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# Factors Affecting ICT Integration among Teachers and Students

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**Abstract:** This study was conducted to determine factors that affected teachers and students ICT integration in the classrooms. There were 125 teachers who were randomly selected in elementary schools in Guangdong province of China. 283 problems faced by the teachers were studied. After further analysis of the listed problems, some pertinent issues which kept surfacing were identified. The issues include teachers concern after changing the mode of instruction to a more ICT-based is with the time distribution, the extra readings required, the new instruction model, reading using computers and remarking of students' work. On the other hand, the factor which concerned students after changing the instruction model to an integrated ICT environment was typing using the computers.

**Key words:** teacher, student, ICT integration, internal barriers

## 1. Introduction

Understanding the barriers which affected ICT integration is essential in improving the quality of education. Ertmer (1999) classified external (first-order) and internal (second-order) barriers which affected technology integration. External factors are extrinsic to teachers and include hardware and software of ICT, technical and administrative support. In contrast, internal factors are intrinsic to teachers and they include beliefs about teaching and ICT, establishing classroom practices, and willingness to change. Different barriers appeared at different phases in the integration process. Moreover, the second barriers were thought to lead to more difficulties than the first-order barriers (Dede, 1998; Fisher, Dwyer, & Yocam, 1996). Thus, even if first-order barriers were resolved, teachers would not automatically use technology to achieve meaningful outcomes.

About a hundred billion yuan RMB has been spent on ICT (Information Communication Technology) development in education in China, but it did not achieve the expected returns. Although teachers recognized the importance of using technology in their classrooms (Roblyer, 1993), numerous barriers blocked the implementation efforts (Ertmer, 1999). Knowing the barriers which are affecting ICT integration is important as the Chinese government recognized the importance of ICT integration to develop education. Most of the primary and middle schools in China equipped the computer classrooms with 30 to 50 computers at least for teaching and learning. This is in line with the external factor demand for ICT usage. So the internal factors are the main barriers for promoting the quality of education in these schools. Knowing and resolving the internal barriers which affected ICT integration is indeed crucial to achieve a high level of ICT integration and realizing the leap frog development of instructional quality.

Most of the previous studies investigated external factors which influenced ICT usage but there are only a few studies that discussed the internal factors which affected ICT integration because it is harder to tackle and measure. The internal factors discussed in this study will only include the instructional elements.

The instructional system in a class can be classified into four elements: teacher, student, media and resource. In traditional classes in China, the main instruction model is the teacher-centered model. The four elements in a teacher-centered model are as the following: teachers are the authority of instruction and will take most of the class hours to teach. Here students will listen and accept passively whatever what taught to them. They will hardly have time in the class to learn autonomously. The only instructional resource in the classes is the textbook, which the teachers will teach according to and students learned mostly from. Although there are reference books used by the

teachers and students, the content of these books are exercises edited according to the textbooks used in the classrooms. Instructional media like TV, computer, projector, and recorder although are used in the classrooms, they are mainly to assist teachers in their teaching and not to support students' learning processes.

With high levels of ICT integration, traditional educational beliefs and teacher-centered classroom practices should be changed to a more student-centered instruction (He, 2005). The four elements in a new instructional model are as the following: the proportion of teacher teaching time and student autonomous learning time in a class are about equal, students will have more time to construct their own knowledge compared to the traditional classrooms. Media are not only to assist the teachers' teaching but also to help students be autonomous learners. The teachers will teach and students will learn not only from textbooks but also other resources.

The comparison of a teacher-centered instruction model and a teacher-leading and student-centered instruction model can be seen in Table 1 (He, 2005).

Table 1: Comparison of Traditional Instruction Model and New Model

| Elements / Model | Teacher | Student | Media | Resource |
|---|---|---|---|---|
| Teacher-centered Model | Most of the time the teacher will be teaching | Hardly time to learn autonomously | For the teacher to teach | Textbook |
| Teacher-leading and Student-centered Model | Only part of the class hours is used to teach | About half of the class hours is used to learn on their own | For the teacher to teach and students to learn | Textbook and other resources |

## 2. Research objectives

This study aimed to investigate factors influencing ICT integration in the classrooms. The internal factors about teachers and students were analyzed specifically. The concrete research questions addressed are as the following:

[1] What are the factors that concern teachers in an ICT integrated classrooms?

[2] What are the factors that concern students in an ICT integrated classrooms?

## 3. Research methods

### *3.1 Content analysis*

The methodology of content analysis was used in this research. Content analysis (Krippendorff, 2004) is a research technique used to make replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use. In this study, the author analyzed the presence, meanings and relationships of key words within the answers given for classification purposes.

### *3.2 Data resource*

Data were gathered from 125 teachers who taught Chinese subject selected randomly in the elementary schools in Guangdong province of China. They wrote the problems they had in their teaching in a piece of paper given by the researchers. Each teacher was asked to write between one to four problems and 283 problems were collected from the respondents. The researcher's gave a scenario before the teachers were given the time to write their problems. The scenario is as follows: A teacher-leading and student-centered instruction model is being used by teachers in the classes. The teachers have classes in one to one computer environment for several years. Students will do their readings and writing through computer. Not only the textbook but other resources for teaching and learning were also provided.

*3.2 Data processing and analysis*

First, the questions were numbered and key words were extracted from the problems. Next all the questions were classified into four categories: teacher, student, resource and media according to the key words and content of questions. Finally, sub-categories were formed from the same and similar topic of the questions among one category. The author asked all the questions twice to guarantee reliability of study. As a result, 283 questions were analyzed. The quantities of the questions about teacher, student, resource and media were 201, 69, 5 and 8 respectively. Sub-categories for "teacher" and "student" were formed. The teacher and student categories and quantities can be seen in Table 2.

Table 2: Teachers' and Students' Concerned Factors

| Teacher Categories and Quantities | | Student Categories and Quantities | |
|---|---|---|---|
| Teacher 201 | Time distribution 56 | Student 69 | Divergence 34 |
| | Reading teaching 40 | | Typing 22 |
| | Basic skill teaching 35 | | Interests 9 |
| | Instruction model 28 | | Preparing lessons 3 |
| | Writing teaching 20 | | Eyesight 1 |
| | Student works amending 17 | | |
| | Others 5 | | |

## 4. Research Findings

*4.1 The teachers concerned factors*

a. Time distribution. There were 56 problems related to time distribution which accounted for the largest proportion among all teacher factors. The teachers were most concern about the time distribution during class practice. There were two types of time distribution. One was the time distribution between the teacher teaching and the student learning. To change traditional instruction model, the most important thing was the change of teaching time. The teacher's teaching time was the greatest proportion of the whole class time in the traditional instructional model, while the teacher's teaching time and student's autonomous learning time was equal approximately in the new model. The quality of instructions improved considerably in the lab schools where the teachers taught according to the new instruction model. This is because students had more time to learn autonomously not only from the teachers but also from the other resources. The other type was the time distribution between listening, speaking, reading and writing of the Chinese language. This was different compared to the traditional instructional model. Listening, speaking, reading and writing were important in traditional classes, but reading and writing of the Chinese language were more important in the new model. Children can listen and speak before they enroll for primary school, so reading and writing were emphasized in the classrooms.
b. Teaching of reading. 40 teachers raised the issue on how to teach reading, which accounted for the second largest proportion among the problems posed by the teachers. The only source of reading materials was from the textbook in the traditional classes, unlike the new model where reading materials came from a variety of sources. There were 28 problems about extra reading. The biggest problem the teachers had about teaching of reading was how to use the extra readings except the textbook. The teachers were not clear how to deal with the relationship between the textbook and the extra readings. Teachers should teach the textbook during the class hours and students learn on their own the extra readings which are closely connected to grammar, new characters, and structure in their textbook. The other 10 problems about teaching of reading were on how to approve students' reading skills. The other 2 problems were that students could not focus on readings because they are so used to reading hardcopies as opposed to electronic materials
c. Basic teaching skill. The teachers had 35 problems about the basic skill teaching, Chinese

character and word teaching. It was really difficult to master Chinese character for students in the low grade, so the teaching of Chinese characters and words was the key problem for teachers. The problem could be solved by the teacher teaching the characters according to the textbook and student reading the same characters in different articles from the extra readings and writing the articles using the same characters in the new instructional model.

d. Instruction model. There were 28 problems about the new instruction model. The traditional instructional model was a teacher-centered instruction whereas the new model was a teacher-leading and student-centered instruction model. Some teachers have yet to understand the elements and characteristics of the new model. The new model was mastered mainly from the four instructional elements: teacher, student, media and resource.
e. Teaching of Writing. The teachers raised 20 problems regarding the teaching of writing. The questions included how to help students accumulate good characters and words, and how to improve students writing abilities. The problem could be solved by students having to write more articles and passages using the good characters and words in the new instructional model as compared to writing in the traditional instructional model.
f. Remarking students work. There were 17 issues raised regarding the teachers inability to correct too many students' writings. The students wrote in each class on a computer in the new model, so there were many writings compared to the traditional classrooms which students wrote one composition in a week in general. The teachers mentioned that they will not have enough time to correct 30 to 40 students' work in a class plus homework. Peer correction and having parents revising the writings may be some effective ways to resolve the problem.
g. Others. There were four problems raised on instructional objective and one regarding encouraging critical thinking.

*4.2 The students concerned factors*

*a. Student divergence. There were 34 problems that the students in a class polarized which was the largest proportion among the factors about students. The students could learn more from many resources in the new instructional model compared to the traditional classes if they were good at reading and writing, but some students could not improve if they were not good at them. Helping students who have difficulty in reading and writing to improve their level of literacy was an issue the teachers had to face. Knowing the problems of each individual and able to give individualized assistance is an effective strategy to solve the polarized problem.*
*b. Typing using computer. The teachers brought forward 22 problems on typing.*
    I. Students in the low grade, could not type quickly. This will affect the students' writing and probably let some students lose their interests in writing. More typing classes would be an effective way to increase the students' ability to type.
    II. Handwriting and typing. The students wrote on the computers and not by writing on the paper in each class, so the teachers were worried that students' handwriting ability would decrease. However, it was found that the students' handwriting abilities did not decrease in the lab schools because the time for handwriting practice was not reduced.
    III. homonym Chinese characters. The students typed Chinese characters using pinyin input which lead to homonym Chinese characters. This is not advisable for students wanting to master the correct font of Chinese characters. Homonym Chinese character instruction is an essential part of Chinese instruction and the teacher should work on strengthening this aspect.

c. Students' interests. There were nine issues raised regarding the problems in maintaining students' interests in reading and writing. The students could do more readings and writing compared to the traditional classes. The objective of literacy could not be achieved if students lose their interests in literacy. The teachers would use different methods to improve students' interests in reading and writing, for example, by using visual aids to aid understanding in the articles.
d. Lesson planning. Three problems surfaced regarding lesson preparation. The students could read and write more in the new instructional model compared to the traditional classes. However, if the students took more time to prepare lessons before a class, students'

homework burden would be heavier.

e. Students' eyesight. There was one problem about students' eyesight. The students took more time to read and write in the new instructional model compared to the traditional classes. The teachers were worried that it could degenerate the students' eyesight, thus poor vision. Good habits of using computer could be cultivated from the beginning to prevent poor vision.

*4.3 Resource factors*

There were 5 problems about the resource. The teachers complained that the existing extra reading resources did not match the textbooks closely and needed improvement. Moreover, the reading resources provided were not enough for teaching and learning in classes and the teachers did not have much time to prepare by themselves. The problem would be solved if the schools and government work hand in hand in creating and optimizing resources.

*4.4 Media factors*

The teachers came up with 8 problems about using the media. There was at least one technical personnel in each school to manage the ICT equipment to support instruction in the ICT environment. Although the routine environment in classes was one to one computer for several years, the problems of media usage still exist. Issues include "*the resources in the computer were not opened, and the students could not write when the internet could not be visited, and the teachers could not login the platform to amend the resources*". Having technical professionals supporting the teachers in using the media equipment should provide some support in resolving the problem.

## 5. Conclusion and Discussion

The study investigated the problems which affected ICT integration in classes. The data showed that questions relating to external factors, like resource and media, were hardly mentioned and external factors were not the main barriers which affects ICT integration among the teachers.

The factors about teacher were the main element compared to the factor about student among internal factors which influence on ICT using in classes. Although the teachers accepted the new macroscopy belief and model of teacher-leading and student-centered, it is really difficult to implement practice for teachers and change classroom practice in their daily routines. This is because classroom practices were more personal and deeply ingrained (Ertmer,1999). Ritchie and Wiburg (1994) noted that "traditional perceptions of what teaching, learning, and knowledge should look like are major limiting factors to integrating technology". To implement new instructional strategy, teachers should not only acquire new knowledge about it but weave this together with the demands of the curriculum, classroom management, and existing instructional skills (Dexter et al., 1999). Teachers had more critical challenges compared to the external barriers (Ertmer, 1999). Some factors about teachers mentioned above also existed in the traditional classes, for instance, Chinese characters and vocabulary teaching, reading skill, teaching of writing, instructional objectives and encouraging thinking. Some factors about teachers existed after the change of the instructional model to the ICT environment. Factors include time distribution, extra readings using the new instructional model, reading by computers and more students' work amendments. To solve these problems, proper training and guidance about practical strategies were crucial for teachers and teachers indeed need effective strategies for dealing with internal barriers.

Student was the other element among internal factors which affects ICT integration. Some factors about students mentioned above also existed in traditional classes. This includes students divergence, students' interests in reading and writing, and lesson planning. Typing was the main concern among students regarding the change from the traditional learning environment to the ICT integrated environment. As such, to solve this problem, students could practice typing during the Information Technology classes to increase their typing speed.

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