. The goal was to produce the smallest number of affinities with the greatest amount of detail.

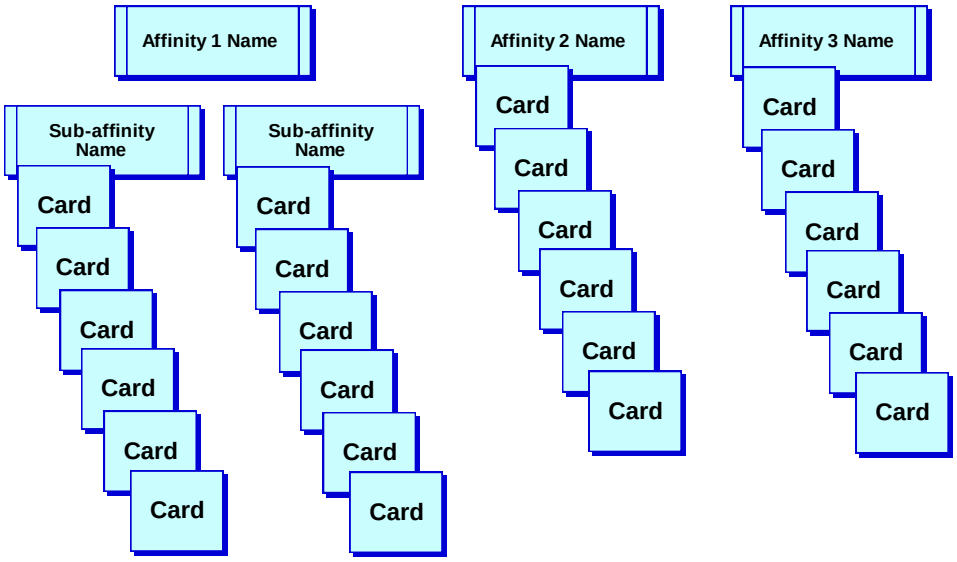


Figure 3.2: Naming Affinities[4]

The computer teachers were divided in two small groups of nine and the mathematics teachers were divided in three small groups, including a group of eight and two groups of seven. The groups provided a total of 231 cards, which were categorized into 30 themes. Initial themes generated by each focus group are in Appendix B.

In a typical IQA process, the focus groups would be the ones who identify all themes altogether and then develop the relationship of each theme or affinity. However, the data collection processes for the computer teachers and the mathematics teachers were conducted on different dates and times. Additionally, since the participants came from different cities across the country, it was not possible to bring the participants from both groups together. As a consequence, the researcher decided to reconcile the thirty themes generated by both groups into eight affinities. This allowed the researcher to develop an interview protocol for the individual interviews as shown below.

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[4] From *Interactive Qualitative Analysis: A Systems Method for Qualitative Research* (p. 99), by N. Northcutt and D. McCoy, 2004, California: Sage Publications.

## INTERVIEW PROTOCOL

**Interview Protocol**

**Understanding Perspectives of Teachers in Thailand towards Information and Communication Technologies Integration in the Classroom**

The focus groups have identified several common themes or affinities that describe their experiences in ICTs integration. Let's look at each of these themes, one at a time, and tell me about your experiences with these.

1. **School Administration and Management**
   School administration and management system is relevant to policy, managing budget allocations for supporting teachers, and providing teaching and learning resources, and assessment.

2. **Content and Curriculum**
   A development of school curriculum and subject matter content based on the national standards or core curriculum.

3. **Teacher**
   Teacher's knowledge of the subject matter, teaching experiences and skills of teaching and learning process (pedagogy), and perception towards students.

4. **Information and Communication Technologies (ICTs)**
   Instructional tools and media available at the school, and ICTs implementation that enhances the instruction.

5. **Student**
   Students' perception of learning, their behavior, and background knowledge.

6. **Environment**
   Environment, both inside and outside the classroom (e.g., classroom space and school context).

7. **Time**
   Time for teaching and working on other jobs at the school.

8. **Parent / Guardian**
   Parent or guardian involvement in students' learning.

The interview protocol consisted of two parts: 1) the open-end *axial interview* designed to provide a rich description of affinities by the participants; and 2) the structured *theoretical interview* designed to identify relationships between affinities. In the first part, the researcher followed the order of the affinities constructed in the focus groups. In the second part, the researcher explicitly asked each individual to identify the relationships between the two affinities and then recorded their response into the Theoretical Code Table, which is explained later. Interview data was transcribed and translated by the researcher. The data then was coded in an axial coding table and a theoretical coding table.

**Individual Realities: IQA Interviews**

Using the above protocol, the researcher conducted the individual interviews. The interview protocol was designed based on the affinities and sub-affinities from the focus group interview. Northcutt and McCoy (2004) mentioned that the individual interviews help provide detailed content that is not possible to derive from only a focus group interview.

***Individual interview axial coding***

The researcher used the individual interview *Axial Coding Table* (ACT), as shown in Table 3.3, to document the statements relevant to each affinity for each participant. Then, the researcher identified the axial codes by noting keywords or phrases that describe or illustrate an affinity. There were multiple axial quotes for any given affinity.

Then, the researcher analyzed axial coding by exploring the meaning of each affinity. The researcher examined the interview transcript and looked for phrases or statements that provide examples of a specific affinity.

| **Individual Interview – M12<br>Axial Code Table** | | | |
|---|---|---|---|
| **Affinities** | **Transcript Line** | **Axial Quotation** | **Researcher Notes** |
| 1) School Administration and Management | M12 / 13 | Each subject area and departments will receive a budget and we have to develop a budget plan annually and use it as planned. | Budget |
| 1) School Administration and Management | M12 / 19 | Our Thai bureaucratic system has a nice policy but there is no evaluation, no follow-up plan. Some projects already finished, but the reports that they turned in did not get any feedback. There is no cycle of work, no revision, and it is like just do it and when it finishes, that is the end. So, the way they evaluate in the bureaucratic system has been down. It does not provide any benefit. | Assessment |
| 2) Curriculum | M12 / 35 | The content we have to teach, I think we do not fully apply it. I do not know whether it is good enough because the learning outcome is decreasing every year. Although it is the same content, same curriculum, the learning outcome is going downward. A quality of students to get into a higher education is decreasing even though the content and curriculum are the same. Or even if they change a whole structure and curriculum, I think it will be the same. So, if you ask me how the content is, I think it is not about the content, it is about quality of teachers. | Curriculum structure |

Table 3.3: Sample Individual Interview Axial Code Table

***Individual interview theoretical coding***

In the second phase of the interviews, the researcher asked questions focusing on how the participants perceive relationships between any two affinities. The structured theoretical interview was designed to identify relationships between affinities. Each participant was asked to determine the nature of the relationship between all possible pairs of affinities. For any two affinities A and B, there are only three possible relationships: either A directly influences B, or B directly influences A, or there is no direct influence between A and B. These Rules for Hypothesizing are summarized as follows:

For any 2 affinities A and B, either

A → B (A influences B)

A ← B (B influences A)

A <> B (No relationship)

If, for example, a participant determined that affinity 2 influenced affinity 1, a left arrow was placed between the pair. The participant continued the theoretical coding until the form was complete. The Theoretical Interview Protocol is shown below.

**Theoretical Interview Protocol**

**Theoretical Interview Protocol**

Many of the themes or affinities identified have some kind of relationship; one effects or causes the other. Let's look at each theme and decide if or how it relates to each other theme. Tell me about your experiences with such relationships. Please give specific examples of how the relationships have affected your experience.

**Affinity Name**

1. School Administration and Management
2. Curriculum and Content
3. Teachers
4. Information and Communication Technologies
5. Students
6. Environment
7. Time
8. Parent / Guardian

**Possible Relationships**

A → B

A ← B

A <> B (No Relationship)

**Interview**
**Affinity Relationship Table**

| Affinity Pair Relationship | | | Affinity Pair Relationship | |
|---|---|---|---|---|
| 1 | 2 | | 3 | 6 |
| 1 | 3 | | 3 | 7 |
| 1 | 4 | | 3 | 8 |
| 1 | 5 | | 4 | 5 |
| 1 | 6 | | 4 | 6 |
| 1 | 7 | | 4 | 7 |
| 1 | 8 | | 4 | 8 |
| 2 | 3 | | 5 | 6 |
| 2 | 4 | | 5 | 7 |
| 2 | 5 | | 5 | 8 |
| 2 | 6 | | 6 | 7 |
| 2 | 7 | | 6 | 8 |
| 2 | 8 | | 7 | 8 |
| 3 | 4 | | | |
| 3 | 5 | | | |

The Theoretical Code Affinity Relationship Table (TCT) was used for recording utterances describing the relationships of the affinities of each participants. Table 3.4 is an example of TCT.

| **Individual Interview – M12<br>Theoretical Code<br>Affinity Relationship Table** | | | |
|---|---|---|---|
| Affinity Pair Relationship | Line Number | Theoretical Quotation | Researcher Notes |
| 1 → 2 | M12 / 1 | I think if there is a good management or good planning, we could design the framework of a good curriculum. I think it depends on the management administration. | |
| 1 → 3 | M12 / 4 | The management of the school influences teachers. This is very clear because the policy must lead the practices. | |
| 1 → 4 | M12/ 6 | The tools depend on the administrators. Like if we want some media or tools, we have to ask them. | |

Table 3.4: Sample Individual Interview Theoretical Code Affinity Relationship Table

The researcher analyzed the text for theoretical codes which illustrate a relationship between two or more affinities. The researcher then documented the reference for retrieval by recording the affinity number on the line of transcript that refers to the affinity, and by documenting the line numbers and affinity numbers in the Individual Interview Theoretical Code Table (TCT). Quotes relating to a specific affinity pair relationship were cut and pasted into the third column of the TCT, along with the line(s) of the transcript that were the sources of the theoretical quote. Once all interviews had been coded, the data from the interviews was summarized to create a composite of the individuals' experience with the phenomenon. Theoretical data was transferred from each Individual Interview Theoretical Code Table to a Combined Interview Theoretical

Code Table. By combining all interviews into one table, the researcher created a database for the entire set of respondents containing all theoretical codes for all affinities pairs, with each code containing a link or a reference to the transcript and line numbers that produced the code.

**IQA Combined Interviews**

Axial data were transferred from each *Individual Interview Axial Code Table* to a *Combined Interview Axial Code Table*, shown in Table 3.5. By combining all interviews into one table, the researcher created a database for the entire set of respondents containing all axial codes for all affinities, with each code containing a link or a reference to the transcript and line numbers that produced the code. This table was very similar to the one used to record axial codes for an individual interview except that it also contains a link to the transcript that produced the code.

| **Combined Interview Axial Code Table – Affinity 3: Teacher** | | |
|---|---|---|
| Transcript Line | Axial Quotation | Researcher Notes |
| M4 / 11 | There are always other jobs to do. We have to teach and do other jobs at the same time. Like me, I work at the Academic Affairs, taking care of learning assessment. Others work at the Planning and Development Department. Everyone has to do other routine jobs. | Extra jobs |
| C13 / 11 | I teach computer and also have to do other jobs that I am assigned. Actually, only teaching is hard enough. I used to teach at a university for one semester before I worked here so I can see a difference of the workload. At the university, most jobs would be relating to teaching. However, working as a school teacher, there are different kinds of jobs to do. Especially people are more likely to think that if it is about computer, a computer teacher has to get involved or will be assigned to do. | Extra jobs |

| | | |
|---|---|---|
| C10 / 27 | In general, we offer only few programming courses. I think we should offer more courses because the students are ready to learn. However, our teachers are not ready. We do not update new technology or knowledge. Sometimes our students know more than us. | Readiness to teach new knowledge and skill |

Table 3.5: Sample Combined Interview Axial Code Table

Later, the researcher combined individual interview theoretical data into the *Combined Interview Theoretical Code Affinity Relationship Table*, shown in Table 3.6. It should be noted that individual respondents may provide the direction of a relationship differently from each other, this table allows the researcher to record both directions for relationships.

| **Combined Interview Theoretical Code Affinity Relationship Table** | | | |
|---|---|---|---|
| Affinity Relationship | Transcript & Line # | Theoretical Quotation | Researcher Notes |
| 1 → 2 | C4/1 | Actually, standard curriculums are provided. It depends on what schools' priority is and in what extent, including policies to be executed. The curriculums are flexible for each school's adjustment. | |
| | C5 | Our school focuses on vocational school, so we tend to design the vocational curriculum. | |
| | C10 | The management who are in charge of the academic affairs, if they have a good vision, a good curriculum team, we are going to get a good curriculum, something like that. This will affect the kids to have a chance to study a good curriculum. If the management team is not good, the curriculum is bad, everything is bad. I mean they are the one who set the policy. They are the team who does this. We just follow the policy and implement. | |
| 1 ← 2 | C6 | If the core curriculum has set just like this, our school has to adjust ourselves. | |
| | C7 | Curriculum influences directly on our management because it regulates both courses and time. We do have to manage it according to the core curriculum. | |
| | C9 | To design a curriculum, it's necessary to stick to the | |

| | | | |
|---|---|---|---|
| | | core curriculum. A school has to differentiate between these curriculum in order to design a suitable learning and instruction for its locality. | |
| 1 → 3 | | | |
| 1 ← 3 | | | |

Table 3.6: Sample Combined Interview Theoretical Code Affinity Relationship Table

**Combined Interview Theoretical Code Frequency Table**

After the axial coding and theoretical coding, the researcher created a combined System Influence Diagram (SID) that represents group realities. Because individual participants may have defined relationships differently, and may, in fact, disagree about the direction of a relation, this table lists both directions for relationships. The researcher counted the number of participants who identified the relationship in the same direction and placed the tally in the frequency. The same was done for all participants who identified the relationship in the opposite direction. Below is the Combined Interview Theoretical Code Frequency Table.

| Combined Interview Theoretical Code Frequency Table | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Affinity Pair Relationship** | **Frequency** | | **Affinity Pair Relationship** | **Frequency** | | **Affinity Pair Relationship** | **Frequency** |
| 1 → 2 | 19 | | 2 → 6 | 4 | | 4 → 7 | 8 |
| 1 ← 2 | 9 | | 2 ← 6 | 18 | | 4 ← 7 | 18 |
| 1 → 3 | 28 | | 2 → 7 | 19 | | 4 → 8 | 3 |
| 1 ← 3 | 0 | | 2 ← 7 | 10 | | 4 ← 8 | 14 |
| 1 → 4 | 27 | | 2 → 8 | 4 | | 5 → 6 | 8 |
| 1 ← 4 | 0 | | 2 ← 8 | 3 | | 5 ← 6 | 20 |
| 1 → 5 | 25 | | 3 → 4 | 26 | | 5 → 7 | 9 |
| 1 ← 5 | 4 | | 3 ← 4 | 3 | | 5 ← 7 | 18 |
| 1 → 6 | 21 | | 3 → 5 | 25 | | 5 → 8 | 2 |
| 1 ← 6 | 4 | | 3 ← 5 | 4 | | 5 ← 8 | 27 |
| 1 → 7 | 28 | | 3 → 6 | 12 | | 6 → 7 | 6 |
| 1 ← 7 | 1 | | 3 ← 6 | 14 | | 6 ← 7 | 2 |
| 1 → 8 | 15 | | 3 → 7 | 3 | | 6 → 8 | 8 |
| 1 ← 8 | 11 | | 3 ← 7 | 22 | | 6 ← 8 | 7 |
| 2 → 3 | 19 | | 3 → 8 | 8 | | 7 → 8 | 0 |
| 2 ← 3 | 10 | | 3 ← 8 | 13 | | 7 ← 8 | 4 |
| 2 → 4 | 23 | | 4 → 5 | 18 | | | |
| 2 ← 4 | 4 | | 4 ← 5 | 11 | | Total | 672 |
| 2 → 5 | 22 | | 4 → 6 | 2 | | | |
| 2 ← 5 | 6 | | 4 ← 6 | 23 | | | |

Table 3.7: Combined Interview Theoretical Code Frequency Table

**Pareto Protocol**

The results of the frequency tallies were transferred into the Pareto Protocol Tables. Pareto protocol is a statistical method for representing the consensus of the group's analysis of relationships. The Pareto Protocol determined which affinity pair relationships were to be used in the system. Below is the Pareto Protocol Table.

## Affinities in Descending Order of Frequency With Pareto and Power Analysis

| No. | Affinity Pair Relationship | Frequency Sorted (Descending) | Cumulative Frequency | Cumulative Percent (Relation) | Cumulative Percent (Frequency) | Power |
|---|---|---|---|---|---|---|
| 1. | 1 > 3 | 28 | 28 | 1.8 | 4.2 | 2.4 |
| 2. | 1 > 7 | 28 | 56 | 3.6 | 8.3 | 4.8 |
| 3. | 5 < 8 | 27 | 83 | 5.4 | 12.4 | 7.0 |
| 4. | 1 > 4 | 27 | 110 | 7.1 | 16.4 | 9.2 |
| 5. | 3 > 4 | 26 | 136 | 8.9 | 20.2 | 11.3 |
| 6. | 1 > 5 | 25 | 161 | 10.7 | 24.0 | 13.2 |
| 7. | 3 > 5 | 25 | 186 | 12.5 | 27.7 | 15.2 |
| 8. | 2 > 4 | 23 | 209 | 14.3 | 31.1 | 16.8 |
| 9. | 4 < 6 | 23 | 232 | 16.1 | 34.5 | 18.5 |
| 10. | 2 > 5 | 22 | 254 | 17.9 | 37.8 | 19.9 |
| 11. | 3 < 7 | 22 | 276 | 19.6 | 41.1 | 21.4 |
| 12. | 1 > 6 | 21 | 297 | 21.4 | 44.2 | 22.8 |
| 13. | 5 < 6 | 20 | 317 | 23.2 | 47.2 | 24.0 |
| 14. | 1 > 2 | 19 | 336 | 25.0 | 50.0 | 25.0 |
| 15. | 2 > 3 | 19 | 355 | 26.8 | 52.8 | 26.0 |
| 16. | 2 > 7 | 19 | 374 | 28.6 | 55.7 | 27.1 |
| 17. | 2 < 6 | 18 | 392 | 30.4 | 58.3 | 28.0 |
| 18. | 4 > 5 | 18 | 410 | 32.1 | 61.0 | 28.9 |
| 19. | 4 < 7 | 18 | 428 | 33.9 | 63.7 | 29.8 |
| 20. | 5 < 7 | 18 | 446 | 35.7 | 66.4 | 30.7 |
| 21. | 1 > 8 | 15 | 461 | 37.5 | 68.6 | 31.1 |
| 22. | 3 < 6 | 14 | 475 | 39.3 | 70.7 | 31.4 |
| 23. | 4 < 8 | 14 | 489 | 41.1 | 72.8 | 31.7 |
| 24. | 3 < 8 | 13 | 502 | 42.9 | 74.7 | 31.8 |
| 25. | 3 > 6 | 12 | 514 | 44.6 | 76.5 | 31.8 |
| 26. | 1 < 8 | 11 | 525 | 46.4 | 78.1 | 31.7 |
| 27. | 4 < 5 | 11 | 536 | 48.2 | 79.8 | 31.5 |
| 28. | 2 < 7 | 10 | 546 | 50.0 | 81.3 | 31.3 |
| 29. | 2 < 3 | 10 | 556 | 51.8 | 82.7 | 31.0 |
| 30. | 5 > 7 | 9 | 565 | 53.6 | 84.1 | 30.5 |
| 31. | 1 < 2 | 9 | 574 | 55.4 | 85.4 | 30.1 |
| 32. | 6 > 8 | 8 | 582 | 57.1 | 86.6 | 29.5 |
| 33. | 4 > 7 | 8 | 590 | 58.9 | 87.8 | 28.9 |
| 34. | 5 > 6 | 8 | 598 | 60.7 | 89.0 | 28.3 |
| 35. | 3 > 8 | 8 | 606 | 62.5 | 90.2 | 27.7 |
| 36. | 6 < 8 | 7 | 613 | 64.3 | 91.2 | 26.9 |
| 37. | 6 > 7 | 6 | 619 | 66.1 | 92.1 | 26.0 |
| 38. | 2 < 5 | 6 | 625 | 67.9 | 93.0 | 25.1 |
| 39. | 1 < 6 | 4 | 629 | 69.6 | 93.6 | 24.0 |
| 40. | 2 > 6 | 4 | 633 | 71.4 | 94.2 | 22.8 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 41. | 2 > 8 | 4 | 637 | 73.2 | 94.8 | 21.6 |
| 42. | 3 < 5 | 4 | 641 | 75.0 | 95.4 | 20.4 |
| 43. | 7 < 8 | 4 | 645 | 76.8 | 96.0 | 19.2 |
| 44. | 1 < 5 | 4 | 649 | 78.6 | 96.6 | 18.0 |
| 45. | 2 < 4 | 4 | 653 | 80.4 | 97.2 | 16.8 |
| 46. | 2 < 8 | 3 | 656 | 82.1 | 97.6 | 15.5 |
| 47. | 3 < 4 | 3 | 659 | 83.9 | 98.1 | 14.1 |
| 48. | 3 > 7 | 3 | 662 | 85.7 | 98.5 | 12.8 |
| 49. | 4 > 8 | 3 | 665 | 87.5 | 99.0 | 11.5 |
| 50. | 4 > 6 | 2 | 667 | 89.3 | 99.3 | 10.0 |
| 51. | 6 < 7 | 2 | 669 | 91.1 | 99.6 | 8.5 |
| 52. | 5 > 8 | 2 | 671 | 92.9 | 99.9 | 7.0 |
| 53. | 1 < 7 | 1 | 672 | 94.6 | 100.0 | 5.4 |
| 54. | 1 < 3 | 0 | 672 | 96.4 | 100.0 | 3.6 |
| 55. | 1 < 4 | 0 | 672 | 98.2 | 100.0 | 1.8 |
| 56. | 7 > 8 | 0 | 672 | 100.0 | 100.0 | 0.0 |
| | **Total Frequency** | **672** | Equal Total Frequency | Equals 100% | Equals 100% | Power = E-D |

Table 3.8: Pareto and Power Analysis

The table above contains the frequencies, transferred from table 3.7, but has been sorted in descending order of frequency. Four columns have been added as follows:

1. Cumulative Frequency. Entries in this column contain the running total or cumulative frequency. Each entry is the frequency of votes cast for an affinity pair added to the previous total.
2. Cumulative Percent (Relation). This is a cumulative percent based upon the number of total possible relationships, in this case 56; i.e., each relationship represents 1/56 or approximately 1.8% of the total possible number. This cumulative percentage is one of two factors in the Power index.
3. Cumulative Percent (Frequency). This is a cumulative percent based upon the number of votes cast (672). Each entry is the percent of votes cast for an affinity pair added to the previous total.

4. Power. Power is an index of the degree of optimization of the system and is simply the difference between Cumulative Percent (Frequency) and Cumulative Percent (Relation).

**The MinMax Criterion.** The last two columns of the Pareto table are the keys to deciding which relationships should be included in the group Interrelationship Diagram (IRD). Since the relationships are displayed in decreasing order of frequency, the question is one of where to set a cutoff point, or to put the matter another way, how to decide which relationships to exclude from the group IRD. Obviously, relationships such as the ones numbered 54 through 56 in the above table should be excluded, since they attracted no votes at all. But how should a cutoff point be determined for affinities that attract relatively few votes? The decision involves optimizing a tradeoff between two criteria: the composite should account for maximum variation in the system (cumulative percent based upon frequency) while minimizing the number of relationships in the interest of parsimony (cumulative percent based upon relations).

**Accounting for Maximum Variance.** True to Pareto's concept, relatively few of the possible 56 relationships account for most of the variance; for example, the first 11 relationships (about 20% of the total) account for well over half (41%) of the variation in the system, and the first 27 (48% of the total) account for 80% of the total variation.

**Maximum Variance:** Frequency. The following graph illustrates the variance accounted for by each succeeding relationship.

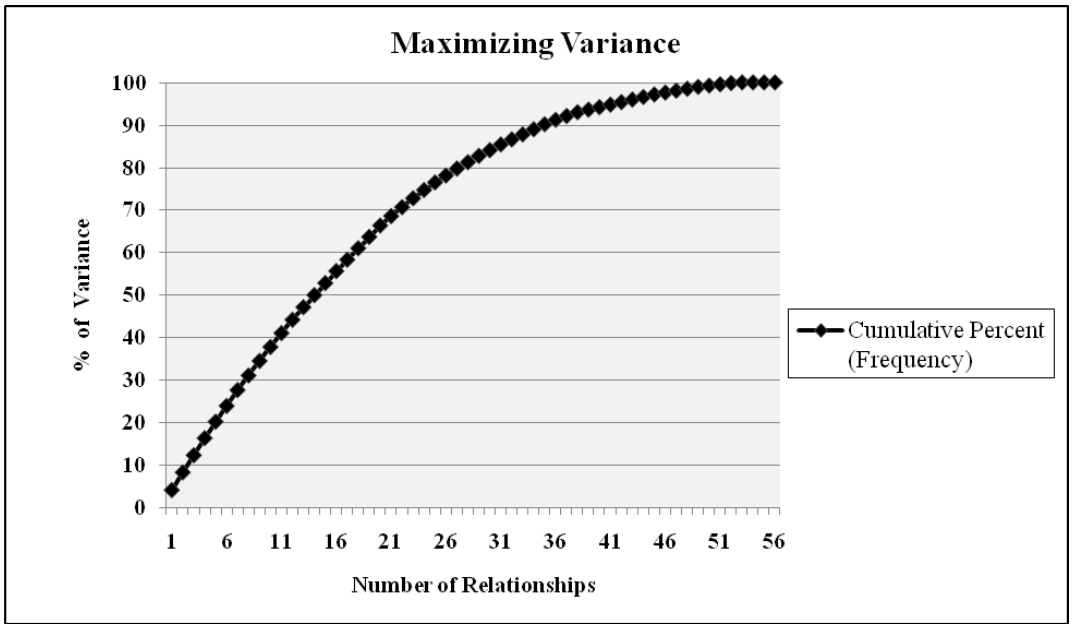


Figure 3.3: Maximizing Variance

**Minimizing the Number of Affinities: Power.** The following chart contains the power analysis for the system.

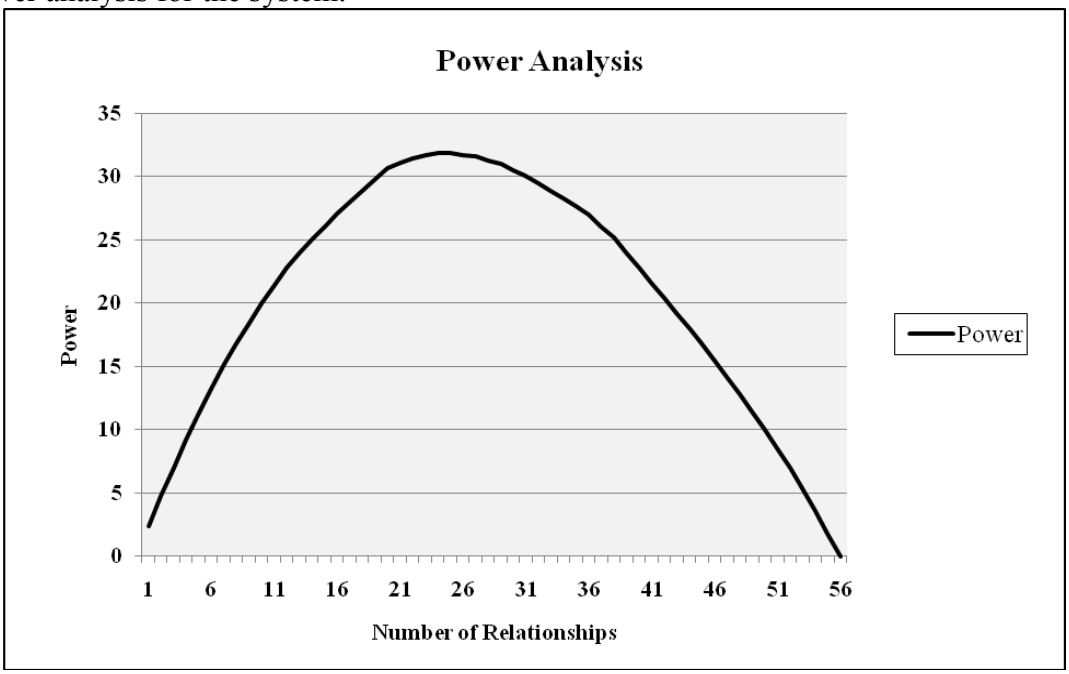


Figure 3.4: Power Analysis

Power reaches a maximum at 27 relationships, which accounts for 80% of the variation in this system; therefore, 27 relationships would be a defensible choice for inclusion in the Group IRD since it is an optimal number in the sense of the MinMax criterion.

**The ART**

The Affinity Relationship Table (ART) summarizes the relationships chosen to be used in the systems as indicated by the Pareto Protocol. There were 27 affinity pairs (cutting point at 80%) chosen to be included in the system. Of these 27 relationships, 3 were considered ambiguous or in conflict. Assume that a group has written a number of hypotheses arguing that affinity A influences affinity B (A →B). Another set of hypotheses argues the opposite, that A ← B. When submitted to the Pareto Chart, the argument is not resolved: the table contains hypotheses that argue for both directions, and both sets seem equally plausible. These conflicting relationships are an indication that a feedback loop may be present and needs to be addressed later in the system. For now, the researcher ignores the lowest frequency conflict and uses the highest frequency affinity pair to build the system. Below is the ART with the conflicting relationships that will be addressed once the system is built.

| Affinity Relationship Table | | |
|---|---|---|
| **Affinity Pair Relationship** | | **Affinity Pair Relationship** |
| 1 → 2 | | 4 → 5 |
| 1 → 3 | | 4 ← 6 |
| 1 → 4 | | 4 ← 7 |
| 1 → 5 | | 4 ← 8 |
| 1 → 6 | | 5 ← 6 |
| 1 → 7 | | 5 ← 7 |
| 1 → 8 | | 5 ← 8 |
| 2 → 3 | | 6 <> 7 |
| 2 → 4 | | 6 <> 8 |
| 2 → 5 | | 7 <> 8 |
| 2 ← 6 | | Conflicting Relationships |
| 2 → 7 | | 3 → 6 |
| 2 <> 8 | | 1 ← 8 |
| 3 → 4 | | 4 ← 5 |
| 3 → 5 | | |
| 3 ← 6 | | |
| 3 ← 7 | | |
| 3 ← 8 | | |

Table 3.9: Affinity Relationship Table (ART)

**The IRD**

Creating an Interrelationship Diagram (IRD) is the first step in a general process called *rationalizing the system*. Output of the Pareto Protocol is summarized in an IRD: a matrix containing all the perceived relationships in the system. The IRD displays arrows that show whether each affinity in a pair is a perceived *cause* or an *effect*, or if there is *no relationship* between the affinities in the pair. The IRD is created by placing arrows into the table, thereby showing the direction of the relationships. An arrow pointing from A to B (A→B) indicates that A is the cause or influencing affinity and that B is the effect or

influenced affinity. Below is the Composite Interview IRD and IRD sorted in order of delta.

| Tabular IRD | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **OUT** | **IN** | **Δ** |
| **1** | | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ | 7 | 0 | 7 |
| **2** | ← | | ↑ | ↑ | ↑ | ← | ↑ | | 4 | 2 | 2 |
| **3** | ← | ← | | ↑ | ↑ | ← | ← | ← | 2 | 5 | -3 |
| **4** | ← | ← | ← | | ↑ | ← | ← | ← | 1 | 6 | -5 |
| **5** | ← | ← | ← | ← | | ← | ← | ← | 0 | 7 | -7 |
| **6** | ← | ↑ | ↑ | ↑ | ↑ | | | | 4 | 1 | 3 |
| **7** | ← | ← | ↑ | ↑ | ↑ | | | | 3 | 2 | 1 |
| **8** | ← | | ↑ | ↑ | ↑ | | | | 3 | 1 | 2 |

Table 3.10: Tabular IRD

Count the number of up arrows (↑) or *Outs*
Count the number of left arrows (←) or *Ins*
Subtract the number of *Ins* from the *Outs* to determine the (Δ) *Deltas*
Δ = Out- In

| Tabular IRD – Sorted in Descending Order of Δ | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **OUT** | **IN** | **Δ** |
| **1** | | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ | 7 | 0 | 7 |
| **6** | ← | ↑ | ↑ | ↑ | ↑ | | | | 4 | 1 | 3 |
| **8** | ← | | ↑ | ↑ | ↑ | | | | 3 | 1 | 2 |
| **2** | ← | | ↑ | ↑ | ↑ | ← | ↑ | | 4 | 2 | 2 |
| **7** | ← | ← | ↑ | ↑ | ↑ | | | | 3 | 2 | 1 |
| **3** | ← | ← | | ↑ | ↑ | ← | ← | ← | 2 | 5 | -3 |
| **4** | ← | ← | ← | | ↑ | ← | ← | ← | 1 | 6 | -5 |
| **5** | ← | ← | ← | ← | | ← | ← | ← | 0 | 7 | -7 |

Table 3.11: Tabular IRD sorted in order of delta

The value of delta is used as a marker for the relative position of an affinity within the system. Affinities with a positive delta are *relative drivers* or causes; those with negative deltas are *relative effects* or outcomes. The Tentative SID Assignments Table represents the initial placement of affinities for the SID.

| Tentative SID Assignments | | Roles |
|---|---|---|
| **1** | School Administration and Management | Primary Driver |
| **6** | Environment | Secondary Driver |
| **8** | Parent/ Guardian | Secondary Driver |
| **2** | Content and Curriculum | Secondary Driver |
| **7** | Time | Secondary Driver |
| **3** | Teacher | Secondary Outcome |
| **4** | Information and Communication Technologies | Secondary Outcome |
| **5** | Student | Primary Outcome |

Table 3.12: Tentative SID assignments and roles

**System Influence Diagram (SID)**

The *System Influence Diagram (SID)* is a visual representation of an entire system of influences and outcomes, and is created by representing the information present in the IRD as a system of affinities and relationships among them. In developing the SID, all of the affinities are arranged according to the Tentative SID Assignment chart, and is efficiently created with a flow chart or "mind mapping" software program, such as Inspiration. The researcher began by placing the affinities in rough order of topological zones: Primary Drivers to the left of the screen, and the Primary Outcomes to the right. Secondary Drivers and Secondary Outcomes were then be placed between the primaries. Each affinity number or name is placed in a box shape. With arrows, the researcher drew connections between each affinity in the direction of the relationship as represented in the IRD.

**Cluttered SIDs.** The first version of the SID contains each link present in the IRD and is referred to as C*luttered*. The cluttered SID contains all of the links identified by participants in the protocol leading to the IRD. Later, arrows are drawn based on the ART to create connections between each affinity in the direction of the relationship as represented in the IRD. Figure 3.5 shows a placement of affinities in order of topological zones.

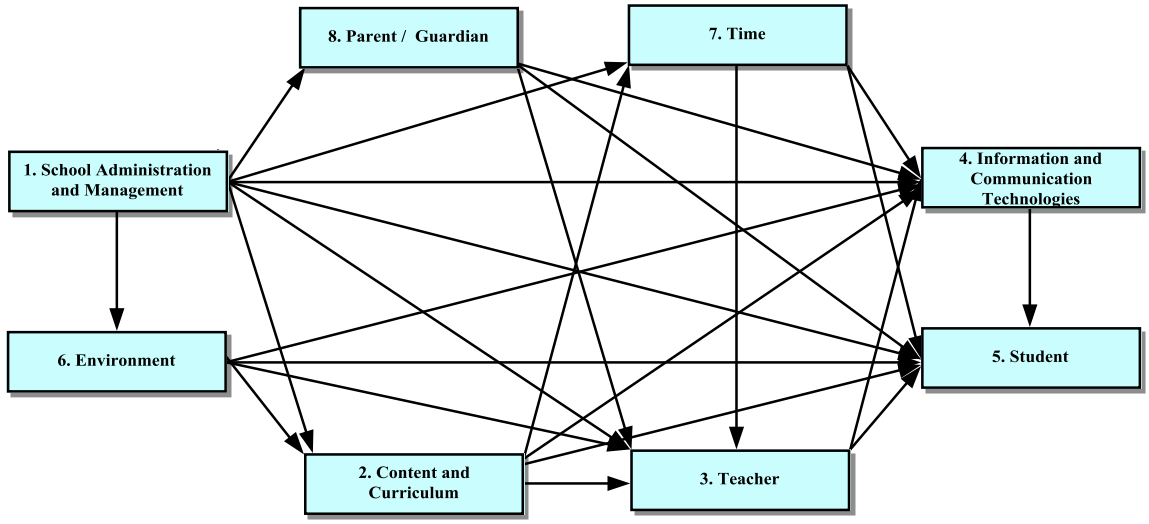


Figure 3.5: Placing Affinities based on the value of Delta

The next step is to remove redundant relationships. The process begins with comparing affinities at the extreme left and right and checking back to the left. If there is any path between the two affinities other than the direct link, that link can be removed. The result of this process is called an "*Uncluttered* SID" (Northcutt & McCoy, 2004, p. 180). For example, in the cluttered SID above, 1 influences 5 directly, at the same time, we could see that 1 also influences 5 through 6, and that 6 influences 5 through 2, 7, 3, and 4. Thus, the direct link between 1 and 5 can be removed. Next, comparing between 6 and 5, 6 directly influences 5, and 6 also influences 5 through 2, 7, 3, and 4, thus the direct link can be removed. The proces moves on to comparing the rest of the

relationships. Once all the redundant links are removed, we can see the uncluttered SID as shown in Figure 3.6. Given that, there is a backward link, between 3 and 6, and 5 and 3, which in this case cannot be removed, we can see a recursive relationship in the system. Detailed explanation will be presented in Chapter 4.

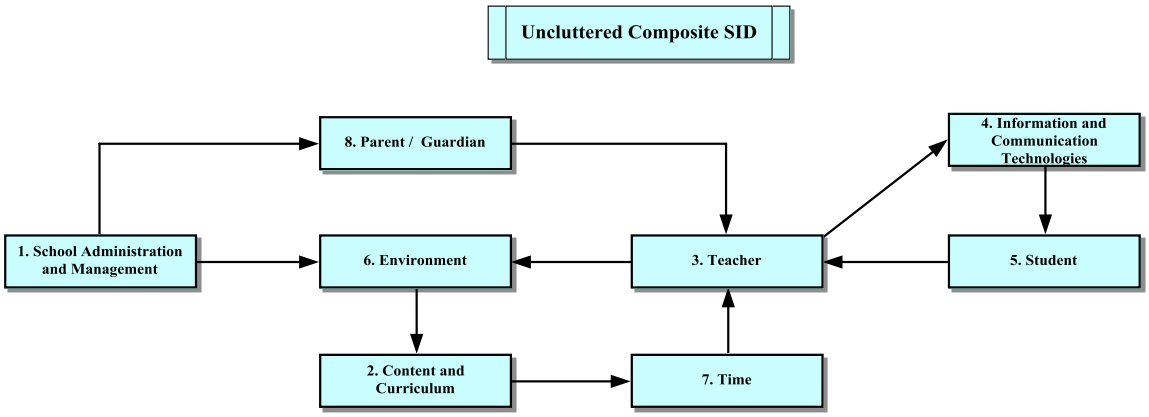


Figure 3.6: Uncluttered SID

**IQA Results**

The typical IQA report accomplishes three goals:

(1) Naming and describing the elements of the system: In order to set a base for systems analysis, each affinity is identified and described in detail by the participants.

(2) Explaining relationships among elements of a system: The SID is presented and readers are given a tour through the system in which the relative influence of each affinity on others is presented in a systemic context; the statements of participants are used to illustrate the systemic relationships.

(3) Comparing systems: Comparisons can be made at two levels: A qualitative analogue to the statistical concept of variation is possible by comparing individual SIDs

to each other and to the composite SID; and a qualitative analogue to post hoc group comparisons is possible by comparing the composite SIDs of different constituencies.

The last phase is interpretation. IQA study proceeds not only from the descriptions of the affinities produced by the participants, but also from two other sources including (1) the participants' judgments of the cause-and-effect relationships among the affinities and the system these judgments create; and (2) comparison of SIDs, both composite SIDs and individual SIDs. Affinities and relationships are described with the words of the group. Comparison is the key for the interpretation, and systems as represented by SIDs provide multiple opportunities for comparison.

## SUMMARY

In this study, the researcher attempted to better understand how two groups of teachers, computer teachers and teachers who teach mathematics, integrate the ICTs, and experiences and how they view their situations when using the ICTs in the classroom. The IQA method provided the researcher with the means to investigate such phenomenon grounded on teachers' perceived realities. The results from this study helped the researcher to identify affinities and cause-effect relationships perceived by the teachers.

# Chapter 4: The Teachers Speak: *Results of the Study*

The purpose of this study was to examine perceptions of teachers in Thailand towards ICTs integration in the classroom. Using the Interactive Qualitative Analysis approach, the researcher could draw a system of teachers' thinking.

In this chapter, the researcher first presents composite affinities descriptions. Affinities that emerged from the focus group interview process included school administration and management, content and curriculum, teacher, ICTs, student, environment, time, and parent/ guardian. The second part presents relationships of affinities by using a diagram to show pairs of relationships in the system and an uncluttered system. The third part shows a result of a Fisher's exact test to compare perceptions of mathematics teachers and computer teachers. To best illustrate the phenomenon of teachers' perceived reality, the researcher examined all quotes for each affinity. The quotes for a particular affinity were organized into sub-groups. These subgroups contained quotes that addressed a common theme describing that affinity. Multiple quotes were then woven together to develop a composite quote.

## COMPOSITE AFFINITY DESCRIPTIONS

Composite affinity descriptions, based on the axial coding analysis, presented collective quotes of both computer teachers and mathematics teachers. The major affinities that emerged included 1) school administration and management, 2) content and curriculum, 3) teacher, 4) ICTs, 5) student, 6) environment, 7) time, and 8) parent/ guardian. Each affinity contained different aspects related to specific experiences of teachers.

To illustrate the composite affinity descriptions, the researcher briefly introduces the affinity and its relevant aspects. Then, the paragraph begins with the voice of a participant in a sentence in bold text. The second sentence, presenting the key concept based on the voice of the researcher, contains a noun or phrase used as a noun that is italicized. The remainder of the paragraph is enclosed in quotes.

**School Administration and Management**

Both computer and mathematics teachers had a number of quotes that focused on school administration and management. The composite quotes that emerged from school administration and management could be categorized into the following aspects. Different types of schools, large provincial school and small sub-district schools, established their school's vision and policies differently. Most *provincial schools' vision* focused on *academic* and the students were grouped based on *their learning ability*. On the other hand, most *sub-district schools' vision* focused on *skill development*. The next sub-category involved budgetary issues. The government used a *per-head budget* formula to fund schools based on the number of students or the school's size, instead of the needs. Moreover, most small schools struggled with a *decreasing number of student admissions* and thus they tried to recruit new students either to increase or to stabilize the number of students. *Assessment of teacher's performance* was another issue that teachers largely indicated that the assessment was not effective. However, teachers had to follow school's policy and to be responsible for their assigned duties.

**The school's vision focuses on academic.** Most *provincial schools' vision* tended to center around *academic issues and concerns*. "Our school is a provincial school, and

because of that, I think most students here are quite ready to learn. The Academic Affairs holds a weekly meeting with the heads of different subject areas to discuss about teaching and learning. Mainly our school's vision focuses on academics particularly mathematics and science. Teachers are required to implement a project-based learning approach so our students have a chance to work on a real project. Our curriculum will be advanced, which may be similar to what undergraduate students have to study in freshmen and sophomore. At our school, there is a learning center, or what we call "academic clinic," to help students who need a tutoring session. We know that their learning abilities are in different levels and some of them might have learning problem such as they do not understand some topics. They can come to this clinic between 7 PM. to 9 PM. every Tuesday and Thursday to discuss with science, math, and computer teachers. They can come and talk to the teachers which topics are not clear to them. Some teachers live in the dorm with the students. So, that is a good thing for our students."

**The way we arrange the classroom is based on the admission scores and GPAs.** School's admission criteria and class placement are focused on *student's learning ability and expectation of learning achievement*. "There is an examination for admission but what I know is that the examination is for grouping students. I do not think that there is any student fails the test and cannot study at our school, unless they are really bad. Each year the school closely looks at the GPAs and uses the GPAs to put students into different classes. For example, the new seventh grade students will be selected and if their GPAs are very good, they will be put in the first two classrooms. For the rest of the students, we will mix them together. For the upper secondary grade students, we will look at admission scores. The students with the high scores will be grouped in the first classroom. Now there are five classes of Science and Mathematics Program and the

students are moved to different classes each year based on their GPAs. So, the high ability students will be grouped in the first classroom. They are "our hope" because they are more likely to pass the entrance examination, just depending on which university they would like to study."

**We emphasize activities rather than academics.** Most small *sub-district schools' vision* focused on *skill development*. "We do not focus on academics because most of them do not further their education in the upper secondary level. So, we have to ensure that they have practical skills. I think half of them have a chance to study in a higher level but the other half does not have that chance. As a computer teacher, I try to encourage them to practice using computers. At least when they apply for a job, they know basic computer applications. Our policy looks at our students' abilities. We do not have any examination for admission and that means anybody can study here, so we have to consider what will help our students. For example, right now we focus on sports and marching band. We have received many award-winnings from these activities. Our school does not have a group of high-performing learners, but instead a group that does not pass other schools' admissions. In an academic part, computer subject is our focus because our school board members understand that our students are not excellent in academics. However, we need to help our students to survive in the society, and so we should focus on technology. At least if they study in a vocational field, they have an advantage on computer skills.

**It depends on numbers of students.** Limited *per-head budget* distribution from the government required the school to collect an additional fee from parents. "We receive budget from the government. Since we have a small number of students, we will receive

a small amount of budget. It is a per-head budget. The school allocated a large amount of money on supporting teaching and learning tools. They tried to recruit new students in order to increase numbers of students. Unfortunately, it has been decreasing every year. Also, they tried to encourage 12th grade students to take an entrance examination and further their study in order to show people and kids living around this area that we have students who are as competent as students in the city area and they can get into a university. For the students who attend the Advanced Program, they have to pay an additional fee for about 3,000 baht each semester (approximately 94 US Dollars, at the current rate 1 US Dollar is about 32 TH baht). This is for the lower secondary level. It is about 4,000 baht for the upper secondary level (approximately 125 US Dollars). The rest of the students, they have to pay 1,000 baht (approximately 32 US Dollars). We added up the additional fee to the money we received from the Government. This amount of additional fee will be spent for the electricity fee, computer maintenance fee, and others. Our school also received an additional budget from "Thai Kem Kaeng[5]" project and we will use for science and mathematics program, to hire teachers to teach our students in Advanced Program. For the budget to support student's learning, actually some are specifically allocated for science and mathematics classes. When there is any special project for the students in these classes, the school will provide a special training session, a field trip, for instance, which is more than what other regular classes would get."

**We have no choice.** Small sub-district schools struggled with *decreasing number of student's admission*. "We cannot select students because our school is a sub-district school. It is not like a provincial school. We have all those students who cannot get into

[5] *Thai Kem Kaeng* or *Thailand: Investing from Strength to Strengt*h is a national development project, 45 billion USD package is to be implemented over the next three years (2010-2012), for investment in the long-overdue infrastructure projects. Part of this fund will be used to upgrade education facilities.

provincial or district schools. Our school is a small school, so we cannot select students for admission. Also, we have a small number of students. Currently there is only one class for each grade level. We cannot separate students based on their learning ability. The input or students mostly live in this community. It is a limitation. It is always like this for any school in a rural area. Most students come from a poor household. There is no examination for admission. Whoever applies will be accepted."

**It does not provide any benefit.** A*ssessment of teacher's performance* is not effective. "It is required that we have to do classroom research every semester. Each semester, we have to do classroom research, which I think it does not work. I mean they do not seriously look at it. They do not examine the quality of the research. We just do it as required. In terms of quality, they do not check how good or bad, or what can be done to improve our students' learning. Also, they do not look at our performance closely. Nobody takes care of this job. So, they just look at the overall picture. I think it is not effective. They will also look at the lesson plans and supervising our instruction. It is not only the assessment within the school but also the Office for National Education Standards and Quality Assessment (ONESQA) that examines our work as a part of the school quality assessment. The assessment also includes, what they call, "Memorandum of good practice." They require us to write a memo of our good practice so we reflect on what we have done. The head of each subject area and the vice president of the Academic Affairs will do the assessment. However, at this school, they focus on jobs other than teaching. I mean teaching is not the key part, but how we help school activities. For example, working hard on the school activity called "Pa-Paa" (Buddhism ceremonies that people donate money or things) will be judged as good performance. So, they look at other jobs that teachers do, but not teaching. Another thing is that a teacher who

supervises the students for a competition and win an award will be considered as good performance. Our Thai bureaucratic system has a nice policy but there is no real evaluation, no follow-up plan. Some projects already finished, but the reports that they turned in did not get any feedback. There is no cycle of work, no revision, and it is like just what we have to do! And when it is done, that is the end. So, the way they evaluate in the bureaucratic system has been down. It depends on the policy from the top level. When the top level seriously wants to implement the policy such as writing a report, we, in the bottom level, have to write a report. If they really follow the policy and other regulations, it would be nice. What we have now is a very flexible and loose implementation, which becomes a habit. If we want to make a change, it has to change from the top level. They have to strictly follow the regulations and the framework. Also, the way they checked our teaching plans or classroom research was not serious and so we just do not know what we did wrong. There was no feedback or comment like which part we should improve. So, the teacher did not do anything to make an improvement. I mean the teacher will just keep doing the same thing. There is no change, no improvement. It is like we submit our work just to get a signature. The most important thing we need to change is an attitude of teachers. They have to know that every job needs to be evaluated."

**Content and Curriculum**

Teachers were familiar with prescribed curriculum and course contents. The new core curriculum required every school to develop their own school-based curriculum. Most schools have their *teachers work as a school-based curriculum developer*. Some teachers indicated they *struggled with the new school-based curriculum*. Additionally,

some teachers felt that the change in the depth of the course contents made it *difficult to teach* and specifically to complete all the content required to teach in a semester. However, some teachers had different thoughts. They thought that *change in the curriculum structure and course content they were required to teach was not a real problem, but rather the teaching ability or quality of teachers*.

**Teachers are assigned as curriculum development committees.** Teachers have to *work as a curriculum developer*. "We are responsible for developing curriculum, making sure that content fits within the National Standard. Also, we have a meeting to improve our curriculum either at the beginning of the semester or the end of the semester. I feel like I can be a part of curriculum development so I do not have any problem. If there is any problem, I can propose to other committees to modify it. We also invited faculty members from various universities to help us develop our school based curriculum. If our school curriculum is different from the national ones, what our students learn might not be good enough for the university admission. This could be a disadvantage for our students when they have to take the O-NET (Ordinary National Educational Test). Their scores might not be as high as we expected. I would like to see them get higher scores although right now it is good enough."

**I prefer the old version of the core curriculum because I can implement it right away.** Teachers perceived a *struggle to implement the new curriculum*. "In the past, the curriculum was developed by the Ministry of Education. Everything was prescribed in detail for example, structure of curriculum, courses descriptions, textbooks, and so on, right? So, every teacher could teach the same content. Later, the local curriculum was added because each local area would have different resources. So, the

elective courses were developed based on the available resources. The students in Chiangmai, for example, should be able to learn how to play northern instruments like Thai two-string fiddle. At this point, I think changes in curriculum were appropriate. The core courses, which related to academics, would be the same but the elective courses could be different. An issue that came up was whether the school could offer the elective courses based on students' interests. However, that was not a major problem because students would not have any problem when they moved to different schools. Now, we developed our school based curriculum, which could be different. I mean it is flexible but in terms of quality, every school has to develop their own school based curriculum and it is very hard particularly for the small size schools. Some wanted to just copy from the large size schools. Also, since the school based curriculum is more flexible and the school has to offer courses based on students' interests, but we do not have teachers to teach those courses so we cannot offer them. Or sometimes we offer it but if there were less than five students enrolled, we have to cancel it. This is another problem. Letting students choose what they want to learn is impossible to do. We still have to consider our school's capacity. This new curriculum, we have to develop school curriculum based on the core curriculum and it can be different, which might be a problem. For example, the eleventh grade students from two schools might not learn the same topics. When they have to take an examination, it will be a problem."

**I have to keep adjusting the content.** Many teachers perceived *the difficulty of the course content*, which they could not finish all the required content in a semester. "Although we develop our school-based curriculum based on the core curriculum, we still have to consider our students' learning ability. Programming is quite difficult. I used to teach a hardcore programming but the students could not get it. So, I have to adjust it

to match with the ability of students. I used to teach a difficult concept such as function and array, but now I cannot do that. Sometimes I think it is too much for our kids, who live in a rural area. It seems impossible to cover all the content they expected in the core curriculum because our students are not competent. If I teach, they can hardly get it. So, I teach based on their ability. If they cannot understand a concept, I have to repeat it until they get it. I choose to teach some concepts and transfer some parts to an elective course. For example, I will not teach geometry in a basic course but teach it in an advance course, which is considered as an elective course. It is because the students struggle with the basic math operations. So, if I followed the core curriculum, the students might not be able to get anything."

**The curriculum is not an issue.** Some teachers perceived that *change of the curriculum was only at the structural level*, which may not help improve the learning outcome. They perceived that *teachers were actually the key factor for improving students' learning achievement*. "I think the new core curriculum is quite similar to the old version. They just change the structure of the content and course names, which to me it does not make any sense. I think this would not solve a problem. They should focus on an issue that students cannot fail to move on to the next grade level. That needs a solution. It is a policy maker level. Every teacher at least earned a Bachelor Degree and they teach the content that is easier than what they learned at the university. They should not have any problem. The content we have to teach, I think we do not fully teach it. I am not sure whether curriculum and content are good enough because the learning outcome is decreasing every year. Although it is the same content, same curriculum, the learning outcome is going downward. The quality of students to get into a higher education is decreasing even though the content and curriculum are the same. Or even if they change

the whole curriculum structure, I think it will be the same. So, if you ask me how the content or curriculum is, I think it is not about the content or curriculum; it is about quality of teacher. I do not think a change of the core curriculum will make things better because as long as an instruction or the way a teacher teaches is the same, it is hard to change. Although the curriculum, content, or frameworks are modified, if firstly, the teacher cannot cover all the content, and secondly, the teacher does not truly understand the content, I think the teacher cannot change teaching and learning process and succeed the goal of the curriculum. Everything is going down, end up in the same way."

**Teacher**

*A lack of teachers* is one of the issues that teachers mostly mentioned. They have a full-day of working on different tasks. The main job is teaching, but every *teacher has to do extra jobs* such as working on administrative jobs, taking care of school networking system, database system, and working at the co-op, for instance. In implementing the instructional tools, teachers nowadays have *basic computer knowledge and skills* and can use computer in their instruction. However, their instructional approach is a combination of *teacher-centered approach* and *student-centered approach*, but teacher-centered approach is mainly applied.

**We definitely need more teachers.** Almost all teachers mentioned *a lack of teachers* at their schools. "For a sub-district and small-sized school like this, a decreasing number of students make it harder to recruit a new teacher. Actually our teachers move out every year; they would like to live in the city area. For those who live the city area, they would like to work near their home. Some moved to other schools that have a higher

number of students. Now, there is only one teacher who majored in mathematics, and that is me. Another teacher earned a degree from Educational Administration but he can teach mathematics. I think we still need more because now each of us teaches about twenty four hours a week. But I would like to have fewer hours of teaching because I can make it more effective. As you know, a number of students per classroom have been increasing and the same as a number of classrooms except the number of teachers. It slowly increased. If we could teach about eighteen to twenty hours a week, that would be great. Sometimes, the seniors, I mean the 12th grade students helped me train younger students. I focus on networking system rather than programming because I did not have a degree in computer science. So, it is a programming course that I have a problem. We do not offer any programming course because we do not have any teacher who is skillful in this area."

**There are always other jobs to do.** Teachers are *required to do extra jobs*, other than teaching. "We have to teach and do other jobs at the same time. Like me, I work at the Academic Affairs, taking care of learning assessment. Others work at the Planning and Development Department. Everyone has to do other routine jobs. Actually, only teaching is hard enough. I used to teach at a university for one semester before I worked here so I can see a difference of the workload. At the university, most jobs would be relating to teaching. However, working as a school teacher, there are different kinds of jobs to do. Especially people are more likely to think that if it is about computer, a computer teacher has to get involved or will be assigned to do. For example, school's database, student's database, anything that has to do with computer, it will be computer teachers' tasks. I used to work on school's website development as well but they knew that I could not keep it up-to-date so they hired a staff to do that job."

**I think teachers have known how to use a computer already.** Although teachers have *basic technological knowledge and skill*, most mathematics teachers use specific software such as Geometer SketchPad (GSP) and use email to communicate with students outside of the classroom. For the computer teachers, most of them have to be responsible for training other teachers at the school, but they found that teachers now can use computer and other tools so they provided training less often. "I teach mathematics by myself. There is no computer teacher here. So, the computer room can be used by any teacher but they have to reserve the room. Last year, there was a project to promote the use of ICTs, but we did not have a computer teacher and computer course offering. So every teacher had to teach the students and have them practice using the computer. I am not very good with ICTs. I use CD-ROM, Geometer SketchPad (GSP) sometimes, and I also use Microsoft Student. I use Hotmail, which I think it is quite easy. When students turn in their assignment, they can send it via email. I will check it and grade it on my computer. Other teachers, they may not do like this. We do not have time to update new technology or knowledge. Sometimes our students know more than us."

Computer teachers mentioned that teachers mostly know how to use a computer. "Our school provides computer training for the teachers. It is based on their interests. For example, when teachers in Thai language subject group would like to do an e-book, we will train them, within the group. We do small group training so that it meets their needs. We used to do a formal training, giving a certificate. We have not done that for a long time. At that time, we made an announcement through the Provincial Administration Office. Recently, there have been fewer teachers participating in our training. Most teachers are newly graduated so they do not have any problem using ICTs. Also, it is a

sub-district school so a newly graduated teacher is more likely to be assigned to work here."

**Most teachers use PowerPoint when they lecture. If they want the students to learn how to use a program, they will just show how to use it and then let the students follow.** Teachers mostly indicated that their instruction mostly represented *a traditional approach*. "When I teach computer, I basically use PowerPoint because I think students are more engaged than a plain lecture. Mostly, I use drill and practice. I show them a good example, teach them, and let them practice. Then, I call some of them to present how they solve a problem. I hardly use a group work approach because there are many problems. Most people say that we should not focus only on content. However, as a teacher, I think if this approach is time-consuming, then I may not be able to teach all required content. So, I have tried to use it such as working as a pair or group work but maybe once a semester. When teaching about software application, I usually demonstrate first and then I have them do a hands-on activity or create something. I usually use a worksheet, which I uploaded everything on the Moodle system. They will learn and practice as described in the worksheet. Later I will have them present their products. They have to explain the development process. At the end of the class, I will discuss about what they have learned and issues they found."

However, only few participants claimed that they partially applied *a child-centered approach*, which they viewed that students should be ready to learn this way. "I apply a child-centered approach and also I focus on the content knowledge. Other than that, I let them do a practice. I have them practice and make sure they know the process. I basically use PowerPoint and I divide them into small groups so they can work on

problem-solving exercises because some computing concepts are relevant to problem-solving. However, an important part of education is the input. My input is quite a 'low quality' group. I have to say that the students who get into this school are a low-performing group. So, if I push them to reach the goal, it will be difficult. What we can do is to change an attitude and a perception. The bottom classes might have some good students. I mean they can understand the concepts. But, I should have mentioned earlier that it might be depending on teachers. It could be because of me, as a teacher, I could not create an activity that engages all students. I should not blame that the students are not capable to learn. I have my students practice more and focus on their background knowledge, making sure they all understand the concepts. If any of them is interested in programming, he can learn more later. It should be considered as an individual interest."

**Information and Communication Technologies**

Teachers applied and in some cases developed *instructional media* for their teaching but it depended on their judgment of its appropriateness to the topic or content, and how students gained benefits for learning. To be specific, mathematics teachers felt that they have less *authority to use the computer room and other tools* than computer teachers, who have a direct responsibility on the ICTs. Teachers perceived *a gap between the schools that have ICTs ready and those that have ICTs but may not be fully functional for all users*. However, some schools received *support from the local community and organization*.

**Mostly I use Word, Excel, and PowerPoint to create my instructional media.** Largely, teachers use basic applications to create *instructional media* to use in the

classroom. “Personally, I use instructional tools because it helps students' learning and it is like labor-saving for me. The media I use are CAIs and some are from different websites, which I would download and store in the school intranet system. I use Word, Excel, and PowerPoint, basic programs because I am not good in computer. So, I think I can use it for my work but not so good. I do not use any difficult program. The school bought GSP software but I do not use it for every class, it depends on the topic for example, I use GSP to teach parallel geometry. It depends on the topic because I think for some topics, a simple tool or material should be good enough. I created a PowerPoint first and then captured images on the screen as well as the audio. Later, I uploaded each clip on the internet. I did it during the mid-term examination. I thought it would be helpful for students to review what they have learned. It turned out that only five to ten students out of two hundred students used it. I just knew later that many students do not have a computer at home because of the family’s low-income. Some students have a computer at home but they do not use it for learning. This is another issue I learned so far. Also, it could be because what I created was not interesting. After that, I decided to stop creating this kind of media. I used others that are ready to use. ”

**We have to wait and we can use computers only when the room is available.** Mathematics teachers, who teach at the schools that do not have a computer lab for every subject matter, are more likely to feel the inconvenience of only being able to use the computer when the room is available and that they *do not have an authority to use the computer room*. They have to rely on the computer teachers or other staffs when they would like to have their students use the room to study mathematics. “Usually it is reserved for computer courses. At least there is a computer to use but it is not for mathematics. Another problem is that I do not have any authority, I mean if I tell my

students to use the computers when the room is available, then there must be a teacher in that room in case that there is a damage. Usually if the computer teacher is not in that room, he will just lock the room. So, nobody can use the room. I understand that he is responsible for the school's properties and that is why he locks the room when he is away. I use a computer room only when it is available. I use it for training students, Advanced Program students, so every student can use the computer. I wish we have more computers in our mathematics lab because the computer rooms usually are reserved for teaching computer classes. I reserved the computer lab, mainly because I would like to use GSP. Usually they can use GSP only when there is a training session so they all know how to use it. Sometimes I would like to use the room but I have to ask for an approval to use the room. If we would like to make a change to have teachers use more technology for teaching and learning, we need more support."

**The students can use computers individually.** Some schools have *ICTs ready for teaching and learning*. "There are about twenty-four students per class. Some of them bring their own laptop; some use the computer in the lab. Also, there are laptops available for the students if they would like to borrow. Our school has a wireless internet. There is a Mathematics room that provides a Smart Board, a projector, an overhead machine. I think it is pretty good to teach students here because it is not like learning in a regular classroom. They will learn in this room once a week. I used a Smart Board. There is a digital board and ten computers in the mathematics lab. This is where I teach and I mainly use PowerPoint. When I teach GSP, I will show how to use it first and after that I let them work together as a group. I know that not every student can use it so I allow them to make a copy of the program and let them do it at home."

However, some teachers perceived a *lack of ICTs availability for teachers and students*. “At school, I basically use my own computer to create a worksheet because my office is in another building. It is not convenient to use. I think most teachers have their own computer to use and they can make a copy and print out at school. Ninety- five percent of my students do not have a computer at home. So, they use it at school. Some students have to sit together like two students work on a computer. It is a limitation. Some computers are broken. In some classes, the students can use the computers individually. In some classes, the students in the front rows can use the computers individually but those in the back rows have to share the computers. There are about forty students and thirty-five computers, but some are broken. However, the students are willing to sit with their friends because they are not confident to work alone. Sometimes I called them to sit on a computer so they can work individually but they preferred to sit with their friends. The internet speed is quite slow and it is difficult for teaching computer. I use PowerPoint to teach about Graph. Also, there is no computer for the students to use in the classroom. There is only a set of computer connecting with a projector to use in the lab of each subject area.”

**We also do not just wait for a budget from government, we have "Pa-Paa computer" (computer donation).** Many schools received *support from the local community and organization* to purchase new tools. “Right now I think our school is pretty ready, if compared with other sub-district or rural schools, I think ICTs in our school is quite good because we have received support from parental association and also the community. We have many donated computer machines that are installed in each classroom connecting with a television for the output. These machines are in a good shape, not perfect like a new one but still work well. We have these donated machines

from the parents and these help us a lot in teaching and learning. However, if you compare us with other schools that have more budgets, definitely we cannot compare with them. What we have is good for kids to use for searching information and produce some works. If you ask a new teacher who has high expectations, that teacher might say that this school does not have enough ICTs. However, I can tell you that this school is still better than many schools in rural areas, much better. Our school received support from a Foundation of Internet for School and Community, which is founded by Thai Journalist Association. They helped setting up the school network and installation of different programs. When there is a donation from other companies through the foundation, they will send to us. They also set up a training camp for both teachers and students. That is how we develop the school networking system."

**Students**

Teachers perceived differences of *students' backgrounds* were associated with their motivation to learn. It seems to the teachers that *well-performing students, who live in a city area, tend to be more active and competitive*. *Low-performing students, who live in a small sub-district area, are more likely to be passive*. Many of *poor students have to contribute to their household production*. Thus, the *perception of these two groups of students towards their learning mathematics and computer subjects are different*. Also, it could be because the nature of computer courses that does not require *background knowledge*, unlike mathematics. Teachers also found that many *students are not afraid if they fail the test* because getting and "F" did not mean they fail to pass on to the next grade level. Thus they tend to be misbehaving and that makes it *difficult for the teachers to manage their classroom*.

**When I teach, they can understand it quickly.** Students who live in the city area are more *active and competitive*. "They can use computers since the elementary level. I would say that a high ability group is very talented. Also, they pay a lot of money for tutoring. During a school break or summer, most of the parents can provide support financially. I teach mathematics to class 5/1 (11th grade, room 1) so I know that about eighty percent of the parents can support for the kids. So, they learn those contents before I teach at school. However, an issue is that studying at a tutoring school is like stuffing things in a short time. It is like they have some ideas and when I teach them at school, they can quickly get it."

**As our students are rural kids, so they do not have motivation and competitiveness.** Teachers perceived that *students who live in the sub-district areas do not have a motivation to learn*. One possible factor would be the low socio-economic status. However, their characteristics are quite polite and always show respect to the teachers. "Our students are just rural kids, not as active as those kids in the city. This becomes a problem of our school because when they take the O-NET (Ordinary National Education Testing) or A-NET (Advanced National Education Testing), they just get low scores because they are not enthusiastic to go to a tutoring school. It is more like teachers have to squeeze all the content to make sure they know everything. The students are from the local community. Overall, their learning achievement scores are quite low. In mathematics, the students have a problem with basic operations. Most of them would not move into a city area. After they graduate, it is more likely that they just work in a field. I think they do not see an importance of learning. They probably think why they have to learn. Eventually they will have to work as a farmer. Some of them do not have even

basic things for everyday living. This is what we have to understand. Let me tell about my experience visiting students' houses. Some live in a nice house but some live in a shack made from bamboo and there is no restroom. It is very different. When I teach, I try not to be stressful. I make jokes and play with them sometimes. I have to repeat it to them. If the topic is difficult, I will not teach it because I know they cannot get it. When I give them a homework, I give them very few because they are not the same as those kids in the city. For those kids, they might be able to do ten items. For my students, one or two items would be enough. I mean if I give them too many items, they just do not do it. However, one or two items would make them feel that they can make it. So, that is why teaching and learning process goes slowly. It is because this place is located in a rural area. There is no water supply. It is quite an undeveloped area. We just had computers and the internet system was built for few years. However, students here are quite polite, not like those who live in a big city. They are nice and respectful to teachers. Students always "wai" (a way to show respect to elder people) teachers every time they see us both inside and outside school."

**It is a rural lifestyle. When their parents need help during the harvesting time, the students will have to help out their parents and miss the classes.** Some poor students have to be *a helping hand for the household*. "Usually there is a parent-meeting once a semester but some cannot come because they have to work. If they choose to come to school, that means they do not get paid on that day. Some students have to help their parents do the fishing. At night they will go out to catch fishes, during the day at school they fall asleep. Many kids have a difficult life because they are not from rich families. The rich kids would go to school in the city area. Some are originally the Northeastern folks and they come down here to get a job in a rubber plantation."

**Most students do not like mathematics.** Most students feel that *mathematics is a difficult subject matter and requires strong background knowledge*. “It is quite hard to find students who like mathematics. Most students like PE because they do not have to be in the classroom. They asked me, "Why do I have to learn?" They have no idea what Log is and do not know how to apply it. I have to accept that their background knowledge is in a lower level. I compared with what I have heard from other experienced teachers at the school and also my personal experience. For example, students in grade 8, some of them cannot remember a multiplication table. So, when I ask them to solve an equation problem, they got a wrong answer because they multiplied or divided the numbers incorrectly. It showed that they could not recall a multiplication table. Some could not even add or minus the numbers because in grade 7, they have to learn about Positive and Negative Integers. Some of them still got confused and asked me "Umm (-2) + (-2), is it equal to 0?" Some new students entering the 7th grade level cannot calculate basic operations like addition, subtraction, multiplication, and division. I have to start teaching all these basic topics first.”

**When it is their computer class, they will rush to the computer room.** Most students like the computer subject because they perceive that they can do hands-on activity and they think it is like *playing computer games*. “Basically the students like computer subject, but I think they have a misunderstanding about this subject. They thought they could play a game. So, I told them that it was not about game and I had to be strict because they played a computer game right after they turned on the computer. Later, I had a rule that they could not turn it on until I finished my lecture. Our students like computer subject because, I am not quite sure but a part of it is that they can study in

a room that has air conditioner. They also love the internet. When we teach, we cannot only stay in the front. We have to walk around to make sure they do not use the internet. I know that they use it, but I think it is their nature. I guess they feel like using a computer is like playing a game. However, there are some issues that they need to learn more such as how to use a computer safely, or precautions about damage on school's database. Sometimes they have no clues about computer virus and it spreads out through the school's network. Or sometimes they go to some websites which I think it is not appropriate and especially when they chat or play in Hi5 or Facebook during the class even though we have a rule. Sometimes we have to block some websites. But they are kids and so they keep finding something else to play."

**Computer is not like mathematics that students need to know some basic concepts before they can learn a new concept.** For computer subject, *background knowledge is not critical*. "In the computer subject matter, I think background knowledge is not critical because each concept can be taught separately so each class is like teaching a new concept which does not require any prior knowledge. Their background knowledge is very different. Some can do everything such as typing, creating a table, decorating, and inserting a picture. However, some cannot do anything. There is a difference in households. I feel that kids have basic knowledge about computer more than before. I used to teach like starting from zero. They had no clue about it. Kids now already knew how to use it. So, I just teach them about concepts or ideas. It is not just about teaching basic knowledge. Our teaching approaches should be changing."

**The rule is that if they fail only one course, they will not be in a big problem.** Students focus on pass and fail rather than what they get to learn and also they perceived

that *failing one course did not mean they could not pass on to the next grade level*. "The content is not that difficult but when the students perceive that they will not fail even if they do not work hard. So they do not care about it. I think this is a result of that students will not fail to move on to the next grade level. It makes them feel like there is nothing to be scared. If they failed, anyway teachers cannot let them be in the same grade level. There are eight courses; they have to fail seven courses so they are considered as 'Not pass to the next level.' However, they are not that bad. They feel even if they cannot pass this course, they are still okay. It becomes a value that failing is an ordinary thing. It is an accumulated problem. I mean they lack basic knowledge and skills. The students I teach are not like a high ability group. They do not pay attention and it is very difficult. When you are in grade 10, you do not pay attention in learning and when you move on to grade 11, you have to know basic concepts that you should have learned in grade 10, but you just do not have any. Teachers are blamed for not encouraging the students, but that is not quite right. If we keep teaching but the students do not put any effort, they do not get anything."

**I need to use different approaches to control them.** When students *misbehave*, it is *hard for classroom management*. "Kids in this generation do not make an effort in their learning. As I have seen, they just wait for us to feed them. They do not do their homework and do something else. The result is that they do not understand what they learned. It is not like my generation. Today's kids do not show any respect to the elder, no courteous, and I have to remind them all the times. Another thing is punishing. In the past, we could punish students by hitting or something like that but we cannot do that or even touch them. So, it is like I just keep telling them what they should do or should not do. In a class, I can see three groups of students. The first group is those students who

think that they already knew and do not pay attention in the class. The second group will be more focused in the class. The third group is those who do not know and do not pay attention when I teach. I mean I know students who have self-motivation and students who do not pay attention in the class. When I teach, I know which groups I have to focus on. For those who pay attention in the class, I think they listen to me and understand when I teach. For the other two groups, I pair them up so they can help each other like partners. Those who already knew can help those who do not know."

**Environment**

Because of *a limited and fixed area*, and thus schools cannot increase the number of classrooms. For those that have an increasing number of students, the *class size became larger*. Additionally, teachers found that the *school context and nearby places were not safe* for commuting individually.

**Classrooms are not enough.** Teachers felt that *the school did not have enough space* to build or renovate the building to increase a number of classrooms. "Students have to move around to study different subjects. The number of classrooms is not enough but we have many rooms for experiments and practices such as science labs, mathematics lab, and computer labs. We do not have any space for a new building. Our school is a sub-district school. There is no canteen, no gym. Other schools usually have all these rooms. Even our school was selected to be a Science Learning Center and received budget for purchasing equipment, there is no space to use."

**It is way too many for one teacher.** Teaching a *large-sized class* makes it difficult to implement a group-based activity. "It is hard to take care of every single student when there are about 50 students in a classroom. I think it is too many students for one teacher. What I say may not make a difference, but I have 40 to 50 students to take care of. There is no space left. Especially the students who sit in the back row are very pitiful. The front row is very close to the blackboard while the back row seats are few inches from the wall. It is so difficult to have a cooperative learning activity or have them work in a small group. Except we use a think-pair-share strategy or something like that. We cannot do a group of 4 or 5 students. It will mess up the class and also it takes time to arrange everything. At our school, number of students is not stable. On average, there are about 45 students but during the middle of the semester, a number of students might be increased to 50 and later decreased. It is quite hard to specify the number because their parents relocated to this area and some moved to other places."

**It happens almost every month. Sometimes it is more often than that.** Few teachers perceived that the place they live and have to go to work are *unsafe areas*. "Our school is located on an island and most people in this community work as a fisherman. Around twenty percent of our students come from a nearby subdivision, which is a slum. These students struggle with family problems and since our school is an opportunity-expansion school, there is no examination for admission. It is one of our school missions to give an opportunity for every student. There is a Child Protection Foundation close to our school. This place will help those kids who may be in risks of abusing, and sexual abusing. Those kids who were abused sexually and were rescued have to live in the center, provided by the Child Protection Foundation. They are sent to our school. So, we have all kinds of kids here. I have to visit students' households every semester and have

to write a report. I usually have other teachers accompany with me because some areas are quite dangerous. There are crimes, drugs, everything that is illegal!

This city became the insurgency area; there have been many dangerous situations. The worst one was when our school principal was killed. There was once that the school almost got burned down. A troop of military has to stay on guard to protect schools in this area. Most attacks have taken the form of drive-by shooting, sometimes they used nails, called "Reu-bai" (nails twisted in an L shape), throwing on the road. If it happens to other schools nearby, our school will be closed as well."

**Time**

Teachers have to be responsible for teaching and doing many routine administrative jobs. They had a *busy working schedule* and felt overwhelmed to manage time for teaching. In addition, teachers had to adjust class hours because *out-of-class activities take over class hours*. They have to teach additional class periods in order to complete all the required content so that the students are prepared for the O-NET (Ordinary National Education Testing). Specifically for computer teachers, they feel *busy to work as a technical support* at the school. Sometimes they are called for help fixing computer problems while they are teaching.

**Time will never be enough.** Teachers had a *busy working schedule*. "There are basic and advanced mathematics courses so I have to see the students four days a week. Sometimes the students got confused because I teach both courses and the schedule might be next to each other. The total teaching hours right now are 25, if adding activities, which are 4, so it is 29 hours. This does not include other jobs, which I have to find a free

time to work on. Sometimes it is close to the deadline, I have to get it done and I have to work at night at school or sometimes I work during the weekend. Thus, the teachers do not have time to prepare for teaching. This is what we have to accept and why experienced teachers still teach in the same style. They may not change even the worksheet. A new teacher may want to fully focus on teaching but does not have time to do as wanted because of other additional assigned tasks. I think there are too many things to do. What we have to do is not only jobs at school but also jobs from Office of The Basic Education Commission and Office of District Education. It is like an extra job. Actually doing a good job on teaching, preparing for classes, and other relevant jobs would be hard enough. Doing everything in and out school jobs is quite overwhelming."

**Sometimes I think students' activities take our teaching and learning hours.** Teachers felt that *out-of-class activities took over class hours* out of the tight class schedule. "Students have to do many activities and it takes over my classes' hours. For example, in my course schedule, I have about 40 hours totally but I can actually teach only about 33 hours. I have to create a web site for my classes, so they can study by themselves and do the practices. If they have any question, they can post a message on web board or send me an email. I think it helps a lot. In the class, I try to teach as much as I can and I let them practice at home. Teaching hours may be flexible because it depends on extra activities. I have to adjust my course syllabus and we never have enough time for our class. The school administrators then have a policy to add the 0 and 8th period. Usually there are seven periods per day. In the case that we need to add the zero periods, the class will start at 7:30 AM. This semester, there are nine periods because the O-NET schedule this year was moved up so we have to change our schedule. As I noticed, it was hard to complete everything, every topic within a semester.

Sometimes there are other activities that interfere with our teaching and learning schedule. For example, the district activity that required our students' participation, I could not teach as fast as I planned because I had to wait for those students who missed the class."

**Instead of focusing on our teaching, we have to do other things like fixing computers.** Computer teachers felt *busy to work as a technical support*. "There are plenty of works to do. I can hardly finish it. Computer teachers have to do many extra jobs. I have to take care of the networking system. Sometimes when I was teaching, I got a call that there was a computer-related problem and I had to leave my class and go fix it. On the day that the internet access failed, I was called all day. Nobody helps me take care of it. I have to spend time taking care of the system rather than preparing for my classes. I guess this situation happens in many schools. If it is not complicated, we can fix it. But sometimes we have to call the shop."

**Parent/ Guardian**

Parents' relationships with their children are extremely important. However, disciplining a teenager seems to be challenging for many parents. Teachers perceived that parents have an expectation that teachers should help discipline their children and it was *teacher's responsibility for students' misbehaviors*. Another thing that every parent focused was providing support to their child's learning in several ways. Parents noticed that the educational system has become more and more competitive, those who do not have any monetary issue *encouraged their child to go to tutoring school*. However, in a small sub-district community where people have close relationship to school, parents are

willing to *help teaching "local wisdom*." Although the way parents, with different background such as rich or poor, and educated or uneducated, may support school and students' learning differently, teachers observed that most *parents had a positive perception of ICTs towards students' learning*.

**Most parents rely on us.** Teachers felt overwhelmed with parent's expectation for teachers to be *responsible for students' misbehaviors*. "Parents expect us to take good care of their children. Some parents who pick up their kids late, they ask us to let their kids spend time at the computer lab. Some do not do anything, some are very supportive. But most teenage students do not listen to the parents and also the parents think that their kids' misbehavior such as using aggressive words is not acceptable. That is an issue. A parent asks me to take care of his kid's behavior but they do nothing as a parent should do. When the student goes home, it is going to be the same. The student uses slang and inappropriate words, when I ask why he keeps doing this. He just says that that is what we say at home. So, if the parent does not cooperate, it is useless to teach because I already taught him but when he goes home, he has the same lifestyle. That is the way the parent talks to the kid. I think parents play a big role here. They do not care for their kids, do not have a good relationship, and just say that it is teacher's responsibility."

**I see my students go to tutoring school every day, including the weekend and holidays.** Most parents of high-performing students *encouraged their child to go to tutoring school*. "The parents of Advanced Program students are more interested into what I have taught to their kids. But the parents of students in other regular classroom seem to focus on behaviors. They take care of and support their kids in every way they can. Every student gets a chance to go to a tutoring school to prepare for the entrance

examination. I think our situation is not different from those who live in Bangkok. There are several tutoring schools opened in the city. However, I think kids in this generation do not know how to live. They do not know about living a life. Many students go to tutoring institutions although they do not have any learning problem. They go to tutoring schools only because they are afraid that others will be better than them. Students go to several tutoring schools depending on the parents' affordability. Some students go to Bangkok because they have a relative living there. Some go to a nearby city, which they can find a dorm room to stay during the summer."

**Some parents helped us teach.** Teachers, who teach in a small sub-district school, mentioned that *parents helped teaching "local wisdom"* at school. "When we ask them to come to the meeting, they support us, but actually I have never found a parent who is demanding or ask us to teach some specific things. I have never found that kind of demanding parents myself. Most are villagers not like those who graduated from famous universities in Bangkok. Those are more enthusiastic. We invite the parents to be a guest speaker and teach our students such as how to play "Klong Yao" (a tall narrow drum), coconut oil distillation, and Buddhism. They help us teach the kids and support school activities."

**Parents started to see that computer might help their kids to study further.** Teachers observed that most *parents had positive perception of ICTs towards students' learning*. "In the past, parents did not see an importance of computer. Right now, it is much better because they can see some of our graduated students open a computer store. I do not know why some parents think that if there is no computer, their kids cannot learn. Particularly, my students who are in a high-performing class, they receive support from

their parents very well. For example, when they know that their kids have to study programming, they buy a computer for their kids. However, when they found out that their kids play games, the parents just come to us and complain about it."

## COMPOSITE THEORETICAL DESCRIPTIONS

The researcher examined all quotes for each separate affinity pair relationship. Multiple quotes were then woven together to develop a composite quote. The following section is a composite description of the theoretical codes based on quotes obtained from all the interviews. The diagram illustrated pairs of relationships and how affinities related to each other. It should be noticed that the placement of each affinity was in ascending order of delta value, analyzed in the Interrelationship Diagram or IRD, rather than the order of the affinities in the interview protocol. The affinity with the highest delta value was placed at the top, far left-hand side. The next one was placed at the bottom, far left-hand side. The placement continued on from the top left, bottom left, and ended at the bottom right side. The affinity with the lowest delta value was on the bottom, far right-hand side of the diagram.

### School Administration and Management influences…

School administration and management is a major driver influencing all other factors, including environment, parent/ guardian, content and curriculum, time, teacher, ICTs, and student.

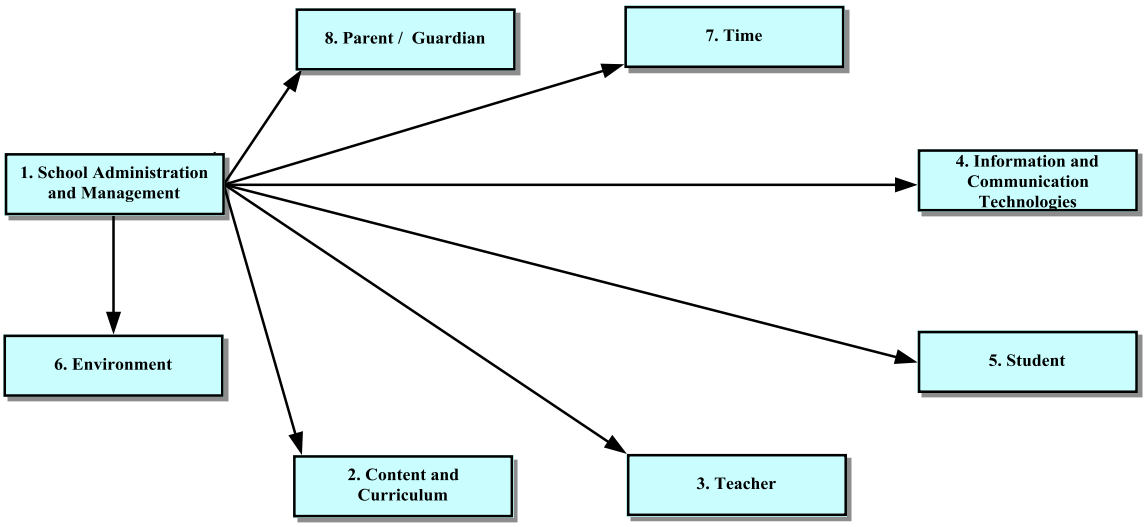


Figure 4.1: School Administration and Management influences…

**Environment.** Teachers perceived that school's policy significantly impacted the number of students per class. "The management influences the surroundings like the number of students per class and the environment. Learning management is planned according to environment in two ways: traditional way, which is studying in a classroom, and new way, which is studying in a science lab, for example, or outside classroom. Administrators had to jump in to manage the numbers of human resources or teachers and a number of classrooms. We try not to have too many students, like one classroom should not have more than thirty-five students. This is the school policy. However, in the real situation, there are fifty students packed in a class and that affects how we teach and students' learning. Teachers said it was quite difficult to supervise them. It is all about policy of school admission. If school does not accept these extra numbers of students, pressure from society would occur. They would say that our school should have had more capacity. Expanding the number of classrooms would be difficult, but reducing the

number of students is doable. It is only the administrators who can decrease the number of students."

**Content and Curriculum.** School's vision and policy provided a guideline for teachers in the school to design the curriculum. "Actually, core curriculums are set [by Ministry of Education]. The school based curriculum depends on what the schools' priority is, and the policies to be executed. The core curriculums are flexible. When the policy of the school goes for the concept of developing students in some ways, this will influence the school based curriculum development. For example, which point we would like our students to achieve, which goal to set, what the school mission and vision should be. If you prefer the kids to be proficient in ICT, the school based curriculum will be planned in a way that the students will use a specific type of tools, and learn the related content. This will affect the kids to have a chance to study a good curriculum. If the management team is not good, the curriculum is bad, everything is bad. I mean they are the ones who set the policy. They are the team who does this. We just follow the policy and implement it."

**Parent or Guardian.** Most participants perceived that the school administration and management was more likely to influence parent or guardian. However, there was a difference between those who lived the city area and district or sub-district area. The school and parent or guardian in the city area seemed to have distant relationship as compared to those who lived in the district or sub-district area.

The teachers who worked in the district or sub-district area mentioned that, "If administrators are not able to reach out to the community or parents, support will be less. Most parents, who live here, graduated here. They are local people. It is like, if teachers

request something, normally they will cooperate with us. We have a close relationship. Or if the kids are punished, some parents who used to study here understand the teacher. Sometimes some kids might make a serious mistake; otherwise, they might not deserve these punishments."

The teachers who worked in the provincial area mentioned that, "Our school has a parent meeting, but there is no house visiting. It is not possible to do that here especially our school because parents are powerful. Visiting students at home is a problem even though the ministry demands that the teachers should visit students' home because they think that the school is bigger than parents. A school is like a giver. But the society here at the school like us, the parents are the generals, bankers, business people level. Home visiting is difficult. Normally they would not let people walk in their house. So, the interaction with the parents is not at home. The school will contact them in other ways such as telephone or mail."

**Time.** School administration and management influenced teaching hours and time teachers required to do other jobs. "It depends on the specification of the school administrators. Every teacher has to do other kinds of works. When the administrators would like us to do something, we just have to do. Like me, I have to work at the co-op. They keep saying that, "Do not let yourself free, you have to do other jobs, other than teaching too." It is like a top-down policy to us. Sometimes, we had to work during weekends, for example, taking students out for field trips. We are so tired. It causes teachers' early retirement, not because of their getting old. When calculating on a compensation, it is worthy if they leave two years earlier. It is a shame to lose human resources. They had such a passion as teachers."

**Teacher.** School's administration and management directed how teachers should perform their jobs. "A systematic and well-planned management with clear objectives that help teachers see the same goals, the career path to the management level, and also the justice, and ethical systems would absolutely influence teachers. Well, the civil service system is a unit that follows the policy. So, things that influence teachers would be the policy and directions. I mean if the goals are not clear in taking care of their fellow travelers, how things will turn out. On the other hand, if they provide good care and support or have a positive morale towards the team members, I believe that teachers will do their best."

**Information and Communication Technologies.** A clear policy from the top level influenced budget allocation and support on the ICTs implementation. "It absolutely depends on administrators. The administrators see the importance of the instructional tools or not, providing tools or not. To purchase tools and equipments requires an approval, based on policy. The school has a policy in supporting it, but sometimes it is not clear. In reality, it is not followed as stated in the policy. Maybe it is because of time, budget, or whatever. It seems like things have been regulated, but it just does not work! For example, if math department requests for a computer room, but is it possible? How much a computer room would cost? A school might not be able to afford it. If a school has enough budgets, we are going to get these tools and equipments. If a school does not have enough budgets, we just cannot have them. Well, we can only chalk and talk, you know!"

**Student.** School leaders mainly focused on policies' implementation more than the students' needs. "The management influences the students because students are the

final product. Everything has to be managed from the top, right? Everything, I mean budget, equipment for the students to use, so if the management from the top level is poor, the product or the outcome is not good either. Right now, some schools do not consider students' desire, but only follow their administrators and their policies. Every school tries to serve these policies as the priority, without looking at what students want. They try to get everything done to serve their supervisors. Especially those administrators of large sized schools or provincial schools would try harder because if they do not serve policies, they would lose their positions soon or get transferred. Therefore, they had to comply with the policies rather than students' needs."

**Environment influences…**

Environment is the secondary driver influencing other affinities, which include content and curriculum, teacher, ICTs, and student.

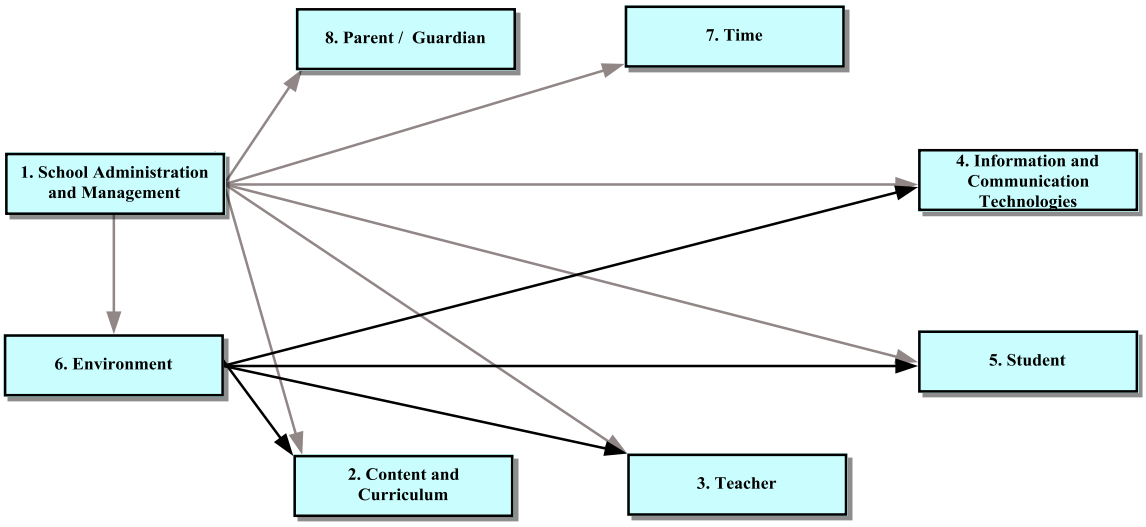


Figure 4.2: Environment influences…

**Content and Curriculum.** Environment or physical environment of classroom and school affected the design of the school-based curriculum. "I think the surroundings are like a factor that affects the success. Classrooms are not sufficient. Students do not have their own classroom; now they have to go to different classrooms, do homework under the trees, or in the canteen. In a regular classroom, which is quite small for a fifty-student class, a grouping approach is not possible. So, it might be difficult to achieve what the curriculum said. That is a problem. Also, the surroundings may influence the curriculum because right now the school curriculum has to respond to the needs of the community. For example, we have to consider what this community has, or what kind of students the community needs. So, when the school realizes this, we can work on the curriculum development. We see the local curriculum, for example, our school is surrounded by forests. At the back of the school is a potato forest, so we also design a lesson to suit us. It is because we focus more on vocation."

**Teacher.** Physical environment in the classroom has an impact on teaching. "The surroundings affect a teacher, for example, the number of rooms that are not enough, or it is under construction. It causes an inconvenience in working. If a classroom is a mess or not ready, we might feel frustrated and cannot teach best. And the layout of the classroom does not allow us to do group activity. If the school surroundings are good, I think the teachers should have more encouragement to work better."

**Information and Communication Technologies.** Classroom space affected the installation of the computer and other tools. "Computer material tools are put in air-conditioned rooms. Some tools need to keep away from dust and heat. Environment has some effects on them. It does influence tools a lot because we have limited space. When

we want to do something, we will have some problems such as no rooms, and no space. For the computer room, it is too small. Mostly, two students have to share a computer, and it seems smaller when seated. We cannot use the media in some classrooms. If the room is too small, we cannot put any big tools like smart board"

**Student.** Environment including school's surrounding, classroom condition, and size affected students' learning. "The suitability of a classroom size also influences the students learning. Classroom condition and size have effects towards students. In a computer room, two students use one computer. There is a pole in some rooms like in old buildings. These affect students' learning. If a school does not have any supportive surroundings, or neglected, old, or not beautiful, students will not want to come to study. When students study in a classroom that has a good condition, they can learn better. Good atmosphere makes people changed. What I would like to say is if they are in a good environment, they can perform better. The students will be happy to learn there all day."

**Parent/ Guardian influences…**

Parent or guardian influences teacher, ICTS, and student in different ways.

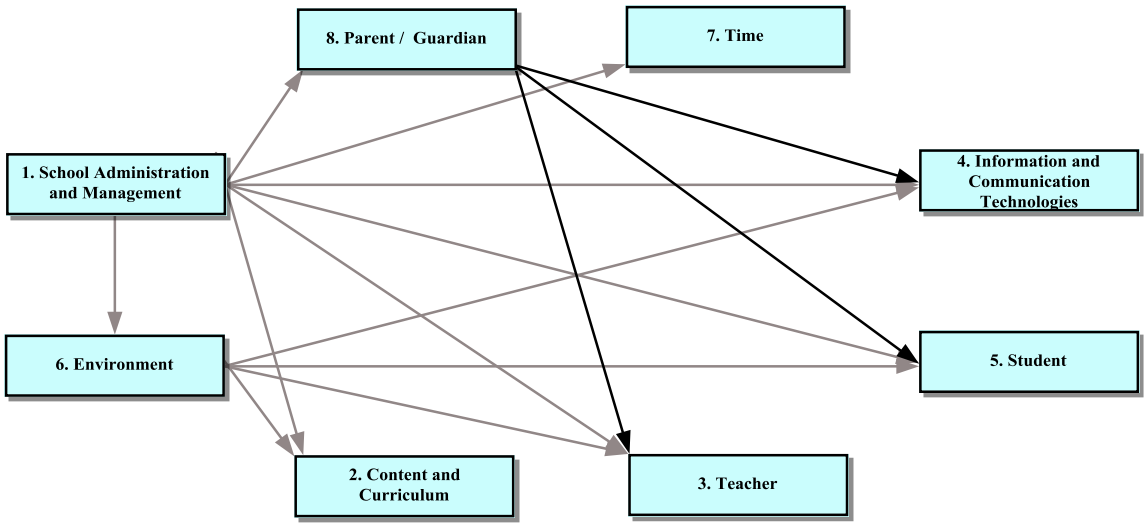


Figure 4.3: Parent/ Guardian influences…

**Teacher.** If parent or guardian greatly cooperated with the school's policy, it helped teacher to easily perform their jobs without worrying about parental disagreement. "For the parents of the students who study in a high performing class, they are more likely to be interested in the school's work. We get a lot of feedback. But for most of the parents of delinquent students, there is not going to be any feedback. Usually, the teachers have to listen to the parents. Sometimes, the parents do not feel so good when we punished their kids, for instance. Some parents will ask a lot about their kids. As I said, parents have tried to get involved in the curriculum. And they try to set a framework for teachers to do what they want. They also come and express their opinions in the parent-meeting. We then hold a meeting to make an adjustment and it seems like the administrators follow them. They do partly guide us. However, parents should take care of their children and let them learn that going to school is their duty. If the parents do not cooperate in taking care of their children, not support the teachers; sometimes it is quite difficult in clearing things between the teachers and the students."

**Information and Communication Technologies.** Parents always provided support on their child's learning, including the use of ICTs. "Parents play a part in equipment supply; donation or request to school for teaching equipment for their children. We will have "Katin" or "Pa-Paa" (Buddhism ceremonies that people donate money or things) to raise funds. There are parents who donate money for us to buy computer equipment, books, and build a library. Parents will be interested especially when they know that we have computers at school. They would ask whether we will charge an additional fee or not so that there are going to be more computers, and they are willing to pay. Parents donated a lot of money for purchasing materials in the past, not quite right now. When parents join a meeting and are requested to donate, they would do that. It is up to how schools spend the money to benefit their children in schooling. Parents will guide us what a school should provide for kids."

**Student.** Parents had a close relationship with students and influence on their child's learning and future career path. "Parents have a great influence on their children. If parents are attentive, help follow up, and supervise students, their study should be good and successful. If parents neglect and ignore, so do children. Problems occur later on. Most students do not live with their parents; they live with the grandparents who do not seem to care anything. Very few students live with the parents who are interested enough in calling and ask about their kids. Some parents are quite self-centered, forcing their children to do what they want. It causes stress to students. Another thing is when their children's score is lower than others. Parents would force them to study hard and they get stressed out. It causes them to compete. They said, "I study for mom, aren't I grateful?" If students cannot get straight A, the parents will be furious. So, students have to do as

much as they can to get straight As in every subject. When I overheard students said, "I have got straight A. This term, I survive!" It is heart-breaking. Students depend on the parents where and what field they should study. How do they take care of their kids? Will they give advice? Do they care them?"

**Content and Curriculum influences…**

Content and curriculum have an impact on time, teacher, ICTs, and student.

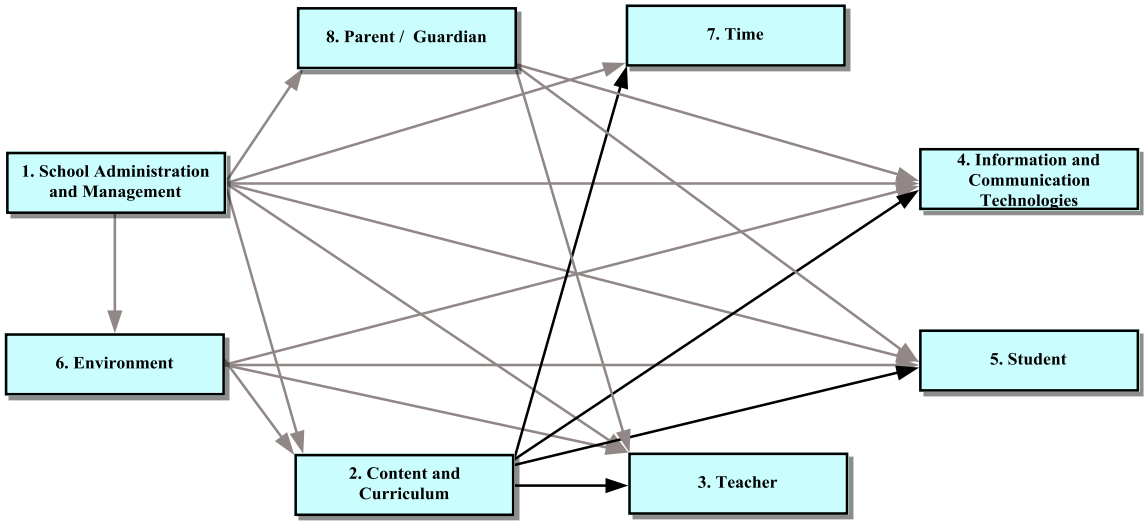


Figure 4.4: Content and Curriculum influences…

**Time.** Content and curriculum determined class hours and schedules. "The curriculum is the time controller. What we want the kids to learn, we have to set a plan, give some time for studying that. There are a lot of content to cover. If the kids can take that every time of teaching, it is going to be in time. However, sometimes when we teach something, they might not understand in the first time presented. This causes the postponement of the schedule set. We have to extend teaching hours to teach this topic so that they will understand better. Sometimes we cannot cover all the content. This

causes us to start earlier or end later in order to complete all the content. Also, some schools have to do activities such as a festival at a temple, for instance. So, there are unplanned activities like that come in. Class time has to be decreased. We are short of time because there are other activities."

**Teacher**. Content and curriculum gave teachers a guideline on what to teach and how they needed to prepare for teaching. "School-based curriculum follows the standard or core curriculum and teachers have to teach accordingly. You have to teach and complete all as stated in the curriculum. The curriculum is like a controller of teachers. Even though teachers might not be familiar with some content, they have to teach. They have to search for information even if it is not their familiar field. The teachers have to practice themselves or to prepare themselves to be able to use that curriculum. However, it would be all over the country that most teachers do not strictly follow curriculum, but textbooks. They get used to teaching by texts, and afraid of not covering all the content. If we ask why they do not follow curriculum, they would say texts are along the line with curriculum, no need to focus on curriculum. Course description is equivalent to curriculum. If they teach all in the course description, they cover the curriculum. They do not listen and say if they do not finish all in the textbook; their students would not be competitive. The school would lose its fame. It turns out to be that way. This happens in all schools, as I checked out with others."

**Information and Communication Technologies.** Content and curriculum guided teachers on what tools should be applied. "Lately, curriculum emphasizes students' research and life-long learning. Thus, ICT plays a role here. In each year, the director will force teachers to create the instructional tools. We have to plan what kind of tools

we are creating. We have to check the curriculum, right? What kind of content, what kind of tools, for what knowledge? We have to consider which tools relevant or need to be used. Sometimes some tools are not appropriate to our school because they are expensive and complicated. Teachers have to learn how to apply. I think some contents are suitable to use tools like CAI or electronic materials, something like that. But some kinds of contents are not, but right now it seems like we just have to do it and just want to have it. More like a trend!"

**Student.** The curriculum determined what the kids have to learn, what activity they have to do, and what experience they need. "Content and curriculum will affect the kids whether they can do the tasks or not, or they can get the knowledge or not. Then, this results in their thoughts. The curriculum is the factor that controls the experience, right? It could make the kids learn better. It could make the kids change their behavior. Students seem to be more like receivers because it is the consequence of the curriculum. For required subjects, they have to follow what teachers manage for them, more or less I think. They have no opportunities to make other choices, but follow what teachers provide. That is, although students prefer to learn about a particular topic, we cannot do that because we have to follow the specified content. They cannot feel like they do not want to learn. Even though you do not feel like to learn, you have to. But the levels of difficulties are flexible depending on the learners' abilities."

**Time influences…**

Time influences teacher, ICTs, and student.

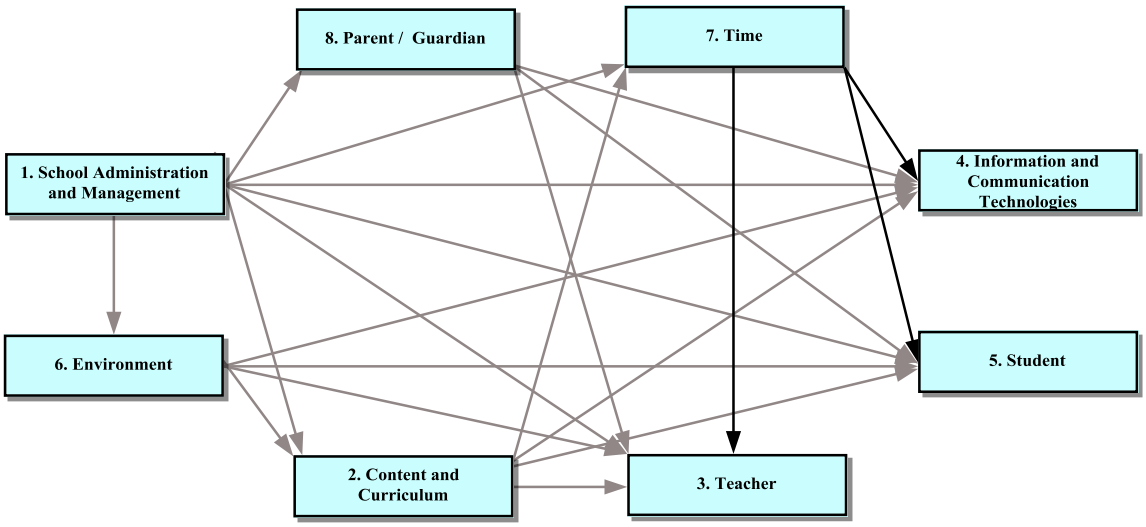


Figure 4.5: Time influences…

**Teacher.** Time was viewed as a fixed component, which affected how a teacher can manage it wisely. "In my opinion, I feel time frames us. Teachers are supposed to prioritize their time in teaching, but in fact, they tend to be assigned a lot of extra works. So their teaching time cannot be run as planned, but adjusted. So, we have to catch up our teaching with the time given. I mean time has been assigned by policies any way. We cannot increase or decrease. So, we have to be the one who controls teaching all the content in time. When we have other jobs coming in, we have little time to prepare. And maybe the scheduling is not good. Sometimes I have to teach three to four hours consecutively, I do not have time to prepare documents. When time is limited, we cannot do many things."

**Information and Communication Technologies.** Teachers perceived that using tools such as a computer was time-consuming. Thus, using ICTs in the classroom depended on available time or class hours. "Time influences the instructional tools. How

do we use them and in what way? Time is the one that controls. It takes time using tools. If we have only this amount of time, which tools we should choose to fit the time we have. Because some tools when used, it takes time. If we have little time, we have to focus only on the content, so the tools are hardly used. When kids learn typing after class, there is only fifteen minutes left. Turning on the machine is five minutes, practice typing for five minutes; it is time to turn off the machine and go home. It is just like that. When I use some media, I have to ask the kids to do it right away. Sometimes the time is not enough, or maybe enough but not that perfect."

**Student.** Class hours and schedule had an impact on student' learning. By providing an appropriate duration of class hours and class schedule, students could perform better in their learning. "A student will study as time scheduled. Time does influence the kids. If the time is short, the kids will feel stressed like they have to do so many, many things, and then they cannot make it. Some of the kids will be stress out. In my view, should students have appropriate time of study, they tend to learn better. Besides, it is up to students themselves and their readiness. We maybe put the blame on children. Some teachers would say it does not make any difference between fifty or sixty minutes. Our class management would be tight because the original lesson plans are used. In learning some course, we need continuation, but time is not enough. For class scheduling, I once found that PE class was in the morning and then math class. I think it had a huge effect. When the kids arrived, they all just sweat and gasped for breath (laughing)."

**Teacher influences…**

Teachers perceived themselves as a driver that influenced ICTs and student.

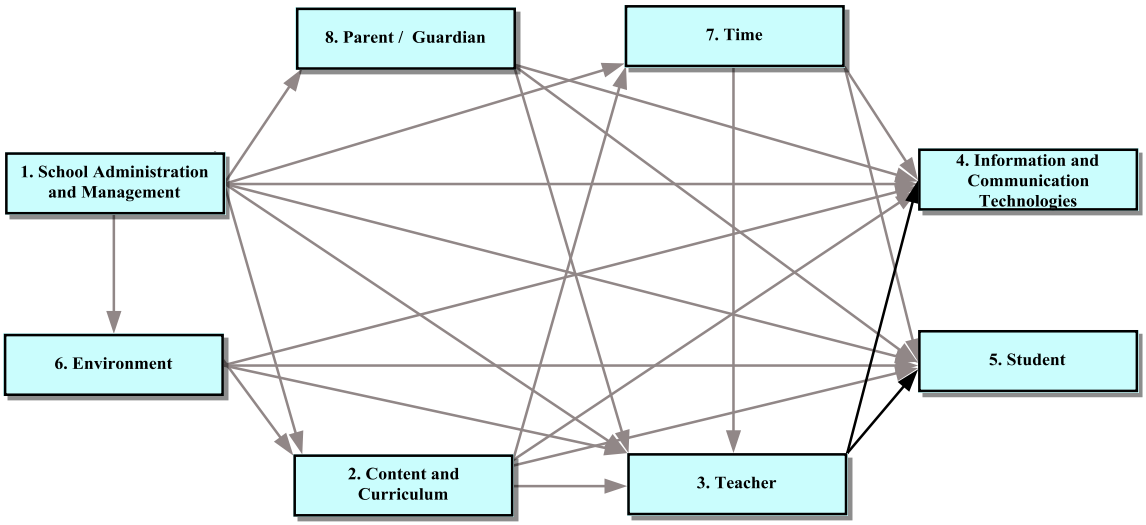


Figure 4.6: Teacher influences…

**Information and Communication Technologies.** Teacher' decision-making on the ICTs implementation basically depended on their technological knowledge and skill and their judgment on other relevant factors. "The teacher will be the one who selects the instructional media because it is kind of the skill of each teacher. If there are tools available but teachers are not knowledgeable, it is useless. Like science or math, there are lots of instructional tools that can teach the same topic, but it depends on the preference of that teacher. Maybe they use PowerPoint, GSP or other tools depending on the teacher. If an instructor has tried to learn more, has an interest, there will be more various tools. But if a teacher only thinks that math needs only chalk on the board, there would be no instructional tools. So, it depends mainly on the teachers. At my school, some teachers cannot use computers. Some teachers do not want to use it, some are lazy, but some are very creative. We have to accept that the teachers' capabilities are not equal. Some teachers may be good at using one type of the instructional tools, but the

other ones might not use them the same way. Some may create their instructional media or tools by themselves, and some use the commercial tools."

**Student.** Most teachers perceived that the role of teacher was to transfer knowledge to students and thus influenced student's learning. "A teacher is the one who transfers knowledge to students. Teachers tend to be influential towards students' learning. They employ some techniques like those who understand psychology, able to help students' learning better than those who do not. If it is a good teacher taking good care of students, kids will be disciplined. When kids are disciplined, they will pay attention to the class. From what I have noticed, if students have faith and love in a teacher, he will try so hard overnight finishing the homework of that teacher. But if they do not like the teacher, they will not want to learn. So the first thing is the faith. We have to make them believe in us first. Actually, I think students also have an influence because depending on the students, the teachers have to adjust their teaching strategies, right? However, do you want the theory or the reality? (laughing). If you like the reality, teachers do have more influence to the students. But if you ask about the expectation, we would like to see the students influence the teachers because we are the ones who design the instruction that will respond to the needs of the learners. But is it possible? In reality it is not. A teacher is still a person who mostly controls the instruction for the learners."

**Information and Communication Technologies influence…**

Information and communication technologies influence students' learning.

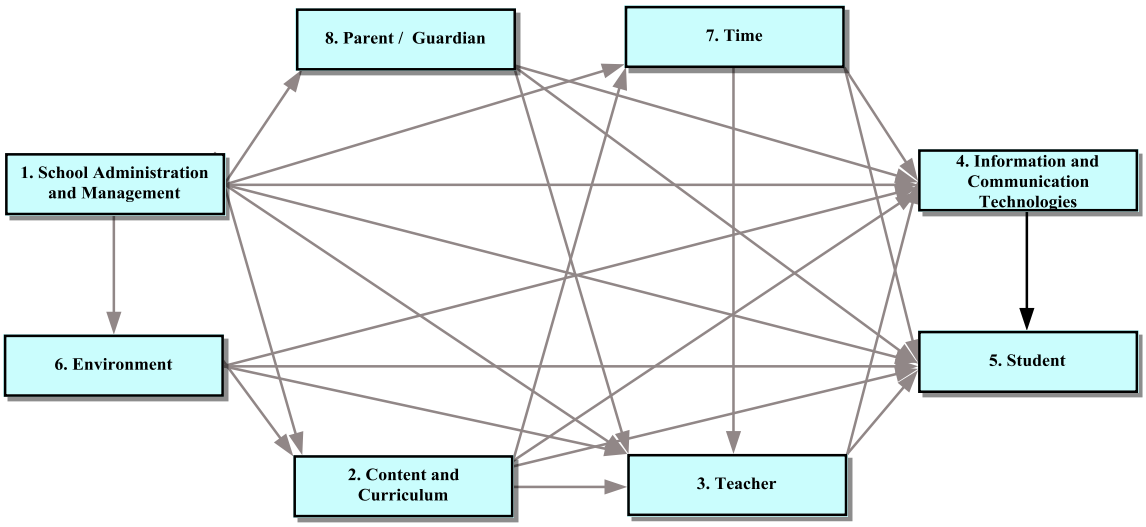


Figure 4.7: Information and Communication Technologies influences…

**Student.** Appropriate instructional media and effective tools helped engage students to learn better. "Tools influence students' learning. Whatever kinds of tools you have, they are going to affect your students. Enough or not enough number of tools? How many do you have? How effective it is? If they are suitable and relevant to students, it helps create a desire to learn and helps students to learn faster or envision in concrete ways. The content that seems difficult to comprehend will be easier. Students will gain all the benefits. A problem is that students play online games during class time. Computer and telephones are partly used for learning, but mostly to listen to music."

## THE COMPOSITE INTERVIEW UNCLUTTERED SID

The cluttered SID contains all of the relationships described by the group. It is saturated with relationships. The problem with saturation is that a cluttered SID, while being comprehensive and rich, can be very difficult to interpret, even for a modest number of affinities that are highly interlocked or embedded within the system. In other

words, many systems have so many links that the explanatory power of the system becomes bogged down in the details of the relationships. Comprehensiveness and richness are certainly objectives of the SID; on the other hand, so is parsimony. A way to reconcile the richness-parsimony dialectic is to produce a supplementary or secondary SID called the Uncluttered SID, one that has redundant links removed.

The Uncluttered Composite SID below was arranged in a simple linear pattern. We can view the Uncluttered Composite SID in a topology zone, the far left component which is school administration and management is the driver that directly influences both parent/guardian and environment. Parent/guardian then directly influences teacher and indirectly influence ICTs and student. The environment influences other components including time, teacher, ICTs, and student. And student is the primary outcome.

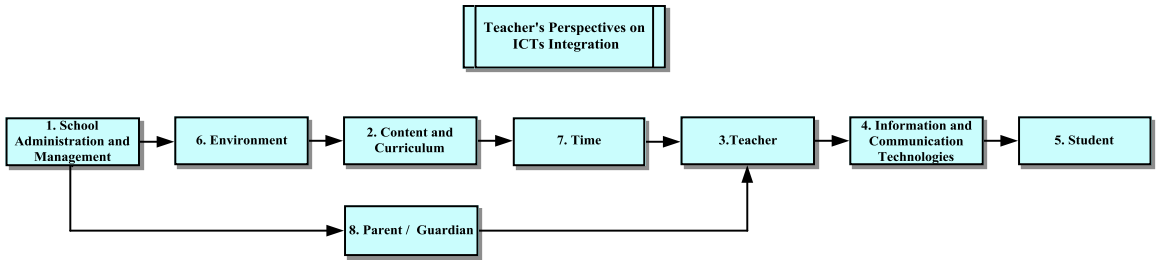


Figure 4.8: Uncluttered Composite SID

**Pareto Reconciled SID**

Once the researcher had removed all redundant links, the Pareto Protocol was examined for conflicting relationships. The next step was to reconcile the conflicting pairs of relationships. Conflicts occur when the same affinity pair has relationships in both directions and a significant frequency to include both in the system. The lesser frequency is temporarily ignored in the IRD but is reconciled in the uncluttered SID. In

this case, three conflicting relationships were examined, including links between 5 and 4, 3 and 6, and 8 and 1. These three links not directly described in the composite theoretical descriptions were added to the SID as shown in grey color in the figure 4.9.

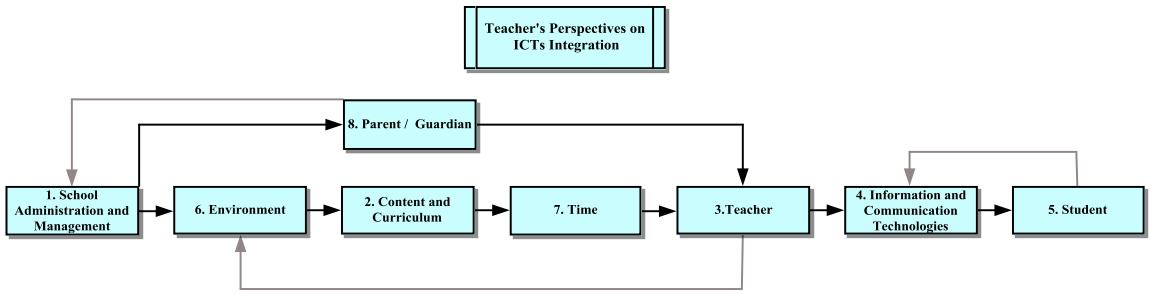


Figure 4.9: Uncluttered Composite SID with the conflicts

To account for the relationships, the system was examined to see if the conflicting relationship was indicated in the system possibly as part of a feedback loop. To create a feedback loop, one needs at least three components to draw a cycle of relationship. If such was the case, nothing needed to be done. The link between 3 and 6 remained the same.

**Reconcile the SID to the Conflicts**

To reconcile the conflicting double-headed arrows, the links between 5 and 4, and 8 and 1, another element in the loop is needed. Examining the delta elements of each pair. The first pair to be reconciled was the one that has the lowest delta element, which was the link between 5 and 4, The arrow from 5 to 4 was moved to the next element one delta earlier in the system, in this case was 3. The next pair was 8 and 1, which we could not move to any other elements, thus it was removed. In the figure 4.10, there were two backward links between 3 and 6, and 5 and 3, which showed feedback loops in the

system. The first loop consisted of teacher, ICTs, and student. Another feedback loop included four components: environment, content and curriculum, time, and teacher. The additional composite theoretical descriptions were presented below.

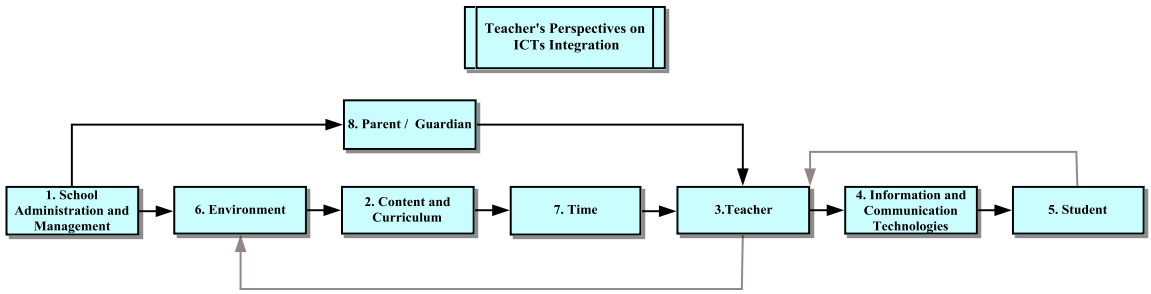


Figure 4.10: Reconciled Uncluttered Composite SID

**Student Influences… Teacher**

A number of responses showed that students' characteristics and their learning abilities had an impact on teaching strategies. "Nowadays student-centered approach is implemented. I think the implementation of this approach is going well. Kids play a major role. A teacher will use a method such as learning with the kids rather than the teacher-centered approach. When teaching different groups of students, we cannot use the same lesson plan. Attentive and ignorant students have an effect towards teachers. Teaching the attentive audiences, I can feel that they can go fast and there is more time left to teach more. On the contrary, when teaching the ignorant kids, I cannot even finish what I plan to teach."

**Teacher Influences… Environment**

Teachers realized that they could create a nice classroom condition to help students' learning. "Teacher needs more specific classrooms. Some teachers are attentive,

creating learning environment in their class. Teachers know that classroom conditions influence students' learning. So, we have to improve classroom to be suitable for students' learning all the time. Moreover, when we are lack of teachers, the class size would be bigger because we just could not separate the students. But now the number of teachers has increased so we can have many classes and the number of students per class can be smaller."

## A TOUR THROUGH THE SYSTEM

Below is the Composite Interview Uncluttered SID that represents perspectives of teachers towards the integration of ICTs in the classroom.

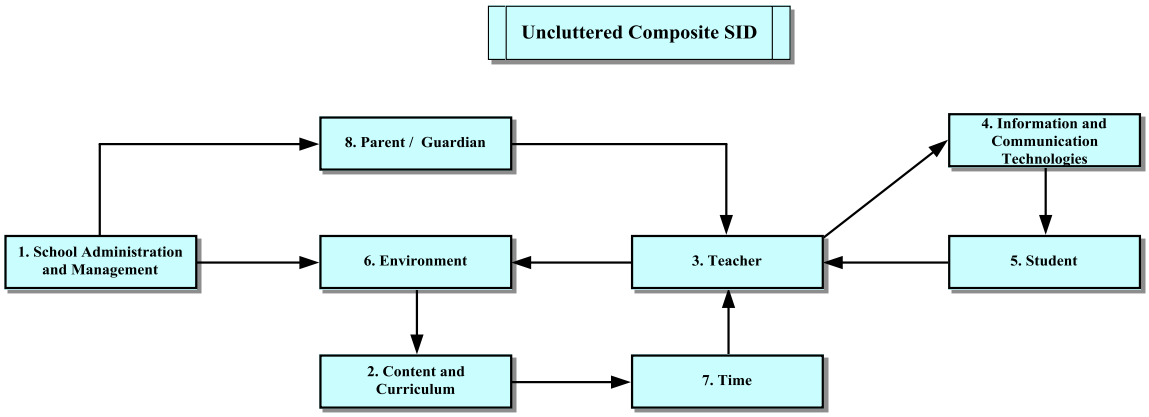


Figure 4.11: Uncluttered Composite SID

As shown in Figure 4.4, school administration and management is a primary driver that shares the goals of the school with parent or guardian. Some parents are more likely to get actively involved in their child's learning thus put a pressure on teachers. The school leaders and parents then influence all of the teaching and learning activities and support for classroom instruction. Teachers have to consider time and the curriculum that they required to implement and also how they can manage their teaching in a

particular environment or instructional context. The number of teachers and their competency also influences how they should design the classroom activities and manage their time. These are all influenced by each other recursively. Through their perception about their students' learning ability and the ICTs availability, the teachers make decisions on their selection of tools or types of media they should develop or should use for their students. Also, the learning styles and computer skills of students are considered when selecting or developing the instructional media.

## SYSTEM STATISTICS

The researcher closely examined the interview data to identify the perceptions of the participants by capturing their suggestive statement, tone, and direct statement of their perception about each affinity. A negative perception of an affinity received a 1, a neutral perception received a 2, and a positive perception received a 3. The overall experience was also coded. The coding process was completed by the researcher and thus it is to some extent subjective. The coding of perceptions is shown in Table 4.1.

The data for all interviews was compiled and a statistical Fisher's exact test was run to identify if there was a significant difference between affinities for each group and the overall perceptions of each group. In this study, Fisher's exact test was applied because one or two cells contained expected count less than 5. A significance level of less than .05 indicates a significant difference in the experiences of the teachers. The researcher found that there was only one affinity, Student, which was significantly different at the .049 level (Table 4.6). Another affinity that was approaching significance was ICTs, which had the .068 level (Table 4.5). Tables 4.2 through 4.9 provide the results of the Fisher's exact test. The associated figures show the percent of positive and negative perceptions by the computer and mathematics teachers.

| Individual Interview Perceptions | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Participants | Subject Area | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | Overall |
| M9 | 1 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 3 | 3 |
| C2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 |
| C12 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| C13 | 2 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 |
| M1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 |
| M3 | 1 | 2 | 1 | 1 | 2 | 1 | 2 | 2 | 2 | 2 |
| M4 | 1 | 2 | 2 | 3 | 1 | 1 | 3 | 2 | 3 | 2 |
| M5 | 1 | 2 | 2 | 1 | 2 | 1 | 1 | 2 | 2 | 2 |
| M6 | 1 | 2 | 1 | 1 | 2 | 2 | 3 | 2 | 2 | 2 |
| M7 | 1 | 2 | 1 | 2 | 2 | 1 | 1 | 2 | 2 | 2 |
| M8 | 1 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 |
| M10 | 1 | 2 | 2 | 3 | 2 | 2 | 2 | 1 | 2 | 2 |
| M11 | 1 | 2 | 2 | 1 | 2 | 1 | 3 | 2 | 2 | 2 |
| M12 | 1 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 2 | 2 |
| M13 | 1 | 2 | 1 | 2 | 2 | 2 | 2 | 3 | 2 | 2 |
| M14 | 1 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 2 | 2 |
| C1 | 2 | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 2 |
| C3 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 2 | 2 |
| C4 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 |
| C5 | 2 | 1 | 2 | 2 | 1 | 2 | 1 | 3 | 2 | 2 |
| C6 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 |
| C7 | 2 | 2 | 2 | 1 | 3 | 3 | 1 | 3 | 3 | 2 |
| C8 | 2 | 1 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| C9 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 2 |
| C10 | 2 | 2 | 2 | 2 | 3 | 2 | 1 | 2 | 3 | 2 |
| C11 | 2 | 1 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 2 |
| C14 | 2 | 3 | 2 | 3 | 2 | 1 | 3 | 1 | 2 | 2 |
| C15 | 2 | 2 | 3 | 2 | 1 | 2 | 2 | 2 | 3 | 2 |
| M2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 2 | 1 |
| | 1 Mathematics | | | | | 2 Computer | | | | |
| | 1 Negative | | 2 Neutral | | | | 3 Positive | | | |

Table 4.1: Individual Interview Perceptions about each Affinity

| A1: School Administration and Management Perceptions | | | | |
|---|---|---|---|---|
| | | **Math** | **Computer** | **Total** |
| **Positive** | Count | 1 | 3 | 4 |
| | Row % | 7.10% | 20.00% | 13.80% |
| **Negative or Neutral** | Count | 13 | 12 | 25 |
| | Row % | 92.90% | 80.00% | 86.20% |
| **Total** | | 14 | 15 | 29 |
| **Fisher's Exact Test** | | | | |
| .326 | | | | |

Table 4.2: Fisher's Exact Test of School Administration and Management Perceptions

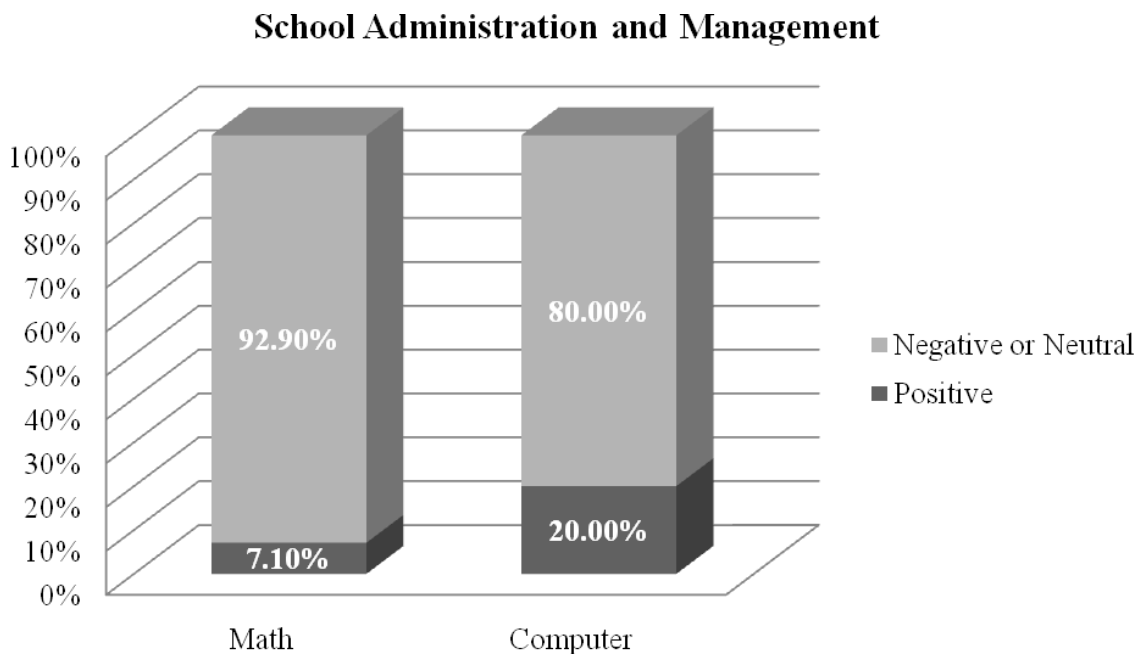


Figure 4.12: School Administration and Management Perceptions

| A2: Content and Curriculum Perceptions | | | | |
|---|---|---|---|---|
| | | **Math** | **Computer** | **Total** |
| **Positive** | Count | 1 | 4 | 5 |
| | Row % | 7.10% | 26.70% | 17.20% |
| **Negative or Neutral** | Count | 13 | 11 | 24 |
| | Row % | 92.90% | 73.30% | 82.80% |
| **Total** | | 14 | 15 | 29 |
| **Fisher's Exact Test** | | | | |
| .186 | | | | |

Table 4.3: Fisher's Exact Test of Content and Curriculum Perceptions

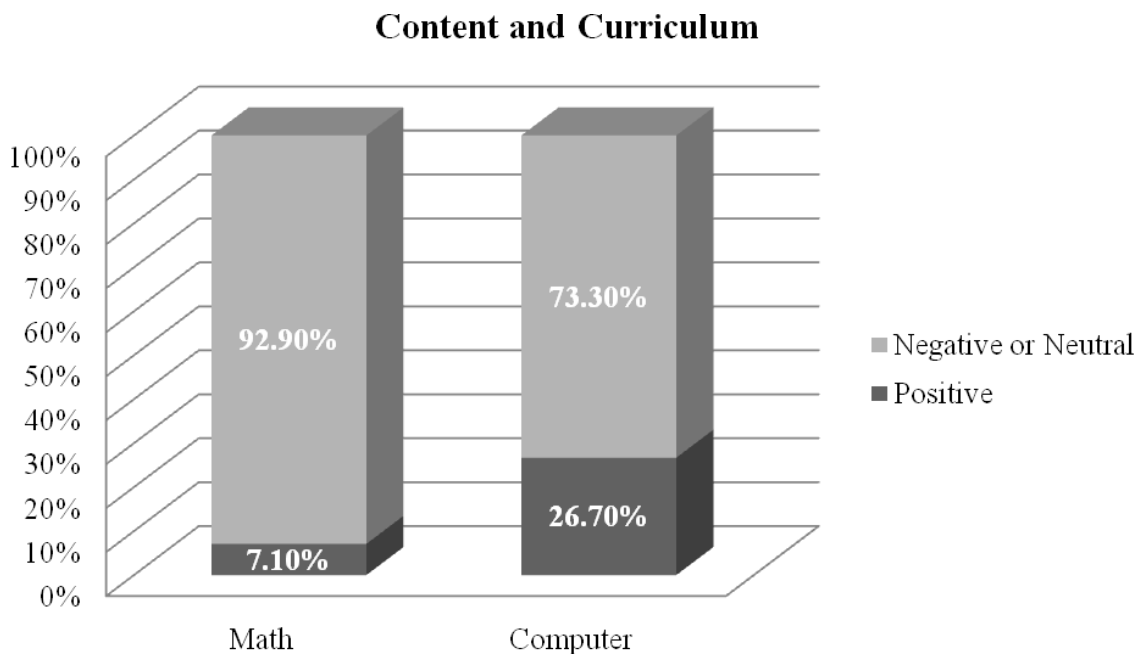


Figure 4.13: Content and Curriculum Perceptions

| A3: Teacher Perceptions | | | | |
|---|---|---|---|---|
| | | **Math** | **Computer** | **Total** |
| **Positive** | Count | 3 | 5 | 8 |
| | Row % | 21.40% | 33.30% | 27.60% |
| **Negative or Neutral** | Count | 11 | 10 | 21 |
| | Row % | 78.60% | 66.70% | 72.40% |
| **Total** | | 14 | 15 | 29 |
| **Fisher's Exact Test** | | | | |
| .383 | | | | |

Table 4.4: Fisher's Exact Test of Teacher Perceptions

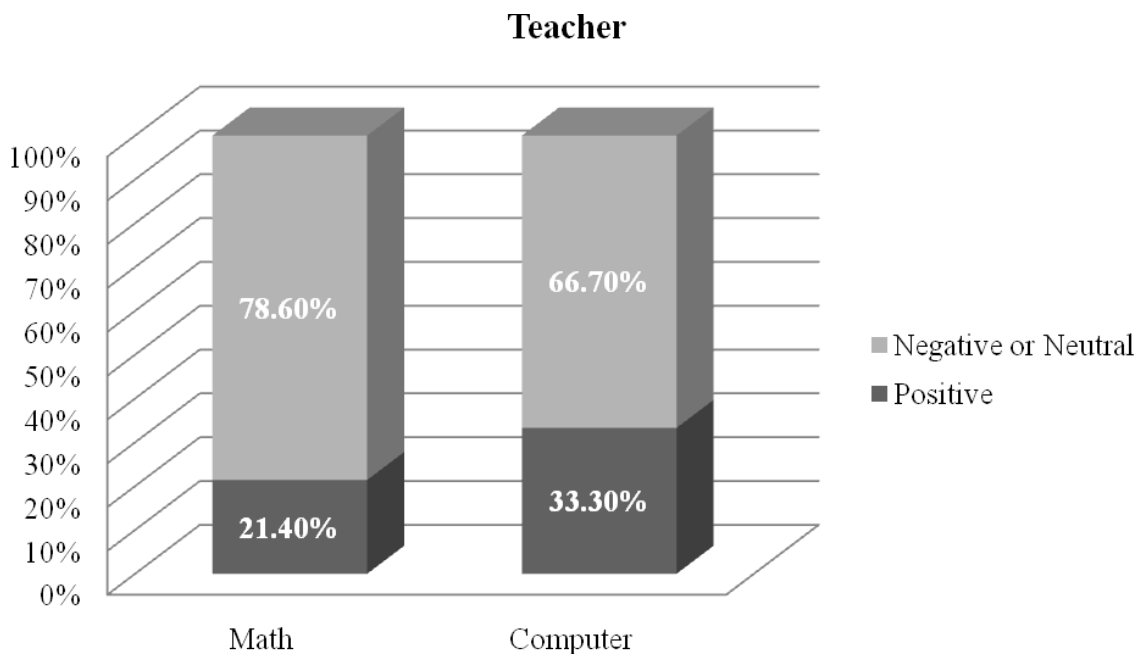


Figure 4.14: Teacher Perceptions

| A4: Information and Communication Technologies Perceptions | | | | |
|---|---|---|---|---|
| | | **Math** | **Computer** | **Total** |
| **Positive** | Count | 2 | 7 | 9 |
| | Row % | 14.30% | 46.70% | 31.00% |
| **Negative or Neutral** | Count | 12 | 8 | 20 |
| | Row % | 85.70% | 53.30% | 69.00% |
| **Total** | | 14 | 15 | 29 |
| **Fisher's Exact Test** | | | | |
| .068 | | | | |

Table 4.5: Fisher's Exact Test of Information and Communication Technologies Perceptions

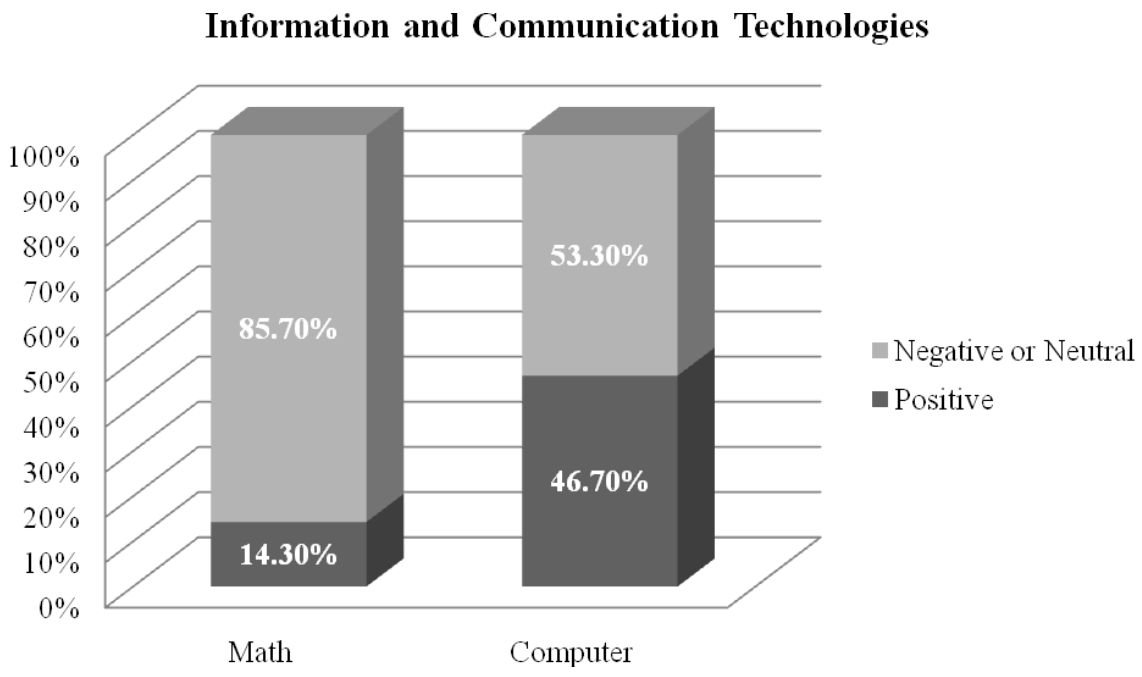


Figure 4.15: Information and Communication Technologies Perceptions

| A5: Student Perceptions | | | | |
|---|---|---|---|---|
| | | **Math** | **Computer** | **Total** |
| **Positive** | Count | 1 | 6 | 7 |
| | Row % | 7.10% | 40.00% | 24.10% |
| **Negative or Neutral** | Count | 13 | 9 | 22 |
| | Row % | 92.90% | 60.00% | 75.90% |
| **Total** | | 14 | 15 | 29 |
| **Fisher's Exact Test** | | | | |
| .049 | | | | |

Table 4.6: Fisher's Exact Test of Student Perceptions

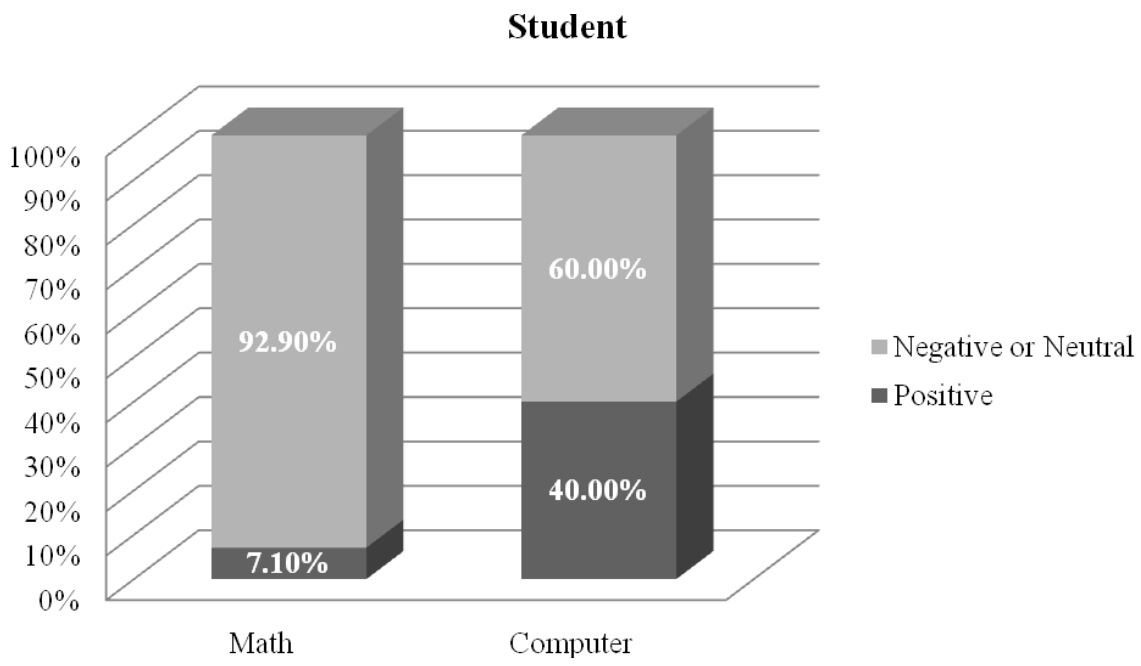


Figure 4.16: Student Perceptions

| A6: Environment Perceptions | | | | |
|---|---|---|---|---|
| | | **Math** | **Computer** | **Total** |
| **Positive** | Count | 3 | 5 | 8 |
| | Row % | 21.40% | 33.30% | 27.60% |
| **Negative or Neutral** | Count | 11 | 10 | 21 |
| | Row % | 78.60% | 66.70% | 72.40% |
| **Total** | | 14 | 15 | 29 |
| **Fisher's Exact Test** | | | | |
| .383 | | | | |

Table 4.7: Fisher's Exact Test of Environment Perceptions

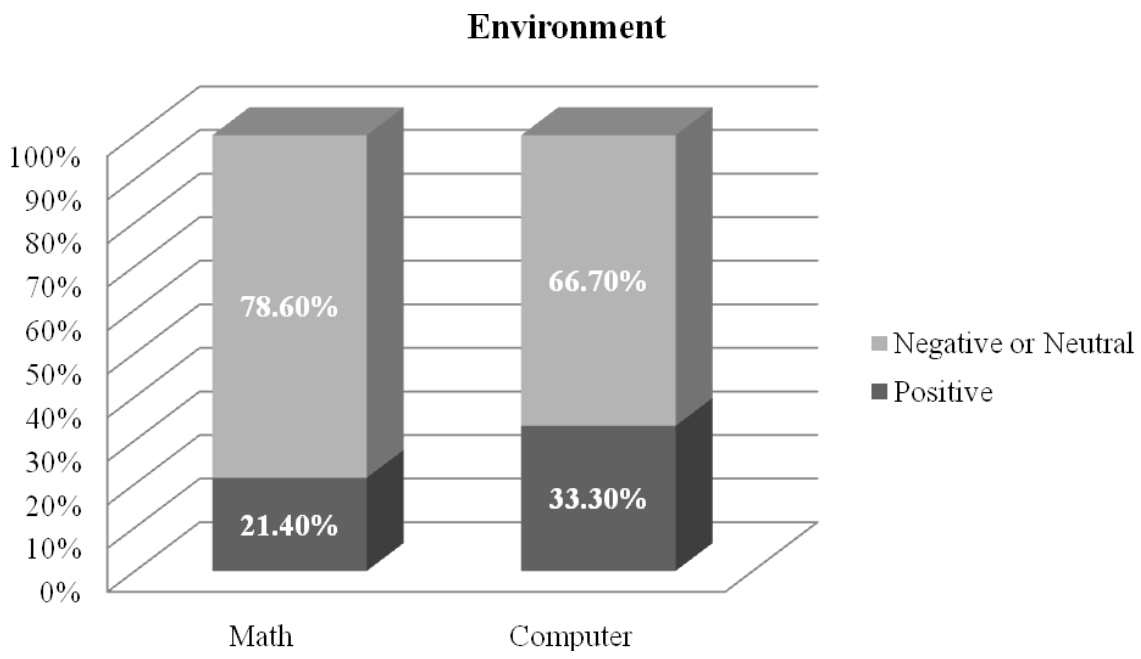


Figure 4.17: Environment Perceptions

| A7: Time Perceptions | | | | |
|---|---|---|---|---|
| | | **Math** | **Computer** | **Total** |
| **Positive** | Count | 1 | 4 | 5 |
| | Row % | 7.10% | 26.70% | 17.20% |
| **Negative or Neutral** | Count | 13 | 11 | 24 |
| | Row % | 92.90% | 73.30% | 82.80% |
| **Total** | | 14 | 15 | 29 |
| **Fisher's Exact Test** | | | | |
| .186 | | | | |

Table 4.8: Fisher's Exact Test of Time Perceptions

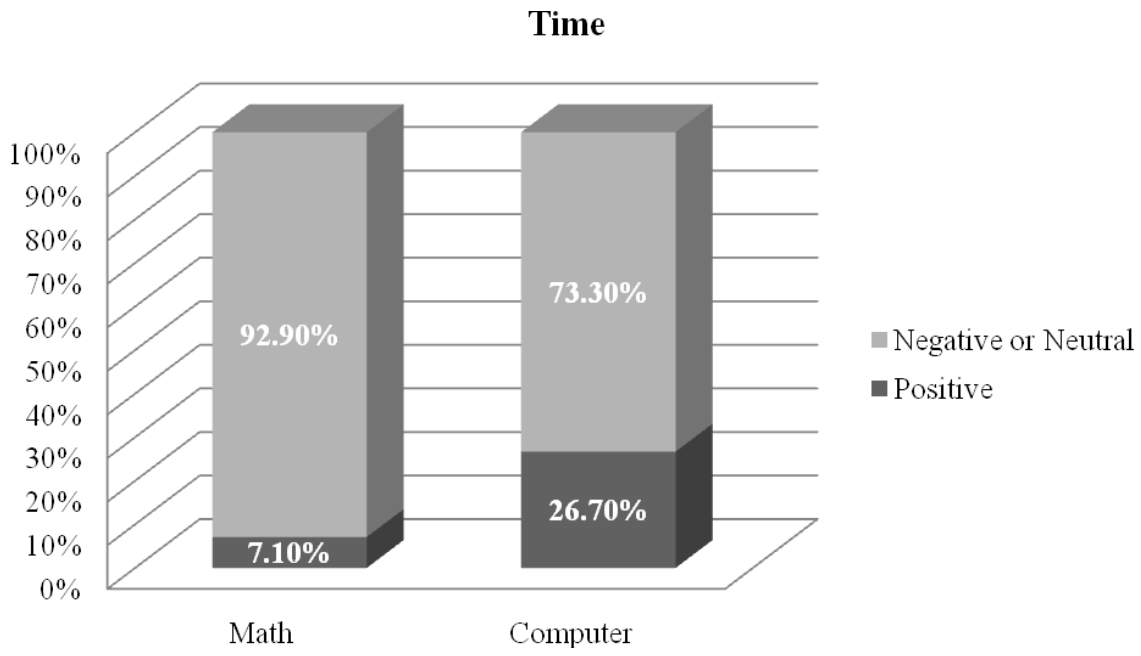


Figure 4.18: Time Perceptions

| A8: Parent / Guardian Perceptions | | | | |
|---|---|---|---|---|
| | | **Math** | **Computer** | **Total** |
| **Positive** | Count | 2 | 4 | 6 |
| | Row % | 14.30% | 26.70% | 20.70% |
| **Negative or Neutral** | Count | 12 | 11 | 23 |
| | Row % | 85.70% | 73.30% | 79.30% |
| **Total** | | 14 | 15 | 29 |
| **Fisher's Exact Test** | | | | |
| .361 | | | | |

Table 4.9: Fisher's Exact Test of Parent / Guardian Perceptions

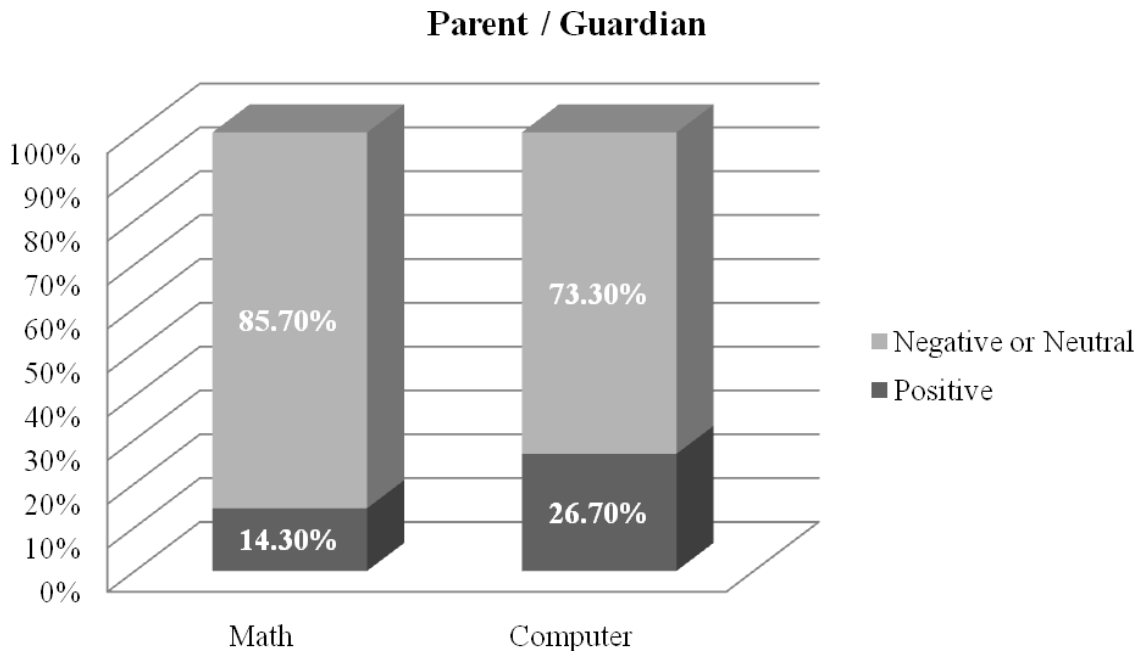


Figure 4.19: Parent / Guardian Perceptions

## SUMMARY

Results from the data analysis based on the IQA approach showed that teachers' perspectives on their integration of ICTs encompassed several components including school management and administration, content and curriculum, teacher, ICTs, student, environment, time, and parent or guardian. Each affinity contained several relevant aspects that were arranged into sub-groups. Table 4.2 shows the list of sub-groups that emerged from each affinity.

| Affinities | Sub-groups |
|---|---|
| School administration and management | • School's vision and policy<br>  ○ Provincial schools' vision centered around academic issues<br>  ○ Sub-district schools' vision centered around skill development<br>• Per-head budget formula<br>• Small schools' struggling with decreasing number of students' admissions<br>• Assessment of teacher's performance |
| Content and curriculum | • Teachers as a school-based curriculum developer<br>• Teachers' struggling with the new school-based curriculum<br>• Content is difficult to teach and complete in a semester<br>• Change in the curriculum structure was not a real problem, but the teaching ability or quality of teacher was |
| Teacher | • Lack of teachers<br>• Teachers have to do extra jobs<br>• Teachers have basic computer knowledge and skills<br>• A combination of teacher-centered approach and student-centered approach, but teacher-centered approach is mainly applied. |
| ICTs | • Instructional media<br>• Mathematics teachers have less authority to use ICTS |

| Affinities | Sub-groups |
|---|---|
| | • A gap between the schools that have ICTs available to use and those that have ICTs but may not be fully functional for all users<br>• Support from the local community and organization |
| Student | • Students' backgrounds<br>  ○ High-performing students, who live in a city area, tend to be more active and competitive<br>  ○ Low-performing students, who live in a small sub-district area, are more likely to be passive<br>  ○ Poor students typically have to contribute to their household income (e.g. working in fields)<br>• Students' perceptions of mathematics and computer subjects are different<br>• Background knowledge is necessary for learning mathematics<br>• Students are not afraid if they fail the test<br>• Student's misbehavior |
| Environment | • Limited classroom space<br>• Larger class sizes<br>• Unsafe area nearby school |
| Time | • Busy working schedule<br>• Students' out of class activities interfere with normal class hours<br>• Computer teachers role in providing technical support interferes with their time for teaching |
| Parent/guardian | • Perceptions of teacher as second parent with responsibility for dealing with students' misbehaviors<br>• Encouraging their child to go to tutoring schools<br>• Willingness to help teach "local wisdom"<br>• Positive perception of ICTs towards students' learning |

Table 4.10: Affinities and sub-groups

The next phase of the analysis involved the development and presentation of the Uncluttered Composite SID. In the analysis, pairs of relationships depicted how each affinity was related to the others. As shown earlier in the Figure 4.4, the driver that emerged in the system was *School administration and management* because this affinity influenced all of the other affinities in the system. The driver directly linked to *Parent/guardian* and then *Parent/guardian* had an impact directly on *Teacher*. The driver also influenced other affinities relevant to classroom instruction, including *Environment*, *Teacher*, *Time*, and *Content and curriculum.* These four affinities were found interrelated in a recursive relationship. The outcome appeared to be in a feedback loop containing *Teacher*, *ICTs*, and *Student*. The relationship of these three affinities was recursive, thus it could be viewed in different ways. We could see how teacher applied the ICTs to support student's learning. Also, it could be viewed as student's learning ability had an impact on teacher's decision to select teaching strategies for effective instruction.

In addition, the statistical analysis comparing the perceptions of computer teachers and mathematics teachers showed that there was only one affinity, "Student", which was found to be significantly different at the .049 level. This could be because of differences in teacher perceptions of students. The computer teachers observed that most students liked to use computers for entertainment (such as playing games or listening to music) and also because computer subjects did not require background knowledge. Thus, they perceived that students enjoyed learning computer courses. On the other hand, mathematics required significant background knowledge and basic concepts to build up the new knowledge. When the students lack the background knowledge, they experienced difficulty in learning mathematics. Thus, it was challenging for the mathematics teachers to help students achieve in their learning. For other affinities, the results showed that both

groups of teachers did not perceive their work experiences in a significantly different way.

# Chapter 5: Discussion

As stated in the introduction chapter, the purpose of this research was to explore Thailand teachers' perspectives towards the integration of ICTs into the teaching/learning process in order to better understand how teachers use technology for classroom instruction and their perceptions of the factors that support or impede their use of ICTs. This chapter begins with an interpretation of how mathematics teachers and computer teachers perceived each affinity in the system. The next part helps provide a deeper understanding of how two participants, who were selected as a representative of each group, perceived each affinity differently. This helps illustrate a variation in an individual level. Then, it is followed by implications for education stakeholders to understand teachers' perceived working conditions. The final section is limitations of this study and suggestions for future research.

## COMPARING AFFINITIES

Based on the finding on teachers' perceptions presented in Chapter 4, the following section discusses how mathematics teachers and computer teachers perceived each affinity. Overall, the two groups perceived affinities similarly, except for one affinity, "Student," that was found to be significantly different at the .049 level.

### School Administration and Management

There was a mixed perception of the role and impact of school administration and management with 3 teachers viewing it very positively, 3 viewing it very negatively and the majority perceiving the school administration and management neutrally. Those who

reacted positively to school administration mentioned that they were impressed with the level of school support. They agreed with the school policy that placed a strong focus on supporting the high ability group of students to enable them to get into an intensive program. One teacher mentioned that these students were “our hope.” However, it should also be noticed that these teachers who had such positive views were the heads of the departments and were assigned to teach AP program. Thus, their experiences tended to differ from other teachers in seeing higher levels of student success.

The 3 teachers with strongly negative views towards administration and management felt overwhelmed with the extra routine jobs they were assigned such as working at the academic affairs and at the co-op that interfered with their teaching responsibilities. Despite their hard work, they felt that the school leaders did not fairly evaluate their performance. One teacher explicitly mentioned, “The school leader had a connection with some local politicians and that was how she got this position; there was a corruption issue.”

The remainder of the teachers did not express dissatisfaction about the school administration and management. They perhaps had already developed a level of expectation and acceptance related to some of the issues such as an ineffective system of assessment and an inadequate level of school budget and funding.

**Content and Curriculum**

With the new core curriculum structure and standards, each school is responsible for developing its curriculum to meet these standards. Teachers thus assumed responsibilities of curriculum development. The majority of teachers accepted their new role as a curriculum developer. However, five mathematics teachers expressed dissatisfaction with this new responsibility. Three out of 5 mathematics teachers indicated

that it was difficult to cover the required course content because their students lacked the necessary background knowledge. Two teachers, who had over 16 years of teaching experience, felt that it was difficult to understand the rationale for separating the mathematics subject matter into two courses: Basic mathematics and advanced mathematics. They indicated that the structural change made it difficult to teach and organize the lesson plans. Also, they explicitly said, "since they changed the structure, I think it was not as intense as it used to be." They questioned whether this change would help improve the learning outcomes. The other teachers, however, did not perceive the change as a problem as they felt that the change was only at the structural level and that would not affect the content that they teach.

Among the computer teachers, three very experienced teachers expressed their concern related to the difficulty of teaching programming courses. They felt that the content was too hard for their students. One teacher indicated that he did not have degree in Computer Science and thus was not academically prepared to offer a programming course. The majority of the computer teachers did not express concerns or problems with the content and curriculum. They mentioned that they developed the school-based curriculum based on the school's visions and academic policies, and students' learning abilities. When teaching, they had to adjust the course content to make sure that it was appropriate for students' learning abilities.

**Teacher**

Five computer teachers and 3 mathematics teachers expressed positive perceptions of "teacher" affinity. They indicated that they did not have an issue related to the lack of teachers. The rest of teachers expressed concerns over the lack of teaching staff and the resulting and often overwhelming workloads they had to assume because of

the staff shortage. Some mathematics teachers needed to help teach computer courses. Some computer teachers mentioned that they were assigned to do additional jobs related to supporting computer applications such as the school's database and networking system. One teacher had to work at the co-op during lunch time. These additional jobs made them work overtime both at school and at home during the weekend. Interestingly, these issues were common to both groups of teachers as well as the teachers from large, mid, and small size schools, and from both provincial and sub-district schools.

In the aspect of teaching strategy or pedagogy, one teacher commented, "I think most teachers are more familiar with chalk and talk." Additionally, most of them indicated that they used drill and practice in their teaching. If they used tools such as PowerPoint, they were used for presenting key content or examples, which helped to engage their students. Although this study could not confirm the pattern or consistency of teachers' teaching strategies in the integration of ICTs into their teaching practices through classroom observation, the interview data still demonstrated that teachers largely used a traditional approach and applied the instructional tools at the "replacement" level (Hughes, 2003).

**ICTs**

The result, although not meeting the statistical level of significance (0.68), suggests that there may be variance between the ways that mathematics and computer teachers perceive ICTs. One of possible reasons is that mathematics teachers felt that they had less authority to use the computer room and other technologies. This tended not to be the case for some mathematics teachers who worked at large-sized, wealthy schools and who had mathematics' lab equipped with computers, Smart Board, and a projector.

Another reason related to the access and availability of ICTs. Some teachers mentioned that some of their computers were broken and thus they had to have two or three students work on one computer. Moreover, some students of the poverty did not have a computer at their household. Thus, it was not possible for teachers to assign a homework that required the usage of a computer or the internet.

Although all teachers indicated that there were computers and the internet access at the school, we saw a variation of the tools' availability based on the type of school. For example, the provincial, large-sized schools tend to have computers available for teaching and learning. On the other hand, the sub-district, small-sized schools tend to have a limited number of computers and access the Internet via a satellite system. However, the sub-district schools typically received financial support from the community by raising funds through "Pa-Paa," which is a type of Buddhism ceremonies.

**Student**

Student is the only affinity for which a significant difference was found at the.049 level. Differences were most notable between mathematics teachers and computers in their views of their students. Eight mathematics teachers expressed concerns that most students did not see an importance of mathematics subject, particularly those who were from the rural areas. Teachers viewed the rural students as more passive learners compared to those who study in city area, where most students tend to be more competitive and active. In contrast, computer teachers felt more positively about their students. Most students basically love playing computer games, listening to music, and playing Hi5. Thus, they perceived computer subject to be fun and to be more practical. This helped make it easier for the computer teachers to engage their students.

Another possible reason for the difference may be related to students' background knowledge. Mathematics teachers found that most students struggled with the subject because they did not have strong background knowledge. Many math teachers mentioned that their students could not perform basic mathematics operations such as remembering the multiplication table. As a result, when they had to learn new concepts, they lacked the prior knowledge to understand the concept and would fall behind. This would result in a lessening of their motivation to learn mathematics.

In contrast, background knowledge for the computer subject was not perceived as an issue by the computer teachers as they felt that each concept could be taught separately. Thus, they had a positive perception of their students.

**Environment**

Both mathematics and computer teachers reacted to environment similarly. Eight teachers found their schools provided an appropriate physical environment (e.g. classroom space, and school context). However, the rest of teachers expressed concerns about the amount of classroom space as the class size became larger. They indicated they often had 50 or even a higher number of students per class. One teacher mentioned, "I have to say that 52 students per class; there is no space left." There was no space for group activity. This was one possible reason why teachers mainly lectured in front of the classroom. One teacher who worked at a school in the south of Thailand shared his experience working in the insurgency area. He indicated that it was unsafe for both teachers and students to commute to school. Such a dangerous situation affected people's lives including the teachers and students.

**Time**

The majority of both teacher groups had either neutral or negative perceptions related to time. They expressed their overwhelming feeling about teaching hours. Most mathematics teachers felt that they had to cover all the content so that the students could prepare for the national test. Some schools decided to add a zero period or ninth period to the instructional day. Moreover, the teachers typically had to work on other routine jobs. They indicated that they did not have enough time to prepare for teaching. An example given earlier was that of computer teachers being assigned to work on different tasks related to school's networking system. They pointed out that these tasks interfered with their time for teaching such as being asked to fix a computer when they were teaching in class. Overall, there was no difference between two groups of teachers' perception of time.

**Parent or guardian**

Only 6 teachers reacted positively to parent or guardian. The majority of teachers mostly perceived parent or guardian in a neutral way. They indicated that some parents helped teach "local wisdom" such as learning a Thai instrument. Many parents also saw the importance of ICTs for learning. They bought a computer for their children if they did not have any financial problem. However, some teachers worried about their children becoming computer game addicts. The other aspect that most teachers worried about was an increasing number of students attending the tutoring school. The teachers understood that most parents were concerned about their child's learning achievement. However, they felt that it would cause more harm to the students, particularly the pressure to get an A or to pass an entrance examination.

Figure 5.1 shows the composite SID with statistical graph. The left bar represents the perceptions of mathematics teachers whereas the right bar represents the perceptions of computer teachers.

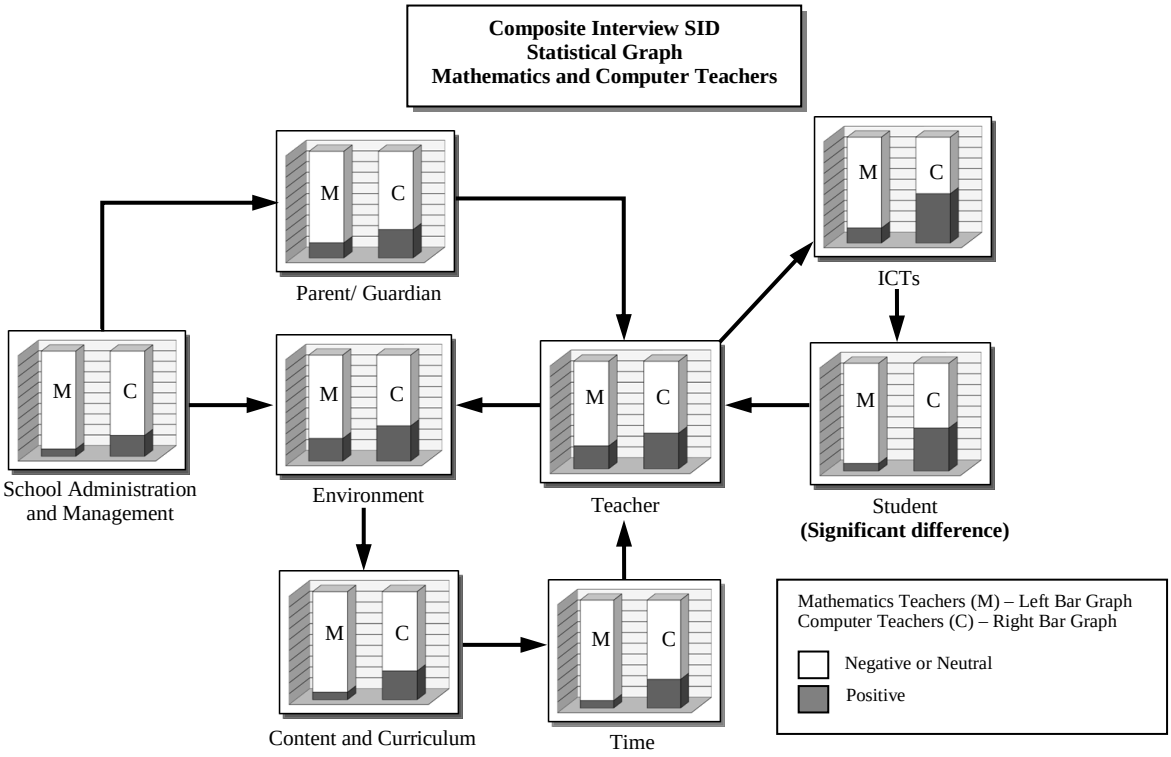


Figure 5.1: Composite SID with Statistical Graph

## INDIVIDUAL VARIATION

Individual variation is another source of comparison for interpretive purposes. The individuals themselves may be selected for comparison because they vary in some interesting way from other individuals or a group. As presented earlier, two groups of teachers perceived affinities in the same way. However, the variations in timbre of the affinities are quite obvious in individual level. Examining individual differences can add some new aspects for understanding teachers' working conditions in ICTs integration. In

the section that follows, a comparison of two teachers represents a range on some interesting dimensions. The selection of the two teachers was based on their different perceptions. The first teacher, computer teacher (C13), evaluated his experience as positive, and the second, mathematics teacher (M2), as negative. The computer teacher (C13) was selected although his perceptions did not have the highest score (see Table 4.1). This was because three teachers (M9, C2, and C12) who had the highest scores worked as heads of the departments and they were assigned to teach the Advance Placement classes. Thus, their perceptions did not reflect those of teachers with a typical range of students and their working experiences contained a more positive aspect. Because of that, computer teacher (C13) was selected to represent the positive side. Mathematics teacher (M2), with the lowest rating scores, was chosen to represent the negative side.

**School Administration and Management**

The computer teacher tended to have a more positive perception of school administration and management than the mathematics teacher even though their perceptions were rated as neutral. The computer teacher indicated many positive aspects of the school administration and management but the tone of voice did not support this impression. The mathematics teacher, who experienced a more unique situation in working at a two-program school located in the insurgency area, was more neutral. The following were among the major perceptions of school and administration.

***Positive.*** “Mainly school's vision and academic policies center around academics particularly mathematics and science program. Teachers are required to implement a project-based learning approach so our students have a chance to work on a real project. We receive budget from the government. Also, our school has a specific department to

make a connection to many universities to support our student's education. Studying here gives students more chance to receive a scholarship either from an organization in Thailand or other countries. For example, a university from Korea and another one from England have a connection with our school. They came here to do an interview with our students to give them scholarships to study further to the doctoral degree. There are about 20,000 students applying each year. After the first round examination, only 500 students pass to the next round. Finally, there will be only 240 students who pass the second round examination. So, these students are like the top group of the country. At our school, there is an academic clinic to help students who need a tutoring session. In a classroom of 24 students, their learning abilities are in different levels and some of them might have problems understanding some topics. They can come to this clinic between 7 PM to 9 PM. every Tuesday and Thursday to discuss with science, math, and computer teachers. They can come and talk with the teachers which topics are not clear to them. Some teachers live in the dorm with the students. So, that is a good thing for the students."

***Negative.*** "Our school mainly focuses on the curriculum relating to the local community. For the content about religions, I mean we are a two-program school, we also teach about religion. Our students are all Muslim. In a day, we have nine periods. Two periods are for religion, the rest is general education. This is the school's policy. There is a scholarship for our students to study in a district school. We will select those high ability students, but we cannot provide the scholarship every year. Our school is quite far from the city area. There are rice fields around the school so there is no store nearby. The distance from the village is about 500 meters. So, we have to provide the students a free lunch and a school bus. Usually the secondary school would not provide any free meal and a ride. However, new student's recruitment is very competitive. There

are many private religious schools around this district and closer to the city area. They also have a school bus provided."

**Content and curriculum**

While the computer teacher seemed to be impressed about the advanced computer curriculum, the mathematics teacher was concerned about the school-based curriculum that combined both religion and general education. Thus, these two teachers perceived content and curriculum in a different way.

***Positive.*** "We followed the national core curriculum when we developed our school curriculum. The courses are divided into three areas. The area I is based on the national core curriculum. The area II is what our school put it as required courses, although it is additional to the core curriculum. The area III is elective. Our students have to take the courses in area I and II, and we let them choose elective courses if they are interested. Every student has to know programming and be able to write a program because we think that programming skill is critical for researchers. When they do a research in the future, they will need this type of knowledge and skill. They should be able to write it, right? That is why we put it into a requirement. They still can take other courses as elective courses. They can take Web Programming or database, something like that."

***Negative.*** "Sometimes I think it is too much for our kids, who live in a rural area. It seems impossible to teach as prescribed in the core curriculum because our students are not competent. If I teach, they can hardly get it. So, I teach based on their ability. If they cannot understand a concept, I have to repeat it until they get it. I choose to teach some concepts and transfer some parts to an elective course. For example, I will not teach

geometry in a Basic course but teach it in an Advance course, which is considered as an elective course. It is because the students struggle with the basic math operations."

**Teacher**

The computer teacher manifested positive views related to Teacher and indicated he felt competent in the use of teaching strategies and technological skills. On the other hand, the mathematics teacher perceived the limited time available and the level of student's learning ability as conditions for the selection of teaching strategies and choices of technology use in the classroom.

***Positive.*** "I use different strategies for different courses. I also use PowerPoint. Basically I copy a part of program, which I think it is important and paste into the slide because if I show them the source code, they might get confused. I usually copy important parts into the slide and explain about it before I run a program. So, it is like they will learn about theory before practice. They will learn about structure, syntax, parts of a program before writing it. For other teachers, it depends on the generation. I mean if they are new teachers, recently graduated, they seem to be fine with technology. The more experienced teachers seem to have more problems when they use technology. However, the school provided many training sessions which helped lessen a number of teachers who were not skillful in using technology for teaching and learning. Right now, I think every teacher can use technology but may be in different levels."

***Negative.*** "There are about 270 students and 25 teachers. Fifteen teachers work as officers and 10 teachers are hired in a contract position. There are 3 lecturers who teach religion and also people who live in the local community help teaching religion. There are 5 mathematics teachers, and one computer teacher. So, mathematics teachers have to help in teaching the computer courses. There are other jobs to do such as working at the

library, being a procurement officer, and a head of building division. Most teachers are newly graduated so they do not have any problem using ICTs. Also, it is a sub-district school so a newly graduated teacher is more likely to be assigned to work here. However, some might ask for a permission to move to another school in a city area. I use a game activity sometimes, but mostly I cannot do that because each period is only 40 minutes, quite a short time. I use worksheets mostly. One reason is that our students are illiterate. They use "Yawi" language. They can read and write Thai, but not very fluent. So, I adjust my teaching based on their abilities."

**ICTs**

There was a huge difference between the two teacher's experiences related to ICTs. The computer teacher positively reacted to the availability of ICTs at the school. On the other hand, the mathematics teacher mostly perceived a lack of ICTs.

***Positive.*** "There are 3 computer labs, but most students own a laptop. The students can use computers individually. Some of them bring their own laptop; some use the computers in the lab. Also, there are laptops available for the students if they would like to borrow. We also have wireless internet."

***Negative.*** "We have one computer room with 20 computers installed. Another room has 5 computers with the internet access. I let my students use it sometimes such as GSP. I also let them use it for a community activity, which will help prepare them for a competition. Our school still lacks of the internet. We still do not have the internet lines here. We have to use the satellite system. It is just on and off, not good."

**Student**

Two teachers also perceived their Students differently. The computer teacher indicated that he seemed to better understand the nature of students and their differential characteristics. In contrast, the mathematics teacher tended to more focus on students as a group indicating that most students at the school only spoke the local language and had a low learning ability.

***Positive.*** "Overall, I think we are fortunate to have competent students. Although some do not pay attention to the class but actually it is not like they do not care to learn at all. It is not that bad. In a class, I can see three groups of students. The first group is those students who think that they already knew and do not pay attention in the class. The second group will be more focused in the class. The third group is those who do not know and do not pay attention when I teach. So, I need to use different approaches to control them. I mean I know students who have self-motivation and students who do not pay attention in the class. When I teach, I know which groups I have to focus on. For those who pay attention in the class, I think they listen to me and understand when I teach. For the other two groups, I pair them up so they can help each other like partners. Those who already knew can help those who do not know."

***Negative.*** "The students are from the local community. They are all Muslim and speak their local language (Yawi Language). Our students might be less competent in academics. I think they make an effort on their learning but they need to acquire background knowledge and improve their reading and writing skills. Their background knowledge is very different. Those, who are very competent, would do great in the class. On the other hand, those who are not competent cannot memorize a multiplication table or basic math operations. In the first semester, we have mixed ability students in the same class. Then we can separate them in the second semester. However, the low ability students would be very slow. Anyway, we have to teach the basic concepts once again. .

Some students got all zeros, but still passed! In the past we had to let them pass to the next grade level. Some students did not care and did not come to school. They think that anyway they are going to pass. If you study in a public school; there is a belief that even though you failed, you still graduate! But recently we adjust the policy in repeating the same class. It is like a teacher now at least has a weapon to scare the kids. If we let them do that, most people would think that it is ok to do just like that and try to follow."

**Environment**

The computer teacher had a very good perception of the school environment. On the other hand, the mathematics teachers perceived the environment as a negative driver for classroom instruction.

***Positive.*** "There are only about 24 students per class. This school is quite exclusive. There are all equipments available for every student. Everything is available."

***Negative.*** "There are about 40 students. Some years there are more than this. There are about 30 to 40 students in the lower secondary level, and about 20 students in the upper secondary level. It is not crowded. There have been many dangerous situations. The worst one was the school principal was killed. There was once that the school almost got burned down. A troop of military is staying on guard to protect schools in this area. If there is something happens, they will throw a lot of nails (twisted in an L shape) on the road in front of the school. It happens almost every month. Sometimes it is more often than that. It depends. If it happens to other schools nearby, our school will be closed as well. For travelling, the students will split to two groups: the one who take the school bus

will go home on time, the other group they have their own vehicle. There is a little problem that we have to control them to be in the school, not to ride the car somewhere else. Most of them are the senior high who have their own car. Just driving a car out of our house is risky, both accident and other things as well."

**Time**

The computer teacher indicated that he was busy working several jobs but seemed to be proud of his school winning in an academic competition. The mathematics teacher, on the other hand, perceived that he could not have enough time to teach because each period was limited to 40 minutes. Also, he felt that it was not safe environment to work after normal school hours.

***Positive.*** "In the morning, I have to get to school around 7:30 AM and school dismisses at 4:30 PM but I have to stay to talk to some students. I teach 12 hours a week but there are only 5 computer teachers comparing to mathematics department, there are 14 teachers. It is a big difference. Although they have the same teaching hours, computer teachers have to do extra jobs such as training in school and outside of school. Another one is training students for a competition in an international level called, International Olympiad in Mathematics, Physics, Biology, Chemistry, and Informatics or computer. The school administrators see the results of these competitions as an indicator for school quality. So, most people seem to know our school from this competition."

***Negative.*** "I teach 20 hours a week. And as I told you that we have to teach religion, this also affects the study time. Normally, a period is about an hour, but it is about forty minutes at our school. Forty minutes is very little. In a day, the students study nine periods, seven periods are general education. There is time for praying during the lunch break. Praying takes little time about five minutes. But we have to separate

them to many groups. I actually live in another district, so I drive around 90 kilometers every day to go to work. I have to go in and out as scheduled because there are surveillance soldiers. If it is not in the working hour, there will not be any guard soldiers. There are the morning and evening shifts. The teachers have to stick to the government working hours. If we would like to go out after that, they are going to try to forbid us to go because it has been risked all the time."

**Parent or guardian**

While the computer teacher perceived that some parents were involved and demanding, the mathematics teacher found that some students lived with the grandparents who did not get involved in the students' learning.

***Positive.*** "Most parents trust our school's teaching and learning system. The school is open to have parents express their opinions and get information. Some parents are quite picky about their kids' livings because it is a boarding school and most kids are from a wealthy family. If you ask me which groups of kids most teachers prefer, it is the ones who are from "Bann Nok" (country area) because they are more patient and pay more attention to their learning. Those who live in Bangkok are more likely to get used to questioning but need an answer instantly. This situation happens because they got trained at the tutoring school, which emphasizes how to get a correct answer in the shortest time. When they are asked to think, it is hard for them. Some might got upset because they did not get an answer right away. They complained to their parents that our teaching was too slow, they could not study here. They did not understand that what we did was to lay out

a foundation. Sometimes we educated the parents and tried to help them understand how it should be."

***Negative.*** "Most parents send their kids to our school because we can give them a ride. Some students do not live with their parents because they have to work in Malaysia. These students live with their grandparents instead and they are more likely to have a problem. So, our religious teachers who live in the local community would know better about the residents and they will make a visit to their houses. In the rural areas, there have been no problems. They respect the teachers a lot. They entrust their kids to us. It is like the upcountry in the past. Nobody sues each other like the schools in town. Scoring or whatever depends on the teachers. No complaints about grading."

**Comparing Individual Systems**

The differences between the two teachers' experiences can be viewed in the SID model. Figure 5.2 shows the SID of computer teacher (C13), who had positive and neutral perceptions of the affinities. In the system, the affinities in the white text box showed the positive perception whereas the blue text box showed the neutral perception.

This computer teacher works at a famous boarding school. The school leaders provided support in many ways to ensure that the students will be successful in their education. However, this means a demanding workload for the teachers. The school-based curriculum was more advanced than required in national core curriculum. Thus, it influenced Parent or guardian to send their kids to study here. Since it is the boarding school, Parents were concerned about their kids' learning and living there. The teacher and student ratio seemed to be satisfactory as there are about 24 students per class. Thus, these affinities were perceived positively. However, Time was perceived neutrally because they felt they were so busy doing different tasks. The number of qualified

teachers, curriculum, class size (space), and time interacted with each other. Then, all of these affinities affected the use of ICTs and finally influenced Student. This computer teacher neutrally perceived the differences of student's learning abilities.

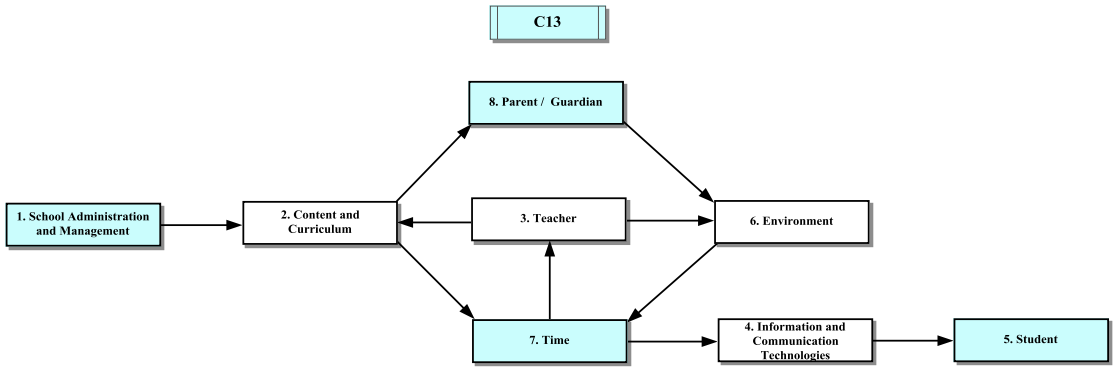


Figure 5.2: SID of computer teacher (C13)

In contrast to the computer teacher (C13), the mathematics teacher (M2) had relatively negative perceptions of working conditions. The affinities in the blue text box showed the neutral perception and the ones in the grey text box showed the negative perception. As the school is located in the insurgency area, the School administration and management can provide limited support for teachers and students. The school-based curriculum combined both religion education and general education. Thus, the perceived experience of teaching a class in a 40 minute time period was negative. However, this teacher neutrally reacted to Teacher because a sufficient number of mathematics teachers were present at the school. The Student and ICTs were perceived negatively because of the perceived students' low learning ability. They used "Yawi" language in their daily life and that influenced the use of ICTs in the teaching and learning process. Also, most students were from a nearby village and a low SES environment. Thus, they might not have a computer at their household. The school had limited ICT tools and communication

technology infrastructure. Parent or guardian did not get involved in the school or with the teachers because most parents had to go to work in other areas and left their child to the grandparents.

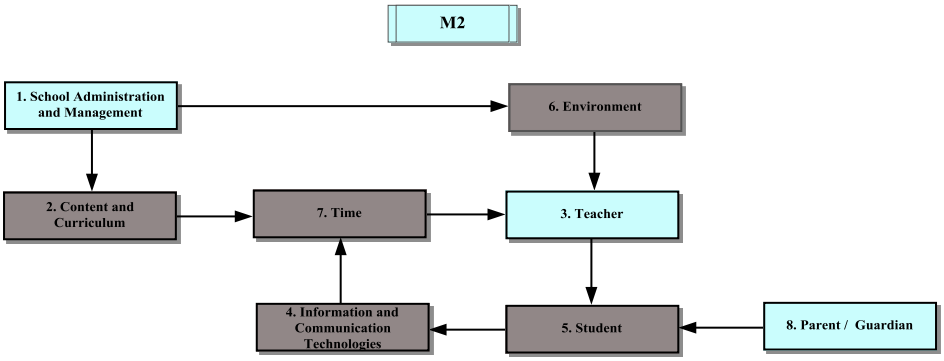


Figure 5.3: SID of mathematics teacher (M2)

These two teachers had quite different circumstances. It raised a question of what relevant stakeholders should do to better support the schools in the insurgency area. The situation has lasted for about 7 years and there were many educators who were injured and killed. In a two-program school, students are required to study both religion and general education. One may ask how the school teachers can ensure producing a higher learning outcome and how the student's learning outcome should be measured.

Based on the composite interview data of two groups of teachers and the in depth interviews of the two teachers' there is a clear picture of the perceived working conditions and how the emerged factors influence each other.

## ZOOMING THE COMPOSITE SID

In IQA approach, Northcutt and McCoy (2004) suggested that zooming in and out of the system allowed the researcher to develop different views of the system. "Zooming" is naming feedback loops and substituting this name for the names of their individual

components. By zooming out, progressively simpler (less branching, fewer feedback loops, and fewer affinities) views are constructed, but each view also has less detail. Zooming out to view the relationship of the SID is reviewed briefly in the following section.

The Composite SID, as displayed in Figure 5.4, reveals two interlocking feedback loops. The first feedback loop includes Teacher, Environment, Content and curriculum, and Time (affinities 3, 6, 2, and 7). The second loop includes Teacher, ICTs, and Student (affinities 3, 4, and 5). The two feedback loops have Teacher as an affinity that interlocks the two feedback loops together. The affinities in each feedback loop interact with each other; there may be a name for such interaction. A review of the axial codes and descriptions suggests a situation related to classroom management. However, considering its placement in the topology zone and the interview data, the researcher found that the affinities in the first loop involved situations which the teachers are less likely to control, for example, lack of teachers, classroom space, core curriculum, and class hours (assigned workload). Although classroom instruction is involved in both feedback loops, the first loop is more related to how teachers work in the given time constraints, given curriculum, and fixed classroom space. Thus, the first loop is named "Teacher's classroom management (Nonnegotiable factors)." The second loop involved how the teachers use ICTs in the classroom. Also, the teachers perceived that they can control the use of ICTs as well as how students learn at some points. Hence, the second loop was named "Teachers' ICTs Integration (Negotiable factors)." Figure 5.4 shows the Composite SID and Figure 5.5 shows the Composite SID in the Telephoto view.

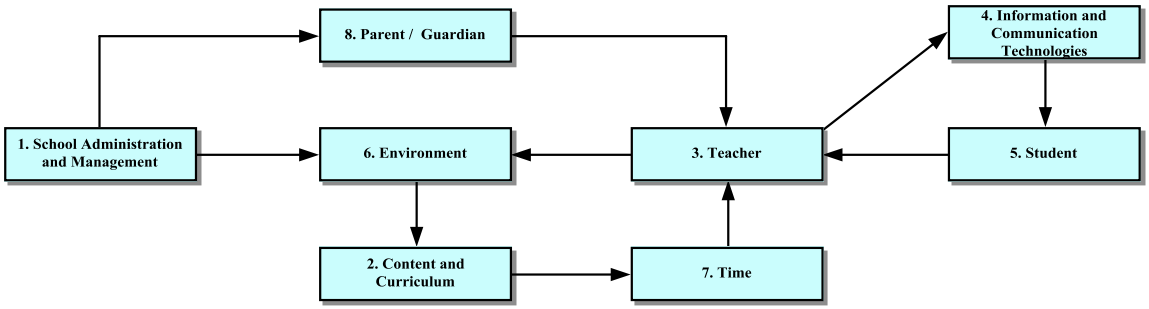


Figure 5.4: Composite SID

In the Telephoto View SID, we can easily separate teachers' working conditions as the ones that teachers cannot control (drivers) and the ones that they are able to some extent control (outcome). The system guides us to understand that the teachers largely viewed themselves in a position where they cannot make any changes in the school system.

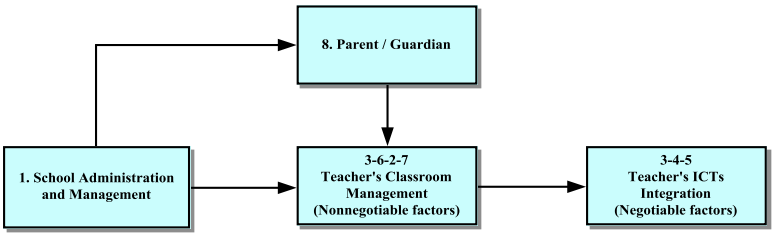


Figure 5.5: Telephoto View SID

In the following sections, using the composite SID and research data to identify factors or elements that affect the teachers' ICTs integration experience, the researcher provides suggestions for the integration of ICTs.

## IMPLICATIONS FOR THE INTEGRATION OF ICTS

The findings reflect the perceptions of the teachers towards their teaching experience and the integration of ICTs into their teaching. Understanding teachers' perceived experience and feelings about their working conditions may help policy-makers and other stakeholders to more effectively support teachers' integration of ICTs. Based on the findings of this study, this section provides suggestions for relevant stakeholders in educational system. The primary aspects of the study that suggest implications for the integration of ICTs include 1) Top-down support and redesigning of working conditions, and 2) teachers' professional development.

### Top-down support and redesigning working conditions

Policy-makers and other stakeholders should continue to develop an evolving framework for improving the school community to ensure a qualified, well-supported, and successful teacher for every student, in every school. In this present study, there are several issues that should be considered.

#### *Support from the government*

Due to the rapid change to the information age, Thai government has been increasing the budget on the development of communication technology infrastructure. One of the goals is to improve quality in education and lifelong learning opportunities. Ministry of Education provided about 190,000 computers to schools in 2000 and yearly budgets for professional development. Recently, Thai government created a national development project called "Thai Kem Kaeng" or "Thailand: Investing from Strength to Strength." This project was purposefully created for an economic stimulus. A part of this

project included providing funds for improving education facilities. However, one of the teachers who participated in this study pointed out:

> Every teacher, every school, had submitted their proposals to the district. I think our proposal was approved and we would have about 1.2 million and then we could allocate the budgets to different departments. Other schools might have got more than that. I have heard that they (Ministry of Education) will do an evaluation probably next year to see whether our students' learning achievement will be increased. How can we make it happened? Other teachers also complained that it was such a pain to get the money. **We were forced to write proposals and we had no idea if we could make it. They wanted to see an improvement, particularly an increasing rate of students' learning achievement. That money was not for teachers. Now they wanted to see the outcome in a year.** We have not yet received the money. If it turns out that there is no improvement, I do not know what else I can do. Can I refuse to get the money? And you know what, we cannot purchase anything we want. There are lists of equipment, its prices and specifications provided. That means we cannot just buy what we think it would be more appropriate for our situation. It was fixed.

This interview data provided an insight into an issue of implementation. Although the government aimed for providing technological support to increase the learning achievement, the fixed rule of implementation made the teachers feel that they were obliged to choose ICT tools, based on the provided lists. The timeframe given for implementation was limited. Moreover, they cannot spend this budget to support teachers' quality. This perhaps can be viewed that the government separated an amount of budget for teachers' professional development. However, there is no information provided in this current project. Providing only budgets for technological support may not yield an improvement of students' learning outcome. The suggestion is that the "Thai Kem Kaeng" project would be successful in educational improvement, if relevant policymakers closely examine the implementation process and continuously adjust the process to make it more feasible. The rules should be flexible for different characteristics of the school community.

***School-based curriculum and assessment***

After the Education reform Act of 1999, every school has to implement new core curriculum developed by the Ministry of Education. For that, the school teachers became the school-based curriculum developer. This new approach should allow every school to be able to design a more effective curriculum that is suitable for the school context. However, the assessment is a one-size-fits-all basis. Every student needs to take two national tests called Ordinary National Education Testing (O-NET) and Advanced National Education Testing (A-NET). Thus, most teachers tried to teach all the required content. The school-based curriculum, as a consequence, cannot meet the needs of the school community such as a two-program school that combines the religion program with general education. As mentioned earlier in the individual variation section, the two-program school had 9 periods per day, and each period contains only about 40 minutes. Two periods were for Muslim education. A suggestion is for policymakers to view different types of schools and its needs. One-size-fits-all assessment may not be appropriate for the idea of school-based curriculum.

***School administration and management VS. teacher and student ratio***

As indicated in Chapter 2 about the ratio of teacher and students, the overcrowded class size is one of the factors that influenced teaching strategies and how teachers use technology in the classroom. Largely, the teachers who participated in the study mentioned about the layout of the classroom that the students sit in the rows and there was no space left to organize group activities. In the computer room, two students shared one computer. There were only few cases that the students can work on the computer individually. The overcrowded class size and limited classroom space thus affected

teachers' belief that lecturing or chalk and talk would be more convenient for both teachers and students because they do not need to move the tables around to work in groups. Also, teachers have to make sure that they can teach all the required content. Thus, the other reason would be related to the time. Working in small groups requires them to arrange tables and time for group discussions. Moreover, teachers might not be able to facilitate every group's work closely enough. Thus, reducing class size may possibly help make teachers consider a student-centered learning approach. This suggestion may raise a question to many school principals because schools receive per-head budget from the Ministry of Education. The interview data indicated that the small and mid-size school principals tried to recruit more students in order to increase the annual budget as well as students' learning achievement and school's accountability. The Ministry of Education and policymakers should take it into consideration since the teacher and student ratio affected teachers' decision-making in classroom teaching and management.

Referring to Figure 5.5, Telephoto View SID, we can see that teacher's classroom management influences teacher's ICTs integration. This shows us that as long as teachers cannot negotiate or control the class size, they perhaps may not be able to change the way they teach and how they integrate ICTs in the classroom.

***Teachers' workload and ICTs adoption***

As Zhao, Pugh, Sheldon, and Byers (2002) described that to make a change in technology adoption in the school system, the school needs to provide support in terms of technological infrastructure such as computer hardware and software, human infrastructure such as technical staff, and an organizational culture that provides positive

motivation as well as social pressure. However, the current study found that computer teachers have to not only maintain their teaching jobs but also work as technical staff at the school. In addition, both mathematics and computer teachers have to do other administrative routine jobs. They felt overwhelmed by the workload and did not have time to prepare for teaching. One teacher mentioned:

> The total teaching hours right now are 25, if adding activities, which are 4, so it is 29 hours. This does not include other jobs, which I have to find a free time to work on. Sometimes it closes to the deadline, I have to get it done and I have to work at night at school or sometimes I work during the weekend. Thus, **the teachers do not have time to prepare for teaching. This is what we have to accept and why experienced teachers still teach in the same style. They may not change even the worksheet.**

What this teacher described indicated that their felt overwhelmed by the workload and that, in turn, affected lack of time for self-improvement such as learning how to use new technology and new teaching strategies. A tentative implication for this issue is that the school leaders should support "reculturing" the school community (Fullan and Smith, 1999). The school leaders should understand that teachers can integrate ICTs effectively not only because they have tools available, but also because they have time for self-improvement. Every teacher should have time to learn and improve their knowledge and skills. Also, they need to have time to cooperatively plan for their teaching with peers before putting it into practice. The school leaders should consider hiring technical staffs as the computer teachers are already overwhelmed with their teaching jobs. This will help every teacher feel more confident that they can get help when they have a problem related to ICTs in the classroom.

***Ability grouping***

The result of this study showed that the relationship between "Teacher" and "Student" happened in a feedback loop, as shown in Figure 5.4. However, the majority of the teachers who participated in this study indicated that teachers tend to have an important role in transferring knowledge and disciplining students. In the feedback loop, we also can see that, based on the interview data, the teachers' perceptions of the students' learning performance constantly affected how the teachers selected their choices of teaching strategies as well as how much of the content they planned to teach a specific group of students.

Ability grouping can be viewed in two different ways. First is teachers' perceptions of student's learning ability if the school has grouped students into different classrooms or programs based on their GPAs, or "between-class ability grouping" (Slavin and Karweit, 1985). This type of grouping yield benefits only for the high-performing group but not for the low-performing group (Westchester Institute for Human Services Research, 2002). The second one is teachers' perceptions of student's learning ability based on the school context such as provincial, large-size school versus sub-district, small-size school. For example, one of the participants adjusted the assignment because of her perception of students as rural students with low SES.

> When I give them a homework, **I give them very few because they are not the same as those kids in the city.** For those kids, they might be able to do ten items. For my students, one or two items would be enough.

Teachers' perceptions and expectations of students in the "high", "middle", and "low" classes and as well as "a discursive practice" (urban vs. rural) tend to be normalized in the Thai educational system. This phenomenon is similar to the study conducted by Popkewitz (1998). An implication is to help both teachers and relevant

stakeholders to realize and be aware of student's individual differences if we want to increase the student's learning achievement. Rosenfeld and Rosenfeld (2008) recommended that concepts about teacher's expectation and student's individual learning differences should be stressed in teacher's professional development.

**Teacher's professional development**

The Institute for the Promotion of Teaching Science and Technology (IPST), an organization under the Ministry of Education, has developed a master plan for teacher's professional development. However, the training mainly focused on how to use the ICT tools and barely discussed about how to integrate ICTs in the teaching of different subject matter. Thus, the training program seemed to separate technological knowledge and skill from pedagogical content knowledge. The following part includes suggested guidelines for future teacher's professional development in ICTs integration.

***Teacher's teaching practice***

The results of the current study showed that the majority of the teachers applied a teacher-centered learning approach, although a few of them indicated that they applied the student-centered learning approach. Moreover, their perceived working conditions became a hindrance for transforming the teaching practice. The professional development program should first help the teachers be more conscious about their own belief and practice. An understanding of their perceptions towards the school community, their working conditions, students, ICTs, and how they integrate ICTs in the classroom will help them see which problems can be solved. Later, possible solutions should be brainstormed and discussed to assist the implementation.

### *Teacher's TPACK and transformation of technological use*

It is assumed that the participants in this study may not be familiar with the concept of Technological Pedagogical and Content Knowledge (TPACK). The professional development program should emphasize this idea as its evolving framework could possibly enhance the integration of ICTs more effectively. The training should not separate the use of tools from the content knowledge.

In addition, the interview data about their ICTs integration repeatedly illustrated the use of ICTs in the "replacement" level (Hughes, 2003). For example, teachers regularly use PowerPoint when they do the lecture. The use of PowerPoint thus is only a replacement of chalk-talk. Thus, there is no change in both teaching and learning processes and may not provide a successful learning outcome. Teachers and other stakeholders should be able to examine how they apply the ICTs and its effects. The policy-makers should also study about a change process in the school context as it needs cooperation from many constituencies such as parent or guardian, student, school leaders, and school districts.

## LIMITATIONS AND FUTURE RESEARCH

There were a number of limitations to this study. First, focus group interview data were collected on different days as the study subjects were participants in two workshops held at different times. Thus, this study failed to produce focus group System Influence Diagram (SID). The results of this study could not be tested if the composite SID based on the individual interview is comparable with the focus group SID. Therefore, this study may need to be replicated to increase the validity of the study.

Second, another limitation arises from participants' demographics. The researcher was aware of heterogeneous characteristics including types of schools, and the socio-economic status of the majority of the students attending at the school where teacher work because of an assumption about an inequality's issue emerged in the pilot study. The result in this study confirmed inequality in educational system. Both groups of the teachers constantly described their school context as well as students' characteristics to justify the decision-making to select their teaching strategies.

However, the researcher also compared the perceptions of two teacher groups based on the types of schools (provincial vs. district and sub-district). The result still showed an insignificant difference. Nevertheless, it was possible that they perceived a tradeoff of their working conditions. For example, teachers who work at a provincial, large-size school perceive that they do not have a problem related to lack of ICTs but they perhaps feel that their work is demanding and competitive. On the other hand, teachers who work at a sub-district, small-size school may be experiencing a lack of tools and lack of teachers. However, they possibly appreciate the pleasant and peaceful living style. This is consistent to Kantabutra and Tang's research findings (2006). Therefore, a future study should examine different groups of teachers who work in different types of schools. That would guide development of a more comprehensive study of teachers' ICTs integration.

Finally, all individual interviews were conducted via Skype (Skype-to-mobile phone). Thus, the researcher could not see facial expressions of the participants. Some problems occurred during the interview such as unclear and muffled sound. Also, the researcher experienced losing the phone connection during the interview and could not reestablish contact with that participant afterwards. Interviewing via Skype also appeared to make the participants more concerned if their answers were correct. They always asked

whether their answers were what the researcher expected. Thus, the researcher tried to repeat the interview process and confirmed them that there was no right or wrong answer, but it was based on their experiences and feelings. Thus future research is recommended to be conducted on face-to-face basis.

## SUMMARY

This study sought to understand the conceptual thinking of teachers in Thailand towards computer and technology use in the classroom. The study involved two groups of teachers: teachers who teach computer subject and teachers who teach mathematics subjects. In particular, the study applied Interactive Qualitative Analysis (IQA) approach to draw a systems thinking of teachers and to provide in-depth perspectives of teachers about their implementation of ICTs in the classroom.

It has been about a decade since the Educational Reform Act of 1999, the master plan enforced teachers to transform their teaching from teacher-centered approach to student-centered approach. Additionally, every teacher should be able to integrate ICTs in their instruction. The results of this study, based on the teachers' voice, indicated their unchanging teaching approach due to their perceived working conditions. If the results of the current study are valid, one key suggestion for every stakeholder is to closely look at the real situation and to show their understanding, rather than blaming teachers. Various support should be provided to help improve their working conditions and to encourage teachers and others who work in the academia world to make an improvement in students' education.

# Appendix A: Process and Sample of Interview Questions

**Focus group interview process:**

Brief summary: In a few minutes, I am going to ask you to tell me about your experience on teaching with computer and internet.

- To begin, try to get as comfortable as you can
- Close your eyes (if you want to)
- Putting aside your thoughts of the day, take a deep cleansing breath
- Now imagine yourself in teaching in the classroom using computer and internet (long pause)
- See yourself engaging in class activities (long pause)
- Notice your surroundings (long pause) Looking around you, take in the sights and sounds that are associated with your teaching in the class
- Allow yourself to become aware of your environment with all of your senses
- Focus on what it feels like to be totally absorbed in classroom teaching. Be there in your mind (long pause)

Now, tell me about your teaching and using computer and internet when you teach in the classroom

Reflect on all the thoughts you had concerning about teaching with computer and the internet

Write these thoughts down on the cards

Write one thought or one experience per card, using words, phrases, sentences, or pictures

Later, the participants will be asked to put the cards on a wall and categorize or group the cards. Then, they will be asked to name and define the affinities as a group. Finally, they will draw a relationship of the affinities.

**Individual interview process:**

Based on the affinities emerged from focus group interview, the investigator will ask two sets of questions: affinities and relationship of each affinity.

- The process begins with giving a set of affinities emerging from focus group to the participants. They will be asked to reflect on his or her personal experience and give examples or meanings.

- After the participants respond to all affinities, the investigator will ask them to draw a relationship of affinities in order to examine how they perceive the connections of the affinities.

# Appendix B: Emerged Themes

| No. | Computer Group 1 | No. | Computer Group 2 | |
|---|---|---|---|---|
| 1 | Teacher's commitment | 1 | Teacher's feelings | |
| 2 | Tool's availability | 2 | Issues relevant to content and curriculum | |
| 3 | Negative feelings of students | 3 | Issues relevant to using ICT | Hardware/Software |
| 4 | Positive feelings of students | | | Network |
| 5 | Student's misbehavior | 4 | Students | Background knowledge |
| 6 | Instuctional media | | | Student's behavior |
| 7 | Issues relevant to teacher and teacher's readiness | 5 | Parents | |
| 8 | Classroom environment | 6 | Issues relevant to management and administration | Environment |
| 9 | Teaching and learning process | | | Budget |
| 10 | Interaction between teacher and student | | | Tools |

| No. | Math Group 1 | | No. | Math Group 2 | No. | Math Group 3 |
|---|---|---|---|---|---|---|
| 1 | Positive | Student | 1 | Budget | 1 | Human/Personal (e.g. parents, community) |
| | | Teacher | 2 | Student | 2 | Time |
| 2 | Negative | Tools | 3 | Technology | 3 | Budget |
| | | Management and Administration | 4 | Teacher | 4 | Content |
| | | Teacher (age, TK) | 5 | Environment | 5 | Tools/Media |
| | | Student | 6 | Time | 6 | Environment |
| | | Time | | | | |
| | | Environment | | | | |

# Appendix C: Consent Form in English

**Title:** Understanding Perspectives of Teachers in Thailand towards Information and Communication Technologies Integration in the Classroom

**IRB PROTOCOL #** 2007-11-0173

**Conducted By:** Benjaporn Wattanawaha
**Telephone:** (512) 371-7279 **Email:** bwatt@mail.utexas.edu
Of The University of Texas at Austin: Instructional Technology/ Curriculum and Instruction Department

You are being asked to participate in a research study. This form provides you with information about the study. The person in charge of this research will also describe this study to you and answer all of your questions. Please read the information below and ask any questions you might have before deciding whether or not to take part. Your participation is entirely voluntary. You can refuse to participate without penalty or loss of benefits to which you are otherwise entitled. You can stop your participation at any time and your refusal will not impact current or future relationships with UT Austin or participating sites. To do so simply tell the researcher you wish to stop participation. The researcher will provide you with a copy of this consent for your records.

**The purpose of this study** is to understand perspectives of teachers in Thailand towards Information and Communication Technologies (ICTs) Integration in the classroom. To meet this purpose, the investigator will apply Interactive Qualitative Analysis approach to conduct a focus group interview and individual interview.

**If you agree to be in this study, we will ask you to do the following things:**

- You will be asked to participate in two sessions: focus group interview and individual interview.
- In a group interview, you will be asked to write down your thoughts about your experiences teaching with computer and internet into note cards and organize them into groups. You, as a group, will then come up with affinities and definitions. Later, you will be asked to explain relationship of each affinity.
- In an individual interview, you will be asked two sets of questions. Firstly, you will be asked about your experiences teaching with computer and internet. Secondly, you will be asked to explain about relationship of each affinity.

**Total estimated time to participate** in study is about one week.

**Risks** of being in the study
There are no risks to participants' physical or mental health beyond those encountered in the normal course of everyday life. The investigator will replace the names of the participants with numbers and pseudonyms when coding the data. The audio-recording during the interview will be heard only for research purposes by the investigator. Other types of risks are not anticipated.

If you wish to discuss the information above or any other risks you may experience, you may ask questions now or call the principal investigator.

**Benefits** of being in the study
There are no benefits for participation in this study further than a group discussion and experiencing Interactive Qualitative Analysis approach.

**Compensation:**
If you want, the researcher will give you the results of the study. Any other compensation for your participation will not be provided.

**Confidentiality and Privacy Protections:**
Your personal information will not be released. They will be replaced with numbers and pseudonyms so that no personally identifying information is disclosed.

The data resulting from your participation may be made available to other researchers in the future for research purposes not detailed within this consent form. In these cases, the data will contain no identifying information that could associate you with it, or with your participation in any study.

The records of this study will be stored securely and kept confidential. Authorized persons from The University of Texas at Austin, members of the Institutional Review Board, and (study sponsors, if any) have the legal right to review your research records and will protect the confidentiality of those records to the extent permitted by law. All publications will exclude any information that will make it possible to identify you as a subject. Throughout the study, the researchers will notify you of new information that may become available and that might affect your decision to remain in the study.

**Contacts and Questions:**
If you have any questions about the study please ask now. If you have questions later, want additional information, or wish to withdraw your participation call the researchers conducting the study. Their names, phone numbers, and e-mail addresses are at the top of this page. If you have questions about your rights as a research participant, complaints, concerns, or questions about the research please contact Jody Jensen, Ph.D., Chair, The University of Texas at Austin Institutional Review Board for the Protection of Human Subjects at (512) 232-2685 or the Office of Research Support and Compliance at (512) 471-8871 or email: orsc@uts.cc.utexas.edu.

***You will be given a copy of this information to keep for your records.***

**Statement of Consent:**
I have read the above information and have sufficient information to make a decision about participating in this study. I consent to participate in the study.

Signature:_____ Date: _____

Please provide a separate signature for your permission of our use of the audio-recordings of the interviews.

Signature:_____ Date: _____

_____ Date: _____
Signature of Person Obtaining Consent

Signature of Investigator:_____ Date: _____

# Appendix D: Consent Form in Thai

**เรื่อง** ความคิดของครูผู้สอนในประเทศไทยต่อการใช้เทคโนโลยีสารสนเทศในห้องเรียน

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**ภาควิชาเทคโนโลยีทางการศึกษา/หลักสูตรและการสอน** มหาวิทยาลัยเท็กซัส เมืองออสติน สหรัฐอเมริกา

ท่านได้รับเชิญให้เข้าร่วมงานวิจัย แบบฟอร์มนี้จะชี้แจงข้อมูลที่เกี่ยวข้องกับการวิจัย ผู้วิจัยจะอธิบายเกี่ยวกับงานวิจัยและตอบคำถามของท่าน กรุณาอ่านข้อมูลด้านล่างและหากท่านมีข้อสงสัย ท่านสามารถสอบถามผู้วิจัยได้ก่อนตัดสินใจที่จะเข้าร่วมงานวิจัย การเข้าร่วมงานวิจัยขึ้นอยู่กับความสมัครใจของท่าน ผู้วิจัยจะให้สำเนาเอกสารนี้ไว้เป็นหลักฐาน ท่านสามารถปฏิเสธการเข้าร่วมการวิจัยโดยไม่มีผลกระทบใดๆ ต่อท่าน ท่านสามารถหยุดการเข้าร่วมการวิจัยได้ทุกเวลาและการปฏิเสธของท่านจะไม่มีผลกระทบต่อความสัมพันธ์กับมหาวิทยาลัยเท็กซัส เมืองออสติน หรือองค์กรที่เกี่ยวข้อง หากท่านไม่ต้องการเข้าร่วม กรุณาแจ้งผู้วิจัยให้ทราบ

**วัตถุประสงค์ในการวิจัย** เพื่อเข้าใจถึงความคิดของครูผู้สอนในประเทศไทยที่มีต่อการใช้เทคโนโลยีสารสนเทศในห้องเรียน ผู้วิจัยใช้วิธีการวิจัย Interactive Qualitative Analysis ในการดำเนินการสัมภาษณ์กลุ่มและสัมภาษณ์เดี่ยว

**หากท่านตกลงร่วมงานวิจัยนี้** ผู้วิจัยจะขอความร่วมมือจากท่านดังต่อไปนี้

- ท่านจะถูกเชิญให้ร่วมการสัมภาษณ์กลุ่มและสัมภาษณ์เดี่ยว
- ในการสัมภาษณ์กลุ่ม ผู้วิจัยจะขอให้ท่านเขียนความคิดของท่านเกี่ยวกับประสบการณ์การสอนโดยใช้คอมพิวเตอร์และอินเทอร์เน็ตลงในกระดาษและจัดเรียงเป็นกลุ่ม กลุ่มผู้ให้สัมภาษณ์จะตั้งชื่อปัจจัยและนิยามความหมาย จากนั้น กลุ่มผู้ให้สัมภาษณ์จะช่วยกันอธิบายความสัมพันธ์ของปัจจัยต่างๆ
- ในการสัมภาษณ์เดี่ยว ผู้วิจัยจะถามคำถามซึ่งสามารถจำแนกได้เป็นสองส่วน ในส่วนแรกผู้วิจัยจะถามเกี่ยวกับประสบการณ์การสอนโดยใช้คอมพิวเตอร์และอินเทอร์เน็ต ในส่วนที่สองผู้วิจัยจะถามเกี่ยวกับความสัมพันธ์ของปัจจัยต่างๆ

**ระยะเวลา** การเข้าร่วมในการวิจัยนี้ใช้เวลาโดยประมาณหนึ่งสัปดาห์

**ความเสี่ยงในการเข้าร่วมงานวิจัย**

การเข้าร่วมงานวิจัยนี้จะไม่มีความเสี่ยงทางร่างกายและจิตใจของผู้เข้าร่วมนอกเหนือไปจากความเสี่ยงในการดำเนินชีวิตประจำวัน ในขั้นตอนการวิเคราะห์ข้อมูล ผู้วิจัยจะทำการเปลี่ยนชื่อของผู้เข้าร่วมการวิจัยโดยใช้ตัวเลขและชื่อปลอม ผู้วิจัยจะเป็นผู้ฟังการบันทึกเสียงระหว่างการสัมภาษณ์เพื่อการวิจัยเท่านั้น ไม่มีความเสี่ยงอื่นนอกเหนือจากนี้

หากท่านต้องการที่จะสอบถามเพื่อความแน่ใจเกี่ยวกับความเสี่ยงที่กล่าวไว้ด้านบนหรือความเสี่ยงอื่นๆ ที่ท่านเคยได้รับ ท่านสามารถสอบถามได้ ณ ตอนนี้ หรือโทรศัพท์เพื่อสอบถามผู้วิจัยได้ตามเบอร์โทรด้านบน

**ประโยชน์จากการร่วมการวิจัย**

ท่านจะไม่ได้รับประโยชน์ใดๆ จากการเข้าร่วมงานวิจัยนี้ นอกเหนือไปจากการสนทนาในกลุ่มผู้ร่วมวิจัยและประสบการณ์การวิเคราะห์ข้อมูลแบบ Interactive Qualitative Analysis

**ค่าตอบแทน**

ไม่มีค่าตอบแทนอื่นใด แต่หากท่านต้องการผลการวิจัย ผู้วิจัยยินดีส่งผลการวิจัยให้ท่านทราบ

**การเก็บรักษาข้อมูลส่วนตัว**

การวิจัยนี้จะไม่มีการเปิดเผยข้อมูลส่วนตัวของท่าน ข้อมูลเกี่ยวกับท่านจะถูกแทนที่โดยตัวเลขและชื่อปลอมเพื่อป้องกันการระบุถึงตัวตนของท่าน ข้อมูลจากการเข้าร่วมงานวิจัยของท่านอาจถูกนำไปใช้โดยผู้วิจัยอื่นในอนาคตซึ่งไม่สามารถระบุได้ในแบบยินยอมนี้ ในกรณีดังกล่าว ข้อมูลจะไม่มีการระบุรายละเอียดเกี่ยวกับท่านหรือการเข้าร่วมงานวิจัยของท่าน ข้อมูลงานวิจัยนี้จะถูกเก็บบันทึกเป็นความลับ ผู้มีสิทธิอำนาจได้แก่ กรรมการตรวจสอบข้อมูลงานวิจัยจากมหาวิทยาลัยเท็กซัส เมืองออสติน (และ/หรือองค์กรอื่นซึ่งเป็นผู้ให้ทุน หากมี) มีสิทธิตามกฎหมายในการตรวจสอบข้อมูลงานวิจัย และจะรักษาข้อมูลดังกล่าวไว้เป็นความลับตามที่ได้รับอนุญาตทางกฎหมาย การตีพิมพ์ผลงานวิจัยจะไม่มีการใช้ข้อมูลซึ่งอาจระบุตัวตนของท่าน ผู้วิจัยจะชี้แจงให้ท่านทราบหากมีการเปลี่ยนแปลงข้อมูลซึ่งอาจกระทบต่อการตัดสินใจที่จะเข้าร่วมงานวิจัยนี้

**ติดต่อสอบถาม**

หากท่านมีข้อสงสัยเกี่ยวกับงานวิจัย กรุณาสอบถามได้ขณะนี้ หากท่านมีข้อสงสัยในเวลาถัดไปจากนี้ หรือต้องการทราบข้อมูลเพิ่มเติม หรือต้องการยกเลิกการเข้าร่วม กรุณาแจ้งให้ผู้วิจัยทราบ ทั้งนี้ ชื่อ เบอร์โทรศัพท์ และอีเมล์ของผู้วิจัยอยู่ด้านบนของแบบยินยอมนี้ หากท่านมีคำถามเกี่ยวกับสิทธิของท่านในฐานะผู้ร่วมงานวิจัย หรือมีข้อติ ข้อกังวล หรือคำถามเกี่ยวกับงานวิจัย กรุณาติดต่อ Jody Jensen, Ph.D. ประธานกรรมการตรวจสอบสถาบันเพื่อการปกป้องมนุษย์ มหาวิทยาลัยเท็กซัส เมืองออสติน สหรัฐอเมริกา ได้ที่เบอร์ (512) 232-2685 หรือหน่วยงานสนับสนุนงานวิจัย ที่เบอร์ (512) 471-8871 หรืออีเมล์ orsc@uts.cc.utexas.edu

***ท่านจะได้รับสำเนาเอกสารนี้ไว้เพื่อเป็นหลักฐาน***

**ข้อความยินยอม**

กระผม/ดิฉันได้อ่านข้อมูลข้างต้นและได้รับทราบข้อมูลเพียงพอที่จะตัดสินใจเกี่ยวกับการเข้าร่วมงานวิจัยนี้ กระผม/ดิฉันยินยอมที่จะเข้าร่วมงานวิจัยนี้

ลายเซ็น:_____ วันที่: _____

กรุณาลงนามของท่านด้านล่างนี้เพื่อยืนยันว่าท่านอนุญาตให้ทำการบันทึกเสียงระหว่างการสัมภาษณ์

ลายเซ็น:_____ วันที่: _____

_____ วันที่: _____

ลายเซ็นของผู้ได้รับมอบหมายในการแจกและรวบรวมแบบยินยอม

ลายเซ็น:_____ วันที่: _____

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