Teachers' Pedagogical Belief and Knowledge towards Integration of ICT into Teaching at Elementary Level

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Abstract

This paper is based on a research, conducted to identify teachers' pedagogical beliefs and their knowledge for the use of Information and Communication Technology (ICT) in classroom. Data was collected through Teacher Belief Scale (TBS) developed by Woolley et al., (2004), and SAF-T3 scale, developed by Papanastasiou & Angeli, (2008) for the knowledge of teachers about their Information and Communication Technology (ICT) use in classroom. Sample of the study comprised of 100 elementary school teachers, selected from the schools equipped with computer lab facility. Data was analysed through descriptive statistics, wherein, mean & standard deviation were calculated. Results indicated that teachers' constructivist pedagogical belief was weak (M=2.76) as compared to their traditional pedagogical belief (M=3.71). Among the 14 areas of ICT use, teachers' knowledge level was high only for three areas i.e. for word processing (M= 3.35), email usage (M=3.17) and for the use of internet (M=3.38). Findings of the study indicated that teachers' pedagogical beliefs and their level of ICT knowledge, are identified as strong predictors for the teachers' use of ICT into their classroom. Based on the findings, it is suggested that teachers' professional development need to emphasize more on training teachers for the use of technology into their pedagogy, which will in turn enhance their pedagogical belief as well. This study added to the prevailing literature and also suggested further research in this area.

Key words: Constructivist pedagogical belief; traditional pedagogical belief, ICT knowledge, use of ICT in classroom

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Introduction

Information and Communication Technology (ICT) is a vital part of every day life, and recognized as significant tool for sustaining and maintaining educational learning and teaching (Sirkemaa, 2001; Drinkwater et al., 2004). ICT includes technological tools which can be used to receive or share any information from around the world. The most frequently used ICT tool is computer (Tondeur et al., 2009). ICT is undoubtedly a "useful tool that enables us to link various learning communities together in new and different ways" (Taylor, 2000, p. 4). Utilisation of different technological tools contributed positively when teachers and students accomplish teaching learning goals (Honey et al., 2000). Integration of ICT into pedagogy enables teachers to adopt student centered approach as opposed to teacher centered approach. Use of technology supports team work and encourages higher order thinking among students (Haddad, 2003). Researchers identified that when ICT is used with effective pedagogical styles or strategies, it develops creative thinking skills in students (Jonassen & Carr, 2000; Kearney & Treagust, 2001).

Teachers possess vast array of beliefs about teaching learning process and these beliefs has an effect on their actions and performance in classroom teaching. Teachers' judgement and decisions are representation of their beliefs. Their beliefs are synonymous to their view point and perceptions (Pajares, 1992). Teacher's pedagogical belief play central role in the integration of ICT into pedagogy (Webb & Cox, 2004; Tondeur et al., 2007). Teachers' pedagogical belief act as a facilitator in understanding the selection and decisions teacher take about the use of technology in teaching (Handal & Herrington, 2003). These decisions are multiple in nature i.e. subject selection, activities needed, and assessment or evaluation in the classroom. Present research was carried out to study the beliefs of teachers about the use of technology in classroom. The existing research have identified and supported that beliefs of teachers are one among other factors that determine integration of technology into their pedagogy (Polly & Hannafin, 2010).

Teachers' Beliefs towards their Pedagogy

Teachers' beliefs towards their pedagogy are called their pedagogical beliefs. Pedagogy is the method of teaching. Teacher's classroom and teaching practice is influenced by the kind of belief they have. Teachers hold either traditional, or constructivist pedagogical beliefs (Chan & Elliott, 2004; Sinatra & Kardash, 2004). These beliefs play an important role in effective learning in all environments (Lim & Chai, 2008). Teachers with traditional beliefs are inclined towards the teacher-centred approach in their pedagogy as compared to the teachers with constructivist beliefs, who practice and promote student-centred approach into their teaching (Chan & Elliott, 2004; Deng et al., 2014).

It is imperative to find out that the existing pedagogy of teacher is adequate for the learners of this digital age. Even though researchers appreciate the awareness that teachers hold about ICT, however, they stress the need of more up-to-date pedagogical skills of teachers. These pedagogical skills help students to keep up and upgrade their knowledge base (Simpson & Clem, 2008). Pedagogical style of teachers hold great importance in the use of ICT into their teaching. Whether teachers use ICT in classrooms or how they incorporate, largely depends upon their teaching style. Research identifies that beliefs of teachers about their teaching are one of numerous aspects occupied in the effective use of technology (Alghazo, 2006; Teo, Chai, Hug & Lee, 2008).

Teacher Pedagogical Beliefs towards Integration of ICT into Pedagogy

According to Dede (2007) the adoption of adequate ICT type and incorporation of ICT into pedagogy, largely depends upon teachers' beliefs (Dede, 2007). To successfully incorporate technological innovation in classroom, it is needed for better insight into beliefs of teachers about use of technology (Zhao & Cziko, 2001; Ertmer, 2006; Dede, 2007). Through different research studies, it is proved that direct relationship exists between teacher's constructivist beliefs and technology integration (Becker & Ravitz, 1999; Becker, 2000; Higgins & Moseley, 2001; Mumtaz, 2004). Teacher's pedagogical beliefs predict or influence the use of technology in classroom (Haney et al., 2002; Angers & Machtmes, 2005; Hermans et al., 2008). Strong constructivist beliefs are associated with ICT adoption (Becker, 2000; Judson, 2006; Roehrig et al., 2007). However teachers with traditional beliefs about pedagogy are eager to use teacher centered approach in classroom (Isikoglu, Basturk, & Karaca, 2009).

Beliefs of teachers considered important in using ICT successfully in the classrooms and for the improvement of student learning in core subject areas (Ayas, 2006). Classroom teacher is considered important to effectively use technological tools for student's help. (Lim & Chai, 2008). "Teachers need to engage in conceptual change regarding their beliefs about the nature of learning, the role of student, and their role as teacher" (Niederhauser et al., 1999, p. 157). Some teachers resist bringing change in their pedagogy, it is basically because of concern towards the influence of technology use in classrooms on their preparation, beliefs, and values. It is logical to argue that teachers' level of pedagogical skills and knowledge, likely to enhance their use of ICT in classroom (Ndibalema, 2014).

Teachers level of ICT knowledge

Teachers' competences in IT, specifically their computer skills affect their pedagogy positively. Teachers are facilitators, designers, guides and assistants in the process of teaching (Warschauer, 1998). Hence their technological competency can be enhanced

through different ways. In this world of advancements, it has become mandatory for everyone including teachers to be well aware of computer skills. Multimedia, systematic teaching models, internet surfing, can be utilized in teaching-leaning process. If teachers lack knowledge in any area of technology then it will not be easy for them to use it into teaching efficiently and effectively (Wei, 2005).

Teachers' lack of ICT knowledge, competencies, and skills, restrict them from the use of technology in their classroom. The higher the knowledge of teachers towards technology, the higher will be its use in classroom (Empirica, 2006; Albirini, 2006; Sinclair, 2009). Low level of knowledge about ICT creates hindrances and constraints to the use of ICT in pedagogy (Al-alwani, 2005; Empirica, 2006). Teachers who lack confidence are not much willing and motivated towards ICT integration in classroom. One reason of lack in confidence to use technology can be "fear of failure" (Beggs, 2000), and can be lack of skills and low level of ICT knowledge (Balanskat et al., 2006).

Significance of the Study

Because of the advancement and worth of technology, Pakistan took steps to implement the technological innovations in education sector. In view of the significance of technology in education environment, National information and communications technology (NICT) strategy for education in Pakistan was developed in 2003. Different issues and areas were identified for improvement and further introduction. To enhance student learning, technology is considered important in this policy document. Other areas include integration of ICT into the subject matter, so that they can explore further concepts for which textbook material is inadequate. It is recommended that with the incorporation of technological tools in education, teaching will move away from traditional whole class lecture or teacher centered classroom, to student centered classroom (Jalalzai, 2005).

Taking benefit from the affluent prospect provided by the ICTs, the recent pedagogical methods need modification. Use of technology in classroom provides students a chance to explore and learn beyond the walls of classrooms. Student can learn by using ICT in different ways, e.g. when they are free in using technology for education it will promote creative and problem solving skills among them. Although Pakistan is taking steps, and NICT (National Information and communication Technology) strategy (2013), prescribes the major elements that require serious consideration to formulate educational reforms. However, it does not draw round explicit proceedings on how to execute these into existing teaching practices. Therefore, it can be said that Pakistan has made progress in the use of ICT, nevertheless, it is disquieting state that teachers do not utilise ICT in classroom teaching. Research identified that they do so because they have fear of complex learning process, lack of responsibility, and weak belief system (Shaikh, 2009). Therefore, the

current research aimed to explore teacher's beliefs about pedagogy and the knowledge they have towards the use of ICT into pedagogy. Following were the two research questions formulated for this study:

- What are the pedagogical beliefs of teachers towards the use of technology into pedagogy?
- What is the teachers' level of knowledge about the use ICT into teaching?

Methodology

This study was descriptive in nature including a survey research design. For the sample of the study, at first stage, 10 elementary boys and girls schools were purposively selected having computer lab facility into them. Then, at the second stage, 10 teachers were randomly selected from each school making 100 teachers in total. The reason for the selection of schools with computer lab facility was that generally, lack of computer lab facility in schools was considered as an excuse by teachers for not using ICT into their teaching. While, this research intends to explore pedagogical beliefs and level of ICT knowledge of the teachers, having computer lab facilities in their schools.

Instrument of the Study

Two questionnaires were adopted as instruments for data collection in this research. To identify teachers' pedagogical beliefs, Teacher Belief Survey (TBS) developed by Wooley et al., (2004) was utilized. Teachers express their beliefs through response options from 1 to 5, where 1for completely disagree and others are disagree, neutral, agree, and completely agree.

 Second research question of the study was about teachers' knowledge on ICT use. Factors Affecting Teachers Teaching with Technology (SFA-T3) developed by Papanastasiou and Angeli, (2008) was adopted for this purpose. Response options from 1 to 5 stands for (I cannot use it= 1), (I can use it to a small extent= 2), (I can use it satisfactorily= 3), (I can use it well= 4) and (I can use it very well= 5). Before using these scale, permission has been sought from the authors of both scales.

Internal Consistency Reliability of Scales

Keeping in view that both these scales (SAF-T3, TBS) were not used in Pakistan, therefore, it was imperative to find out its suitability in the Pakistani context. For this purpose, it was administered to fifty (50) secondary school teachers for pilot testing, and reliability was calculated. The value of Cronbach's alpha coefficient for these teachers'

score on Teacher Belief Survey (TBS) was 0.788, and was 0.881 on teachers' knowledge on ICT (SAF-T3), as mentioned in Table 1.

Table 1
Cronbach alpha reliability coefficient for TBS and SAF-T3 scales

Scale	Reliability Coefficient
Teacher Belief Survey	0.788
Teachers' knowledge on ICT scale	0.881

The value of alpha reliability coefficient indicated that these scales were reliable to use in the Pakistani context.

Results

Teachers' Pedagogical Beliefs

One research question of the study was to identify teachers' pedagogical beliefs towards the use of ICT into pedagogy. Scores of the teachers on 'Teacher Belief Survey (TBS)' (having five point Likert scale response options) were explained on the basis of mean. Scores on teachers' belief survey questionnaire exhibit teachers' beliefs towards constructivist and traditional teaching. Results of items related to Constructivist pedagogy belief and traditional pedagogical belief are presented in Table 2 & 3, respectively.

Table 2
Teacher's constructivist pedagogical beliefs (n= 100)

Items	Mean
I believe that expanding on students' ideas is an effective way to build my curriculum	2.85
I prefer to cluster students' desks or use tables so they can work together.	2.60
I invite students to create many of my bulletin boards	2.72
I involve students in evaluating their own work and setting their own goals	2.93
I make it a priority in my classroom to give students time to work together when I am not directing them	2.81
I prefer to assess students informally through observations and conferences	2.75
I often create thematic units based on the students' interests and ideas	2.72
Total mean	2.76

Based on the scores on scale which were from 1- 5, it was estimated that on a continuum from 1 to 5, the mean value above 3 shows high pedagogical belief, and the mean value below 3 shows low level of respective pedagogical belief. Table 2, presented the scores of teachers on items relevant to constructivist pedagogical belief. Here, for each item, mean value is less than 3, overall, total mean score for

this section is 2.76. This indicated that teachers possess low level of belief towards constructivist pedagogy.

Table 3
Teacher's traditional pedagogical beliefs (n= 100)

Items	Mean
I like to make curriculum choices for students because they can't know what they need to learn	3.71
I base student grades primarily on homework, quizzes and tests.	3.76
To be sure that I teach all necessary content and skills, I follow a textbook or workbook	3.99
I teach subjects separately, although I am aware of the overlap of content and skills	3.84
My students spend the majority of their time working individually	3.46
For assessment purposes, I am interested in what students can do independently	3.83
I generally use the teachers' guide to lead class discussion of a story or test	3.68
I find that textbooks and other published materials are the best sources for creating my curriculum	3.74
I am a firm believer in paper-and-pencil tests	3.45
Total mean	3.71

Table 3, presented the scores of teachers on items relevant to traditional pedagogical belief. Here, for each item, mean value is greater than 3, and overall, total mean score for this section is 3.71. This indicated that teachers possess high level of belief towards traditional pedagogy. Based on the results presented in table 2 & 3, it can be concluded that teaching style of a teacher reflects and mediated by their belief system.

Teachers' level of Knowledge on ICT

Focus of second research question was to assess Teachers' level of knowledge about ICT use into teaching, which was determined through SFA-T3 scale. Results on 5 point Likert scale was measured through descriptive statistics by calculating mean and standard deviation which are presented in the Table 4 below.

Table 4
Teachers' level of knowledge on ICT (n=100)

Items	I cannot use it %	I can use it to a small extent %	I can use it satisfactorily %	I can use it well %	I can use it very well %	M	S.D
Word processing	1.9	19.8	30.0	28.3	14.2	3.35	1.038
Data bases	27.4	24.5	51.1	18.9	8.5	2.54	1.337
Spread sheets	9.4	29.2	26.4	20.8	8.5	2.89	1.136
Graphics	19.8	31.1	19.8	16.0	7.5	2.58	1.224
Multimedia authoring software	47.2	51.1	16.0	9.4	6.6	2.08	1.308
Presentation software	17.0	27.4	21.7	17.9	10.4	2.76	1.264
Internet	7.5	16.0	22.6	29.2	18.9	3.38	1.213
Concept mapping	42.5	17.9	18.9	8.5	6.6	2.14	1.279
Email	17.0	13.2	21.7	21.7	20.8	3.17	1.400
Publishing software	48.1	22.6	9.4	9.4	4.7	1.94	1.213
Webpage authoring software	57.5	15.1	9.4	8.5	3.8	1.79	1.183
Programming languages	57.5	15.1	9.4	4.7	7.5	1.83	1.272
Modeling software	61.3	12.3	11.3	6.6	2.8	1.70	1.115
Micro worlds/Simulations	59.4	13.2	8.5	9.4	3.8	1.78	1.203

Based on the scores on scale which were from 1- 5, it was estimated that on a continuum from 1 to 5, mean value above 3 shows high level of ICT knowledge, and mean score below 3 indicate low level of ICT knowledge. It appeared from the results presented in Table 4, the teachers have adequate level of ICT knowledge in three areas; use of email, internet and word processing. High level of knowledge indicated with the highest score (mean =3.38 & standard deviation =1.213) of internet usage, followed by the use of word processing score (mean =3.35, standard deviation =1.038), and for email use score (mean =3.17 and standard deviation =1.400).

Mean and standard deviation values of six areas of ICT indicated teachers' moderate level of knowledge. These are, knowledge about Spread sheets (mean =2.89, standard deviation =1.136), use of Presentation software (mean =2.76, standard deviation =1.264), use of Graphics (mean =2.58, standard deviation =1.224), data bases (M=2.54, standard deviation =1.337), use of concept mapping (mean =2.14, standard deviation =1.279), and for using multimedia authoring software (mean =2.08, standard deviation =1.308).

The low level of teachers' knowledge towards ICT can be seen in the areas of Publishing software (mean =1.94, standard deviation =1.213), followed by programming language (mean =1.83, standard deviation =1.272), Web page authoring software (mean =1.79, standard deviation =1.183), Micro worlds/ simulations (M=1.78, standard deviation =1.203), and modeling software (mean =1.70, standard deviation =1.115).

It appears from the results presented in Table 4, among the fourteen areas of ICT use, teachers possess either moderate or low level of knowledge in most of the areas, except for only three i.e. use of internet, emails and Microsoft word. Therefore, it can be said that generally teachers lack adequate knowledge for the use of technology into their teaching.

Discussion

Present study was conducted to identify beliefs of teachers towards their pedagogy and their level of knowledge for the use of ICT into teaching. Results of the study indicated that teachers held strong pedagogical beliefs towards traditional teaching, and their constructivist teaching belief was relatively low. By identifying teachers beliefs about traditional and constructivist teaching, result concluded their beliefs towards the use of technology in classroom. Research has established direct relationship between constructivist beliefs of teachers and their integration of ICT into teaching, i.e. teacher's pedagogical beliefs predict or influence classroom use of ICT (Becker, 2000; Higgins & Moseley, 2001; Mumtaz, 2004). Strong constructivist beliefs are associated with ICT adoption into teaching (Becker, 2000). However teachers with traditional beliefs are eager to practice teacher centered approach in classroom (Isikoglu, Basturk, & Karaca, 2009). Findings of this study are akin to existing research in this area (Alghazo, 2006; Tondeur, et al., 2008; Teo, Chai, Hug & Lee, 2008; Hermans, et al., 2008).

Findings related to research question two indicated teachers' knowledge about technology use in pedagogy. It appeared from results that the teachers have adequate knowledge about ICT in very few areas, i.e. email, internet and word processing. However, there were lack of competencies in the areas like simulations, modeling software, publishing software and programming. Lack of knowledge about ICT affects its use in the classroom and act as a barrier (Albirini, 2006). Teachers who are not much competent in some technological tools showed that the practice of ICT in teaching was limited. Limited knowledge about ICT creates hindrances and constraints to the integration of ICT in pedagogy (Al-alwani, 2006; Empirica, 2006).

To change the outdated pedagogy and practices of incorporation of ICT into teaching, a change in teachers' pedagogical belief and knowledge about ICT is needed. (Shepherd & Mullane, 2010; Kurt, 2010).

Conclusions

Literature revealed that a lot of work has been done on teachers' beliefs about pedagogy as 'barriers' to the use of technology into pedagogy (Ertmer, Ottenbreit-Leftwich & York, 2007; Higgins & Moseley, 2001). This study aimed to study two factors teachers' pedagogical belief and level of ICT knowledge that affect ICT integration into teaching. Result indicated that teachers held strong traditional pedagogical beliefs and weaker constructivist beliefs. Another factor, 'teacher's level of ICT knowledge' was also identified as minimal.

Researchers have identified a range of factors involved in ICT integration. These researchers divide factors into barriers that teacher cannot control in integration of technology. These include deficiency of resources and school culture. Barriers which are within teachers control include personal beliefs, attitudes, knowledge and skills (Hixon & Buckenmeyer, 2009). Studying these barriers or factors in integration of ICT into pedagogy, provided an insight about the problem, to professional development organizations. Their investment in the area of technological use needed to be according to the beliefs of teachers. As teachers are the change agents in teaching learning process, training related to ICT tools will provide them knowledge about ICT. As a result, teachers will eventually increase the use of ICT into their classroom. In the new era of technological development and advancement, teachers need to keep themselves updated with the use of ICT into teaching. With the very first step of training, fear and low self-confidence can be reduced in the use of technology into teaching. Once teachers have competencies and skills to use ICT and possess constructivist beliefs, they would be more eager to integrate ICT into the classrooms. The beneficiaries of this integration will be the students in schools. When they receive quality education and meet standards of digital age, then they can stand in line with international standards.

The study recommends future researchers to correlate knowledge of teachers about ICT and level of ICT use and learning. Further exploration of other factors is needed for effective use of ICT in teaching process. Further work could be conducted in the form of in-depth qualitative studies through interviews of teachers to identify the reasons of limited use of technology into classroom. Observation of classrooms would also be beneficial to investigate the extent of ICT use in classroom. This study suggests supplementary in-depth investigation of how teachers' early career and experiences shape their beliefs.

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