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Effects of Elementary School Teachers' Background Variables on Their Educational Beliefs and Different Types of Computer Use[1]

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Abstract

The purpose of this study was to investigate whether teachers' background variables affect teachers' educational beliefs and different types of computer use. In addition, this study explored the relationship between teachers' educational beliefs and different types of computer use. The participants in this research were 180 elementary school teachers, including 56 males and 124 females, in central-west Taiwan. A questionnaire was developed for the purpose of collecting relevant information. Moreover, descriptive statistics, factorial analysis, independent samples T-test, one-way ANOVA and product-moment correlation were used as the methods of statistical analysis. To understand elementary school teachers' attitude toward and perception of teachers' educational beliefs and different types of computer use, the researchers interviewed 18 teachers. The results indicated that teachers' educational degrees affected teachers' educational beliefs, while teachers' educational degrees, teaching years, positions, number of classes, and the frequency of technology integration affected different types of computer use. The results of the questionnaire and interviews demonstrated that teachers' educational beliefs were correlated with different types of computer use. Based on the findings, some implications are considered to be of help to elementary school teachers and educators.

Key words: Teachers' background variables, Teachers' educational beliefs, Different types of computer use

Introduction

It has been suggested that the use of computer technology in education may play a vital role in improving students' learning performance. However, the factors associated with teachers' instructions, such as their experiences, attitudes and even educational beliefs, may affect the use of technology. The influence of teachers' educational beliefs on classroom practice has been investigated and well-documented (Buchman,1987; Lumpe, Haney & Czerniak, 2000; Mishra & Koehler, 2006; Nespor, 1987; van Driel, Beijaard & Verloop, 2001). However, the direct impact of teachers' educational beliefs on computer integration is not obvious (Wozney, Venkatesh & Abrami, 2006). Generally speaking, teachers tend to use their past experiences, beliefs, and attitudes toward teaching and learning, to develop their educational beliefs about technology as a teaching method or instructional tool (Ertmer, 2005; McGrail, 2005; Niederhauser & Stoddart, 2001; Windschitl & Sahl, 2002).

Researchers have rarely investigated that different types of educational computer use are in line with teachers' educational belief systems (Windschitl & Sahl, 2002). Ertmer (2005) argued that low-level computer use is likely to be related to teacher-centered or traditional practices. On the contrary, high-level computer use is likely to be associated with student-centered or constructivist practices. To use computers as a cognitive tool in knowledge construction, teachers may consider using computers as learning tools and incorporating computers into the classroom (Hokanson & Hooper, 2000). Previous studies have reported that teachers who hold constructivist beliefs also tend to use computers in more challenging ways (Becker, 2001). It is believed that the more a teacher recognizes the computer as a useful tool to promote important instructions and learning needs, the higher perceived value of computers use will be (Niederhauser & Stoddart, 2001).

With regard to computer instruction programs at elementary level in Taiwan, albeit teacher's positive attitudes toward computer-assisted language learning (CALL) activities, institutional and individual factors impeded their

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authentic computer application. Research findings continue to emphasize the importance of language teacher development programs in CALL at the elementary level and highlight the need to provide contextualized practice with computer technology in language teacher education programs (Sardegn & Yu, 2015).

Therefore, the purpose of this study was to investigate whether teachers' background variables affect teachers' educational beliefs and different types of computer use. In addition, this study explored the relationship between teachers' educational beliefs and different types of computer use. This study explores three principal research questions as follows:

1. To what extent do different teachers' background variables affect their educational beliefs and different types of computer use?
2. What are the relationships between teachers' educational beliefs and their different types of computer use?
3. What are the effects of teachers' educational beliefs on their computer use?

Literature Review

This section discusses related literature on previous studies of teachers' educational beliefs and different types of computer use. The related studies are divided into three parts: teachers' educational beliefs, computer use, and the relationship between teachers' educational beliefs and computer use.

In order to measure teachers' educational beliefs, many scholars who are devoted to education have been generating and substantiating many instruments (Hermans, Tondeur, van Braak & Valcke, 2008; Kerlinger & Kaya, 1959a, 1959b; Woolley et al, 2004). In 2001, Niederhauser and Stoddart examined the characters of different teachers' beliefs, investigating over 2170 elementary and secondary teachers and identifying two diverse categories of beliefs about the effective use of computer technology: transmission-oriented, in which computers are used as teaching tools to deliver information, give reinforcement and trace student progress; and constructivist-view, being different from transmission-oriented, computers are used to gather, analyze and integrate information. In the meantime, the researchers in Taiwan also distinguished teachers' educational beliefs into three aspects: (1) student-centered, which means that teachers emphasize students' independent decision and learning, (2) teacher-centered, which signifies that teachers have the authority to determine learning in the classroom, and (3) interactive, which emphasizes the interaction and communication between teachers and students (Lin, 2001). Furthermore, Woolley et al. (2004) developed the Teachers Beliefs Survey (TBS). The findings of the survey showed different traits between the following two dimensions: traditional teaching and constructivist teaching. The former is mainly teacher-centered and stresses traditional methods of the curriculum and evaluation, while the latter is considered to be student-centered and have novel approaches to teaching and learning. With innovations in education, teachers are expected to integrate innovative educational beliefs and apply them to teaching and learning. The discrepancy between belief systems depends on the extent to which teachers adopt traditional and constructivist teaching beliefs. Whether or not belief systems in teachers are specific, this aspect of teachers' educational beliefs is a current issue for educational researchers.

With the influence of computers on educational environment, many researchers have explored how frequently teachers and students use computers by recording the time teachers and students spend using computers and measuring the rates of applying technology in the classroom (e.g., Mathews & Guarino, 2000; O'Dwyer, Russell & Bebell, 2004). Through analytical revisions, computer-assisted instruction results in small but positive effects compared to those found in traditional instruction (Blok, Oostdam, Otter & Overmaat, 2002; Torgerson & Elbourne, 2002). However, although computers provide feasible methods and efficient teaching and learning advantages in education, many researchers argued that computers are under-used in many schools, and the potential of computer technology has not been accomplished in terms of quantity or quality of use (Abrami, 2001; Conlon & Simpson, 2003; Demetriadis et al., 2003; Ertl & Plante, 2004; Hayes, 2007; Muir-Herzig, 2004; Pelgrum, 2001; Sutherland et al., 2004; Wilson, Notar & Yunker, 2003; Wooley, 1998). Similarly, the categories of educational computer use were differentiated between computers as information resource tools, computers as authoring tools and computers as knowledge construction tools (Ainley, Banks & Fleming, 2002). The results recommended a three-factor structure, identified as basic computer skills (to develop students' technical computer skills), the use of computers as an information tool (to research and process information) and the use of computers as a learning tool (to practice knowledge and skills), and concluded that computer use should not be examined in a singular, but instead a multifaceted aspect (O'Dwyer et al., 2004; Tondeur et al., 2007).

There is growing evidence that teachers, adopting constructivist beliefs, are highly positive computer users (Becker, 2001; Niederhauser & Stoddart, 2001). Typically, constructivism differs from the knowledge-transmission model of learning. The knowledge-transmission learning model regards teachers as the source of knowledge and students as passive recipients of knowledge. As compared with knowledge-transmission model, in constructivism, instead of focusing on learning objects or ways that are transmitted from one person to another, students and teachers are involved in learning; interactions, feedbacks and experiences are the outcomes of learning (Howard, McGee, Schwartz & Purcell, 2000; Lee, Ardeshiri & Cummins, 2016; Scardamalia & Bereiter, 2006). Teachers who adhere to constructivist beliefs are likely to focus on student-centered learning, organizing activities to promote independent learning, peer discussions, meaningful understanding and student decision-making. Generally speaking, they emphasize more on the process of student learning than product (Brooks, 2002). An obvious finding is that computer usage experience is definitely related to teachers' attitudes toward a computer. In other words, the more experiences teachers have with computers, the more likely they will show positive attitudes toward computers (Rozell & Gardner, 1999). Positive computer attitudes are prone to facilitating computer integration in the classroom (van Braak et al., 2004). These early experiences with computers "can shape teachers' subsequent encounters for years to come, despite great efforts to persuade them differently" (Ertmer, 2005, p. 30). For example, Hermans et al. (2008) indicated that teachers' "traditional beliefs had a negative impact on integrated use of computers" (p. 1499). On the contrary, constructivist beliefs were identical with educational computer use. In a similar vein, Overbay, Patterson, Vasu, and Grable (2010) discovered that "constructivist practices and beliefs were significant predictors of technology use" (p. 103). Additionally, a survey by Ravitz, Becker and Wong (2000) indicated that the more extensively teachers employed technology, the more flexible and greater changes would take place in their teaching from a constructivist perspective.

From the literature review mentioned above, it is believed that teachers' educational beliefs are vital factors that may considerably influence different types of computer use. Particularly, Richardson (2003) indicated that constructivist pedagogical beliefs are student-centered, consisting of idea sharing and the instruction of planned or unplanned domain knowledge. As compared with traditional instruction, teachers who hold a constructivist view are likely to take advantage of the technology and involve students in learning. There is no doubt that teachers' educational beliefs play a crucial role in using computers to facilitate teaching and learning. However, few studies have been conducted to examine the relationships between teachers' educational beliefs and different types of computer use in Taiwan. Therefore, the purpose of this study was to investigate whether teachers' educational beliefs are in line with different types of computer use in elementary schools in Taiwan.

Method

Research Design

The overall design of this study combined both quantitative and qualitative research methods. Methodological triangulation was employed to increase the credibility and validity of the results. Therefore, an organized questionnaire and semi-structured interviews were employed in the study. Additionally, the questionnaire was modified and examined by the second researcher's supervisor and expert teachers so as to ensure the validity and reliability of the instrument. The basic research framework of the study included teachers' background variables (gender, teaching years, educational degree, degree of urbanization (rural/ urban), number of classes, position in school and the frequency of technology integration); teachers' educational beliefs (student discipline, course and teaching plan, teaching and evaluation, and student learning); different types of computer use (basic computer skills, computers as information tools, and computers as learning tools).

Participants

The participants in the questionnaire survey were 180 elementary school teachers in central-west Taiwan, based on purposeful sampling. There were 56 male teachers (31.1%) and 124 female teachers (68.9%) who participated in this study. Ten schools in Yunlin County, Taiwan were involved in the study. The teacher's background consisted of gender, teaching years, educational degree, degree of urbanization (rural/ urban), number of classes, position in school, teaching subject, and the frequency of technology integration.

Instruments

A questionnaire was developed for the purpose of collecting information from elementary school teachers about their background, educational beliefs and different types of computer use. The questionnaire encompassed three parts: (1) teachers' background variables, (2) teachers' educational beliefs, and (3) different types of computer use.

Teachers' Background Variables

This study investigated teachers' background variables by considering the following facts: gender, teaching years, educational degree, degree of urbanization (rural/urban), number of classes, position in school and the frequency of technology integration.

Teachers' Educational Beliefs

In this study, teachers' educational beliefs were measured through the scale developed by Zhu and Yeh, (2003). To make it suitable for the current educational environment, the researchers revised some parts of the scale. The teacher beliefs survey for elementary school teachers focuses on the aspect of constructivist teaching (CT) and it embraces four sub-dimensions: (1) student discipline, (2) course and teaching plan, (3) teaching and evaluation, and (4) student learning. In the student discipline dimension, it contains items such as ''Teachers should respect students' different points of view" and" Teachers should have the attitude of loving education when disciplining students." In the course and teaching plan dimension, it contains items such as ''Teachers should have independent abilities in designing courses and choosing materials" and "The main goal of course and teaching is to develop students' self-esteem, achievement and the willingness to learn." In teaching and evaluation dimension, it contains items such as "Teachers should not evaluate all the students by the same standard" and "In addition to cognitive evaluation, it is necessary to include the evaluation of affective and psychomotor skills in a learning evaluation." In student learning dimension, it contains items such as "The learning effect of students comprehending what they have learned is better than that of being informed by others" and "Students should be responsible for their learning." The respondents were asked to rate each statement on a five-point Likert scale: 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree and 5 = strongly agree.

Different Types of Computer Use

To substantiate whether profiles in teachers' educational beliefs are relevant to different types of computer use in school, the researchers included an additional instrument in the questionnaire (Tondeur et al., 2007). This instrument was designed to measure different types of computer use in Flemish primary education. The aspect of basic computer skills describes the use of computers as a school subject to teach students technical computer skills, such as "I teach students to use computer terms correctly." and ''I teach students how to make good use of the keyboard and mouse."

In addition to the use for school subjects, the second and third facets expressed more dimensions of educational uses for computers. The aspect of computers as information tools embraces such items as ''I teach students how to use the computer to exchange information with others," ''I teach students how to use the computer to organize information" and "I teach students how to use the computer for looking up the meaning of a word." Finally, The aspect of computers as learning tools encompasses items such as ''I teach students how to use the computer for problem solving," ''I teach students how to use computers for direct instruction, i.e. to learn something new" and "I think that students can use the computer to 'catch up' if they have fallen behind with their work." The respondents were asked to examine the cognition level that they use computers to practice various tasks on five-point Likert scale: 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree and 5 = strongly agree.

Interviews

The researchers conducted semi-structured interviews (Berg, 2007; Tutty, Rothery & Grinnell, 1996). The outline of the interview questions was previously arranged. The interview questions consisted of two parts. The

first part is guided questions and the other part is explanation of details. The researchers selected 18 elementary school teachers as the interviewees in accordance with a purposeful sampling strategy (Patton, 1990). Patton (1990) suggested that at least 10% of the participants needed to be included as interviewees. The goal of the interview is to know elementary school teachers' perceptions about teacher's educational beliefs and different types of computer use. There are six interview questions.

Data Collection Procedures

Measures of teacher's background, teachers' educational beliefs and different types of computer use were administered to all of the participants in order to investigate their attitudes toward teachers' educational beliefs and different types of computer use, and explore the relationships between teachers' educational beliefs and different types of computer use. The questionnaire was sent to 200 elementary teachers in 10 schools. Above all, the completion rate was 90%, of which 180 elementary school teachers participated in this study. Following the questionnaire, semi-structured interviews were conducted with 18 teachers to explore in depth about their attitude toward teachers' educational beliefs and different types of computer use. Each of the interviewees' responses was transcribed.

Data Analysis

In this study, the collected data were analyzed quantitatively and qualitatively, respectively. In the quantitative aspect, the teachers' educational beliefs and different types of computer use results were analyzed. In the qualitative aspect, the interviews on elementary school teachers' feedback on teachers' educational beliefs and different types of computer use was also documented and discussed. The following methods were used:

1. Descriptive statistic was used to analyze the times distribution and percentage of samples in teachers' background characteristics, and the Mean and the SD of teachers' educational beliefs and different types of computer use.
2. Factor analysis was adopted to reduce the numbers of variables and inspect the validity and the factorial structure of teacher's educational beliefs and different types of computer use.
3. Reliability analysis (Cronbach's α) was applied to test the reliability of the instrument. The Cronbach's alpha of teachers' educational beliefs scale reveals a high internal consistency of 0.777, whereas the Cronbach's alpha of different types of computer use scale reveals a high internal consistency of 0.934.
4. Independent samples T-test and one-way ANOVA were used to determine whether the differences in teachers' background characteristics were attributed to other factors.
5. Pearson product-moment correlation provided a measure of the strength of the relationship between variables.
6. Interview comprised interviewees' responses and feelings toward teachers' educational beliefs, and different types of computer use were transcribed and discussed.
7. Methodological triangulation was employed to increase the credibility and validity of the results. Therefore, an organized questionnaire and semi-structured interviews were employed in the study. Additionally, the questionnaire was modified and examined by the expert teachers so as to ensure the validity and reliability of the instrument.

Results

Results for Research Question 1: To What Extent Do Different Teachers' Background Variables Affect Their Educational Beliefs and Different Types of Computer Use?

To answer this research question, the researchers present analyses of (1) independent samples T-test and one-way ANOVA for teachers' educational beliefs and (2) independent samples T-test and one- way ANOVA for different types of computer use.

Results of Independent Samples T-test and One-way ANOVA for Teachers' Educational Beliefs and Different Types of Computer Use

Independent samples T-test and one-way ANOVA were employed to determine whether there are any effects of teachers' personal characteristics on teachers' educational beliefs (student discipline, course and teaching plan,

teaching and evaluation and student learning, please see Table 1) and different types of computer use (basic computer skills, computers as an information tool and computers as learning tools, please see Table 2) to stay in the accounting form. The results are shown in Table 1 and Table 2.

Table 1. ANOVA analysis in educational degree and teachers' educational beliefs

		SS	DF	MS	F	P-value
Student Discipline	Between Groups	2.879	2	1.439	5.203	0.006
	Within Groups	48.963	177	0.277		
	Total	51.842	179			
Course and Teaching Plan	Between Groups	2.208	2	1.104	4.171	0.017
	Within Groups	46.863	177	0.265		
	Total	49.072	179			
Teaching and Evaluation	Between Groups	0.396	2	0.198	0.604	0.547
	Within Groups	57.986	177	0.328		
	Total	58.382	179			
Student Learning	Between Groups	0.509	2	0.255	0.991	0.373
	Within Groups	45.469	177	0.257		
	Total	45.978	179			

* $p < 0.05$

Table 2. ANOVA analysis in educational degree and different types of computer use

		SS	DF	MS	F	P-value
Basic Computer Skills	Between Groups	2.979	2	1.490	3.289	0.040
	Within Groups	80.168	177	0.453		
	Total	83.148	179			
Computers as An Information Tool	Between Groups	2.352	2	1.176	2.272	0.106
	Within Groups	91.631	177	0.518		
	Total	93.984	179			
Computers as Learning Tools	Between Groups	10.316	2	5.158	15.196	0.000
	Within Groups	60.080	177	0.339		
	Total	70.396	179			

Table 1 and Table 2 demonstrated the results of whether there are any effects of teacher's background variables on teachers' educational beliefs and different types of computer use. The data showed that there was a significant interaction effect between educational degree and the sub-dimension of student discipline ($p < 0.05$). There was also a significant interaction effect between educational degree and the sub-dimension of course and teaching plan. Likewise, the results proved that the variation in the aspect of basic computer use would be significantly affected by the factor of teacher's educational degree ($p < 0.05$), number of classes and frequency of technology integration. Moreover, the variation in the aspect of computers as learning tools could be significantly affected by the factor of teaching years, teacher's educational degree, teacher's position in school, and frequency of technology integration. Additionally, the variation in the aspect of computers as information tools might be significantly affected by the factor of the frequency of technology integration.

Results for Research Question 2: What Are the Relationships between Teachers' Educational Beliefs and Their Different Types of Computer Use?

To answer this research question, the researchers present analyses of (1) Pearson product-moment correlation for teachers' educational beliefs and (2) Pearson product-moment correlation for teachers' educational beliefs and different types of computer use.

Results of Pearson Product-moment Correlation for Teachers' Educational Beliefs and Their Different Types of Computer Use

Pearson product-moment correlation was conducted to examine the correlation coefficient between teachers' educational beliefs and different types of computer use. Table 3 showed the correlation between teachers' educational beliefs and different types of computer use. In Table 3, teachers' educational beliefs was found to be positively and significantly correlated with different types of computer use ($p < 0.01$).

Table 3. Correlation between teachers' educational beliefs and different types of computer use

Variables	Teachers' Educational Beliefs	Different Types of Computer Use
Teachers' Educational Beliefs	-	0.491^{**}
Different Types of Computer Use	0.491^{**}	-

** $p < 0.01$

Furthermore, to investigate every variable of educational beliefs and different types of computer use precisely, the researchers presented Table 4 to show the correlation between the four sub-dimensions of teachers' educational beliefs and the three aspects of different types of computer use.

Table 4. Correlation between the four sub-dimensions of teachers' educational beliefs and the three aspects of different types of computer use

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Student Discipline	-	0.459^{**}	0.372^{**}	0.225^{**}	0.373^{**}	0.324^{**}	0.357^{**}
(2) Course and Teaching Plan	0.459^{**}	-	0.467^{**}	0.392^{**}	0.401^{**}	0.381^{**}	0.391^{**}
(3) Teaching and Evaluation	0.372^{**}	0.467^{**}	-	0.301^{**}	0.316^{**}	0.328^{**}	0.322^{**}
(4) Student Learning	0.225^{**}	0.392^{**}	0.301^{**}	-	0.155^{*}	0.207^{**}	0.167^{*}
(5) Basic Computer Skills	0.373^{**}	0.401^{**}	0.316^{**}	0.155^{*}	-	0.701^{**}	0.577^{**}
(6) Computers as Information Tools	0.324^{**}	0.381^{**}	0.328^{**}	0.207^{**}	0.701^{**}	-	0.646^{**}
(7) Computers as Learning Tools	0.357^{**}	0.391^{**}	0.322^{**}	0.167^{*}	0.577^{**}	0.646^{**}	-

* $p < 0.05$; ** $p < 0.01$

Based on Table 4, every dimension of teachers' educational beliefs and every aspect of types of computer use were found to be positively correlated with student discipline, course and teaching plan, teaching and evaluation, basic computer skills and computers as learning tools ($p < 0.01$). Above all, student learning was investigated to be significantly related to computer as learning tools ($p < 0.05$), while other variables were positively correlated with student learning and computers as learning tools ($p < 0.01$).

Based on Table 3 and Table 4, the results suggested that teachers' educational beliefs are highly correlated with different types of computer use ($p < 0.01$). In addition, there are significant relationships between the four sub-dimensions of teachers' educational beliefs and the three aspects of different types of computer use ($p < 0.05$, $p < 0.01$).

Results for Research Question 3: What Are the Effects of Teachers' Educational Beliefs on their Computer Use?

To answer this research question, the researchers present the analysis of a semi-structured interview. There are six interview questions in this interview and each question consisted of two parts, guided questions and explanation questions for more details. In order to understand teachers' concepts about their educational beliefs and attitudes toward computer use, the researchers designed 6 interview questions for 18 teachers, 10 (5 males and 5 females) from an urban area, and 8 (4 males and 4 females) from a rural area.

According to the six interview questions, questions 1 to 3 were opinions of the factors and effects on teachers' educational beliefs and different types of computer use. Questions 4 to 5 were in search of teachers' awareness of the relationship between teachers' educational beliefs and different types of computer use. Question 6 "Do you have any suggestions to improve teaching by considering educational beliefs and applying computer use?" was added in case other possible feedback was left out. The interview was completed in both English and Chinese.

The interview results were categorized as follows:

1. What is your educational belief? Which factors affect your educational beliefs?

Based on the results of the interview, teachers' educational beliefs included teachers' expectations not only for students' behaviors, learning and performances but also the interaction with parents and the self-examination. There were two main factors that affected teachers' educational beliefs: external factors and internal factors. The external factors consisted of schools', parents' and students' feedback and support, students' characteristics, the motivation by educational books and workshops; the internal factors consisted of teachers' self-expectation toward students, parents and themselves, their concepts toward the society and their teaching experiences. The following quotation presented the excerpts from the interviewees:

Teacher A, D and Q: My educational belief is to develop students' living and learning attitudes and communicate with parents so as to build a peaceful and happy learning environment. The support from school and parents may influence my educational beliefs.

2. Do you consider computers to be useful tools for teaching? Why?

All the interviewees considered computer as useful tools in assisting their teaching. Computers could provide the information, authentic materials and multiple ways for teaching and learning. In addition, they could improve teachers' teaching and motivate students' learning. The excerpts were displayed as follows:

Teacher D, K and L: I regard the computer, especially usage of the Internet, as a tool to promote teaching and learning. It helps students develop learning motivation, establish active learning attitudes and broaden students' horizons. The positive aspects of using the computer are presented.

3. What are the factors that influence your computer use? Why?

In addition to students' and parents' feedback and support, the convenience, time and course contents were the other important factors that affected teachers' computer use. The following quotation demonstrated the excerpts from the interviewees:

Teacher F and N: I think a computer can be applied to teaching when teachers want to control the class and establish an active atmosphere in the classroom for a long time. However, computers should be used appropriately.

4. Do you think teachers' beliefs are in accordance with different types of computer use? Why?

Most of the teachers thought that their educational beliefs were correlated with their computer use. Teachers' educational beliefs and their computer use affected each other mutually. The excerpts from the interviewees were shown as follows:

Teacher B, C, H and M: Yes. The type of teaching material, the expectation of constructive learning abilities or the remediation of teaching and learning can be solved by means of different types of computer use.

5. Do you think your educational belief promotes computer use in your teaching? Why?

Most of the interviewees thought that their educational beliefs promoted their computer use. The more positive and firm educational beliefs teacher built, the more frequent and active usages of computers they would have. Most of the teachers valued computers as vehicles to facilitate teaching and learning. Furthermore, computers were regarded as the remediation for compensating students' insufficiencies in their learning. The following showed the excerpts from the interviewees:
Teacher A, D, I and Q: Yes. With support from schools, parents and students, we teachers can build more positive educational beliefs. Furthermore, the educational beliefs would lead to the improvement and innovation of our teaching, including different creative ideas by using the technology.

6. Do you have any suggestions to improve teaching by considering educational beliefs and applying computer use?

In order to improve and enhance teachers' teaching and students' learning, we need to consider some aspects: (1) our government should increase the educational budget and carry out the technology education course for students. Additionally, it has to hold educational and computer-related workshops, popularize in-service training

courses about computer use and integrate websites for teachers. (2) Schools have to increase the hardware and software equipments for teachers to execute their teaching and motivate students' learning. (3) Teachers, parents and students all have to formulate correct concepts about computer use. (4) In addition to being aware of teaching materials, teachers can interact and exchange information with other teachers for the purpose of strengthening their educational beliefs and teaching abilities about computer use. The following quotation was the excerpts from the interviewees:

Teacher A, H and R: Our government should increase the educational budget, hold educational and computer-related workshops and integrate websites for teachers to inquire and use.

Discussion

Discussion on Research Question 1: To What Extent Do Different Teachers' Background Variables Affect Their Educational Beliefs and Different Types of Computer Use?

The results showed that teachers who had a higher educational degree were more likely to have constructivist beliefs about student discipline and course and teaching plan. Moreover, teachers having a higher educational degree with teaching years between 6 to 15 and 16 to 25 years might have more positive attitudes toward different types of computer use. On the contrary, when a teacher's educational degree was lower and their teaching years were over 26 years, they might have a lower adoption on different types of computer use. Additionally, teachers who used computers in assisting their teaching once or twice a week, three or four times a week or everyday had positive attitudes toward computer use than those who never used computers in assisting their teaching. As many researchers argued, computer-assisted instruction showed small but positive effects compared to those found in traditional instruction (Blok, Oostdam, Otter & Overmaat, 2002; Torgerson & Elbourne, 2002). Furthermore, the results showed that homeroom teachers valued computers as learning tools more than subject teachers. Homeroom teachers might have a greater tendency to instruct students to use computers to compensate for their insufficiency and solve problems in learning, and they tended to explore further research in specific subjects.

Discussion on Research Question 2: What Are the Relationships between Teachers' Educational Beliefs and Their Different Types of Computer Use?

The researchers performed Pearson product-moment correlations to compute the relationship between teachers' educational beliefs and different types of computer use. A significant positive relationship between teachers' educational beliefs and different types of computer use was found in this study, with coefficients up to 0.491 ($p<0.01$). Furthermore, the four sub-dimensions of teachers' educational beliefs were significantly correlated with different types of computer use, with coefficients ranging from 0.155 ($p<0.05$) to 0.701 ($p<0.01$). Several studies asserted that teachers who use computers in different ways due to their conceptions of using ICT are related to their existing teaching beliefs or belief system (Higgins & Moseley, 2001; Sugar et al., 2004).

Moreover, the evidence showed that teachers who adopt constructivist beliefs are highly positive computer users (Becker, 2001; Niederhauser & Stoddart, 2001). In other words, the findings indicated that teachers who focused on student-centered constructivist teaching and had positive attitudes toward the four sub-dimensions of teachers' educational beliefs were likely to have active concepts and applications on different types of computer use.

Discussion on Research Question 3: What are the Effects of Teachers' Educational Beliefs on their Computer Use?

In this study, 180 participants completed the questionnaires and 18 teachers were the interviewees. The findings in this study imply that some factors of a teacher's background information significantly affect teachers' educational beliefs and different types of computer use. Furthermore, teachers' educational beliefs are highly correlated with different types of computer use.

1.What is your educational belief? Which factors affect your educational beliefs?

The factors which affected teachers' educational beliefs include (1) teachers' teaching experiences, (2) educational books or workshops, (3) interactions with students and parents, and (4) feedbacks and supports from schools, parents and students. The following quotation presented the excerpts from the interviewees:

Teacher B and G: I think it is important to respect every student's uniqueness and give different guidance and homework according to different characteristics and situations. Students' feedback would be the most important factor to affect my educational beliefs.

2. Do you consider computers to be useful tools for teaching? Why?

All participants (18 interviewees) considered computer to be a useful tool for teaching. Besides finding information and receiving messages, they thought that computers could provide multiple ways to motivate student learning and innovate teaching. The excerpts were displayed as follows:

Teacher H and Q: Computers can provide authentic materials such as pictures, videos and similar situations so as to combine the living environment with learning and reinforce students' cognition and learning experiences.

3. What are the factors that influence your computer use? Why?

Time, course contents, equipment, convenience of technology, students' needs and parents' feedbacks were the factors that influenced the interviewees to use computers. When the effects of using computers were positive and obvious, teachers would have greater aspirations to use computers. The following quotation demonstrated the excerpts from the interviewees:

Teacher L: There are two reasons for me to use a computer. On the one hand, it can help me complete my teaching work, such as grading students' performances, revising the compositions and building the website about student learning. On the other hand, it can provide a prompt channel for me to receive the latest information easily.

4. Do you think teachers' beliefs are in accordance with different types of computer use? Why?

Most of the teachers expressed that teachers' educational beliefs are in line with different types of computer use. Teachers who have more positive beliefs may use computers more often and value the computer application more. Furthermore, it is believed that teachers who have firm educational beliefs are likely to use computers in a positive and active way. The excerpts from the interviewees were shown as follows:

Teacher D, F, G, N and P: Yes, The more positive beliefs teachers have, the more frequent and active usage and application of computers will be.

5. Do you think your educational belief promotes computer use in your teaching? Why?

Yes. Because most of the teachers expect students to have multiple performances in different orientations and learn in various ways, the appropriate computer use cannot only facilitate teachers' teaching but also improve student learning. Teachers play an important role as gatekeepers to guide students to obtain useful and concrete information. Computer use can be valued a lot, but it should be connected with teaching and learning carefully. The following showed the excerpts from the interviewees:

Teacher B, C, H and M: Yes. I think that every student should not be left behind. Thus, I apply computers to help them catch up and reinforce their motivation for learning.

6. Do you have any suggestions to improve teaching by considering educational beliefs and applying computers?

On the one hand, teachers have to consider the discrepancy of technological abilities among students, being well prepared and aware of computer-assisted materials, interacting with other teachers to learn successful examples about computer-assisted teaching and insisting on concrete educational beliefs. On the other hand, the government and schools need to give help and support on software and hardware, increase the educational budgets, hold educational and computer-related workshops, popularize in-service training courses and integrate websites for teachers to use. The following quotation was the excerpts from the interviewees:

Teacher B, K and N: By means of gathering and integrating materials for teaching, teachers can broaden their horizons and cope with problems in different dimensions. Through interaction with other teachers about the appropriate software application, teachers can strengthen their interests and effectiveness.

Conclusion and Implications

Based on research findings, four conclusions are drawn below. Firstly, the results demonstrated that the factor of educational degree had a significant effect on the aspects of student discipline and course and teaching plan. Therefore, teachers' educational degree was the main factor that affected their teaching methods in disciplining students and planning the course.

Secondly, teaching years, educational degree, number of classes, position in school and the frequency of technology integration were the factors that influenced different types of computer use. The results showed that teachers who have a higher educational degree and teaching years between 6 to 15 and 16 to 25 years are more likely to regard computers as basic skills and learning tools. In addition, depending on how often teachers integrate technology into their teaching, it is convincing that the effects of their computer use were more significant than those who never used it. Moreover, the results illustrated that homeroom teachers are more likely to use computers as learning tools than subject teachers.

Thirdly, accordingly, results showed that teacher's educational beliefs were highly correlated with different types of computer use. Hence, teachers' educational beliefs and different types of computer use affect each other mutually. Both concepts are important and worthy of further study.

Fourthly, most of the interviewees mentioned that teachers' educational beliefs were of vital importance in their teaching, and computers were vehicles to facilitate teaching and learning. The more positive beliefs teachers have, the more frequent and active usage and application of computer will be. Thus, teachers' educational beliefs can be considered to be an important factor that influences different types of computer use.

The conclusion and pedagogical implications for teachers including teachers' educational beliefs (student discipline, course and teaching plan, teaching and evaluation and student learning), different types of computer use (basic computer skills, computers as information tools and computers as learning tools) and the relationship between teachers' educational beliefs and different types of computer use were addressed in the following sections.

Teachers' educational beliefs

The results demonstrated that the sub-dimensions of student discipline and course and teaching plan were significantly affected by teachers' educational degrees. In other words, when teachers got higher educational degrees, they might create multiple viewpoints and positive attitudes toward controlling students' behaviors, counseling and guiding students, and planning course content. Additionally, teachers with higher education degrees were likely to have more constructivist concepts and be focused on students' interests, needs and abilities in a student-centered fashion. Therefore, the researchers suggested that teachers be encouraged to attend educational courses or to promote their academic degree in order to improve teaching techniques and develop constructivist concepts. If teachers establish broader mindsets, they are probably able to cope with different conditions and multiple perspectives. Both teachers and students might benefit.

Different types of computer use

According to the results, most of the teachers regarded computers as useful tools in assisting their teaching. Although teachers implemented computers for teaching at variable rates, the results still displayed important effects on computer use. To increase the rate of computer use in teaching, the researchers offer some specific suggestions. Firstly, computer-related workshops or in-service training should be systematically popularized to teachers in order to enhance teachers' computer knowledge and techniques. Secondly, some teachers are afraid of using computers or cannot connect computers with teaching and learning. By means of interacting and exchanging information with other teachers, teachers can build various perspectives and learn different methods of computer use. Finally, it is important to advocate the convenience and benefits of computer-assisted teaching. The more effects and benefits teachers realize, the more likely they will use computers.

The relationship between teachers' educational beliefs and different types of computer use

Based on constructivist educational beliefs, teachers are prone to taking positive attitudes toward teaching practice, including using computers in their teaching. Similarly, computer use in teaching is also a factor that may influence teachers' educational beliefs. They are mutually correlated. Therefore, there are some implications for education.

Firstly, our government needs to increase the educational budget to provide state-of-the-art hardware and software equipment in schools. With sufficient technological resources, teachers and students are more likely to be motivated to apply technology in teaching and learning.

Secondly, the Ministry of Education and other education-related departments are supposed to integrate websites for teachers to inquire and use; they also need to hold workshops regularly in order to improve and strengthen teachers' education and computer skills.

Thirdly, teachers are expected to develop firm and concrete educational beliefs in their teaching. What is valued in their teaching may affect their decisions and performance in the classroom. If teachers want to instruct students to receive different dimensions of knowledge, computers are used as vehicles to assist teachers in achieving their goal. Moreover, teachers can adjust and reinforce their educational beliefs and computer applications in terms of their teaching experience, educational books or journals, and cooperation and interaction with other teachers. Teachers are expected to consider students' needs and personal characteristics and examine their own teaching goals and beliefs continuously. Most importantly, teachers' educational beliefs and teaching skills need to be more flexible for the purpose of following educational trends.

Fourthly, parent and student feedback and support are vital elements for teachers to enhance and promote their teaching. The positive feedback and support strengthen teachers' confidence in their own beliefs and increase their enthusiasm for discovering various ways of teaching as well.

Fifthly, since teachers' educational beliefs were highly related to different types of computer use, every aspect of influencing factors is worthy of investigation in order to contribute positive findings to the pedagogical environment.

Limitations and Suggestions for Future Research

Limitations

The findings of this study might contribute to the Ministry of Education, educators and teachers who would like to enhance the rate and interest in computer use in education. Nevertheless, based on the research design in the study, the findings have their limitations, which are listed below.

Firstly, because of the limitation of the area, the research area was restricted to central-west Taiwan. There might be a limitation in discovering different results.

Secondly, the study was conducted in 10 schools (180 teachers); a larger population might have yielded more conclusive results.

Thirdly, this research mainly focused on elementary school teachers' concepts on teachers' educational beliefs and different types of computer use. One limitation is that the discrepancy between elementary school teachers and teachers at different stages in viewpoints are not explored (e.g. junior high school teachers, senior high school teachers, college teachers, etc.).

Suggestions for Future Research

The findings of this study might contribute to elementary school teachers and educators who would like to enhance computer use in education. This study was aimed at exploring the relationship between elementary school teachers' educational beliefs and different types of computer use. Nevertheless, there are some limitations in this study that were mentioned above. Therefore, the researchers provide some suggestions for future studies.

Firstly, the research was conducted in central-west Taiwan because of the limitation in geographical area. If future researchers could investigate related studies in other counties or cities, it might provide more comparable results. For example, teachers who teach in big cities might have more resources and opportunities to enhance computer-assisted teaching, the concepts of educational beliefs and different types of computer use might be different between cities and counties.

Secondly, the sample size of the study can be increased. Only 180 elementary school teachers participated in this study. The researchers recommend that future researchers involve more participants in future studies. If a greater number of participants could join a related study, the results of the research might be applied to other contexts and the findings could be inferred to the same situation, not just restricted to this study. For this reason, more participants are suggested for future research.

Thirdly, this study emphasized the results of elementary school teachers' educational beliefs and different types of computer use. If the research could be broadened to higher levels of education such as junior high school teachers, senior high school teachers or college teachers, different findings might be discovered. Generally speaking, students' levels on technological skills would be improved in the process of education. That is, students who have higher educational degrees would have learned more specific and various techniques about computers. Thus, it is necessary for teachers who teach in junior high schools, senior high schools or colleges to teach advanced computer skills to students in order to fit the students' skill levels. Teachers are supposed to develop more expertise as the educational level of students increases. The different results of teachers' educational beliefs and different types of computer use on various educational stages are worth exploring in the future.

Finally, this study found that teachers' educational beliefs were correlated with different types of computer use. With a view to strengthening positive constructivist educational beliefs and enhancing teachers' computer use in education, more specific methods and intensive research studies are suggested in the future.

References

Alfassi, M. (1998). Reading for meaning: The efficacy of reciprocal teaching in fostering reading comprehension in high school students in remedial reading class. *American Educational Research Journal, 35* (2), 309-332.

Berg, B. L. (2007). *Qualitative research methods for the social sciences* (6th ed.). Boston, MA: Allyn and Bacon.

Chen, T. C. (2002). *The development of English reading diagnostic test for junior high school students.* Unpublished master's thesis, National Changhua University of Education, Taiwan.

Duffy, G. G. & Roehler, L. R. (1987). Improving reading instruction through the use of responsive elaboration. *The Reading Teacher, 40* (6), 514-519.

Fevre, D. M. L., Moore, D. W. & Wilkinson, I. A. G. (2003). Tape-assisted reciprocal teaching: Cognitive bootstrapping for poor decoders. *British Journal of Educational Psychology, 73* (1), 37-58. doi:10.1348/000709903762869905

Fielding, L. & Roller, C. (1992). Making difficult books accessible and easy books acceptable. *The Reading Teacher, 45* (9), 678-685.

Gay, L. R., Mills, G. E. & Airasian, P. (2009). *Educational research: Competencies for analysis and applications* (9th). Upper Saddle River, NJ: Prentice Hall.

Hong, Y. L., Huang, H. S., Lin, C. R., Chou, Y. L., Liou, Y.-M. & Hsie, L. H. (2006). The development of the Englsih word recognition test for junior high and elementary school students. *Psychological Testing, 53* (2), 155-180.

Jenkins, J. R., Stein, M. L. & Wysocki, K. (1984). Learning vocabulary through reading. *American Educational Research Journal, 21* (4), 767-787.

Lee, K., Ardeshiri, M. & Cummins, J. (2016). A *computer-assisted multiliteracies programme as an alternative approach to EFL instruction*. Technology, Pedagogy and Education. doi: 10.1080/1475939X.2015.1118403

A computer-assisted multiliteracies... (PDF Download Available). Available from: https://www.researchgate.net/publication/294107654_A_computer-assisted_multiliteracies_programme_as_an_alternative_approach_to_EFL_instruction [accessed Apr 27 2018].

Ministry of Education. (2008). *Guidelines of English curriculum of grade 1st-9th*. Taiwan: MOE.

Myers, P. A. (2006). The princess storyteller, clara clarifier, quincy questioner, and the wizard: Reciprocal teaching adapted for kindergarten students. *The Reading Teacher*, *59* (4), 314-324.

Neuman, W. L. (2006). *Social research methods: Qualitative and quantitative approaches* (6th ed.). Boston: Pearson.

Oczkus, L. D. (2003). *Reciprocal teaching at work: Strategies for improving reading comprehension* (2nd ed.). Newark, DE: International Reading Association.

Palincsar, A. S. & Brown, A. L. (1984). Reciprocal teaching of comprehension fostering and comprehension monitoring activities. *Cognition and Instruction*, *1* (2), 117-175. doi:10.1207/s1532690xci0102_1

Palincsar, A. S. & Brown, A. L. (1986). Interactive teaching to promote independent learning from text. *The Reading Teacher*, *39* (8), 771-777.

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

Pilonieta, P. & Medina, A. L. (2009). Reciprocal teaching for the primary grades: We can do it, too! *The Reading Teacher*, *63* (2), 120-129. doi:10.1598/RT.63.2.3

Rosenshine, B. & Meister, C. E. (1993, May). *Reciprocal teaching: A review of 19 experimental studies* (tech. rep. No. 574). Urbana, IL. Retrieved from https://www.ideals.illinois.edu/bitstream/handle/2142/17744/ctrstreadtechrepv01993i00574_opt.pdf?sequence=1

Sardegna, V. G. & Yu, L.-T. (2015). Taiwanese Elementary School Teachers' Computer Literacy and Use: Implications for Language Teaching Training Programs. *CALL-EJ, 16*(1), 1-15

Scardamalia, M. & Bereiter, C. (2006). Knowledge building: Theory, pedagogy, and technology. In K. Sawyer (Ed.), *Cambridge Handbook of the Learning Sciences* (pp. 97-118). New York: Cambridge University Press.

Tutty, L. M., Rothery, M. & Grinnell, R. M. (1996). *Qualitative research for social workers: Phases, steps, and tasks.* London: Allyn and Bacon.