Teacher's Knowledge, Beliefs and Pedagogical Practices in Integrating ICTs in different Curriculum Areas in Secondary Schools: A Case Study of Pakistan

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Abstract

*This study set to explore teachers' knowledge, beliefs and pedagogical practices in integrating information and communications technology (ICT) in curriculum areas in a private secondary school in Karachi, Pakistan, through a case study of four teachers. Data were collected through classroom observations, interviews, informal conversations and analysis of documents, and analysed using QSR NUD*IST. It was found that teachers' knowledge, beliefs and pedagogical practices significantly influenced how teachers integrated ICT in the curriculum areas. Due to limited time, the study could not trace longer how the teachers' knowledge, beliefs and pedagogical practices changed over time, thus, a longitudinal study is needed to trace how teachers' knowledge, beliefs and pedagogical practices change over time.*

Introduction

Research indicates that teachers' beliefs, feelings and knowledge about teaching, largely influence the way they teach (Borg, 2001; Flores, 2001). Furthermore, teachers have been unable to integrate ICT in the curriculum areas successfully (Robertson, 2003) because of beliefs users have towards technology, lack of access and/or knowledge of using technology for teaching and learning (Williams, Coles, Wilson, Richardson, & Tuson, 2000) or simply fear of technology.

Purpose of the study

The study explored teachers' knowledge, beliefs and pedagogical practices in integrating ICT in Science and Social Studies in a

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secondary school in Pakistan. Though many teachers use the computers for accessing information or word processing, little is known on how teachers use computers to enhance their pedagogical practices and students' learning outcomes. Several studies have measured teachers' pedagogical practices through observing and recording lessons in which ICT is used (Asan, 2003; Cox, et al. 2004; Smeet & Mooij, 2001; Williams, et al. 2003); however, such studies have not captured the pedagogical reasoning behind the teachers' practices.

Research questions

The study was guided by the following research questions:

1. What knowledge do teachers have about using computers and integrating ICT in curriculum areas?
2. What are the teachers' beliefs about using ICT for teaching and learning different subjects?
3. What are the teachers' pedagogical practices in integrating ICT in curriculum areas?

Literature review

Knowledge

Veal (2004) defines pedagogical content knowledge (PCK) as "the knowledge base needed for teaching" (p. 331). He classifies knowledge into four types: subject matter knowledge, knowledge of the students, knowledge of the context, and pedagogical knowledge. Similarly, Rodrigues, Marks and Steel (2003) subdivide PCK into three categories: subject knowledge, teaching and learning knowledge, and general craft knowledge. All the authors focus on the contents of knowledge

Beliefs

She (2000) classifies three types of teachers' beliefs: beliefs about the subject matter, beliefs about their teaching and beliefs about how students learn. The first type of beliefs originate from the teacher's previous training, while the second and third types come from the teacher's daily teaching experiences. Cronin-Jones (as cited in Haney, et al., 2002) has similar classification, but adds beliefs about the ability of students in a particular age group.

Pedagogical practices

Borg (1998) reveals that teachers' pedagogical practices are influenced by teachers' "real-time perceptions of classroom events" (p. 31). On the contrary, Breen, et al. (2001) assert that it is the experience that shapes teachers' pedagogical practices, not the context *per se*.

Teachers' Knowledge and, Information and communications technology

Teachers' subject knowledge and how ICT is related to that subject (Cox, et al. 2004), teachers' computer literacy (Asan, 2003), and confidence (John, 2005; Teo, 2008; Williams, et al. 2000) influence ICT integration in lessons. Thus, training in computer is essential for successful ICT integration in lessons (Davis, Preston, & Sahin, 2009). However, such training needs to be relevant and context based (Rodrigues, et al. 2003) and ensures access to ICT resources and on-going support to teachers (Williams, et al.). Likewise, confidence does not necessarily lead to ICT use in classrooms because there are other factors that influence ICT use (O'Oconnor, 2003).

Teachers' beliefs, and information and communications technology

Several studies indicate a consistent and strong relationship between teachers' beliefs about the use of technology (Cox, et al. 2004; Russell, et al., 2003; Williams, et al. 2000), though there is a ontroversy on whether computer use or teachers' beliefs and practices come first. Cox, et al. (2004) confirmed that teachers' beliefs and knowledge shape computer use.

Methodology

A qualitative design was used to explore teachers' knowledge, beliefs and pedagogical practices in a specific and naturalistic place, at a given time to understand teachers' inner perceptions on the meanings, context and experiences shaping their practices.

Sampling

This study was carried out in a private secondary school in Karachi, Pakistan, in the province of Sindh. The selection of both the site and

research participants was purposive because the school was amongst the schools that had then started integrating ICT in the curriculum areas.Four research participants- Karen and Sarah for Science (Classes VI & VII; VI & VIII) and Naz and Nusrat for Social Studies (Classes VI & VIII; VIII respectively) were selected based on teachers being "trained" in ICT and use computers for education for a duration of one day workshop to several years. Scrutiny of documents indicated that ICT was rarely integrated in Classes III to V, and classes IX and X were excluded from the study because the time the study was conducted they were preparing for examinations. The selection of two teachers from the same subject and from different subjects was for comparing and contrasting the ways in which ICT was integrated in each selected subject.

Methods of data collection

Data were collected through classroom observations, interviews, informal conversations and analysis of documents.

Classroom observations

Classroom observations aimed at unearthing teachers' knowledge and beliefs as "beliefs cannot be directly observed and measured but must be inferred from what people say, intend and do" (Pajares as cited in Sahin, Bullock & Stables, 2002 p. 712).

Each observation lasting for 60 minutes focused on teaching and learning, the subject matter and general classroom interactions. Each teacher was observed thrice over a period of four months. Classroom observations were audio taped and observation field notes were taken. The audio taped classroom observations were transcribed verbatim. Part of the audio taped data and detailed field notes were used for elicitation purposes in stimulated recall interviews and informal conversations.

Interviews

Two forms of interviews were used: stimulated recall interviews and a focus group interview. Stimulated recall interviews explored the reasons for certain actions and behaviour teachers exhibited during teaching. Three stimulated recall interviews were used as part of post classroom observations. The audio taped part of the data was played,

the teachers listened to it and it was stopped at a point for teachers to describe why they acted or behaved in such a manner. Thus, teachers' knowledge, beliefs and pedagogical practices could be unearthed.

A focus group interview explored further the emerging themes from the teachers as identified from classroom observations and individual interviews and to compare emerging themes from different teachers. Interview data were audio taped and transcribed verbatim for analysis.

Documentary review

Lesson plans, lesson notes and Social Studies and Science curriculum documents were thoroughly read to find out how ICT was supposed to be integrated in the subjects.

Informal conversations

Informal conversations were used depending on the teachers' availability and willingness. The teachers seemed relaxed; consequently, were able to reveal some of their knowledge, beliefs and pedagogical practices.

Data analysis

The transcribed interview and classroom observation data were analysed using QSR NUD*IST as data collection continued. Thus, the previous data analysis process determined data to be collected thereafter. The documents were read several times to identify emerging categories and themes.

Findings

The major findings are divided into three areas: teachers' knowledge, beliefs and pedagogical practices in integrating ICT in different curriculum areas.

Teachers' knowledge about integrating ICT in curriculum areas

Teachers' technical knowledge

Knowledge about the computer meant technical skills such as Internet searching, selecting software, and technical skills for using

ICT resources for teaching whose sources were formal training and constant computer use both at school and home.

Teachers with more computer training and who constantly used computers were more confident in integrating ICT in curriculum areas than those with less computer training and those who rarely used computers, as Sarah emphasises: Trial and error is a good thing because it increases curiosity. Sometimes in trial and error we face problems, but we learn a lot from it.

Classroom observation revealed that teacher who had attended longer and several computer courses tended to integrate ICT in the lessons smoothly than those who had attended few and shorter computer courses.

Teachers' knowledge of the subject matter

The teachers' knowledge about the subject matter included knowledge of ICT resources and programmes, reasons for using ICT, computer knowledge, and processes involved in integrating ICT in the curriculum areas. This knowledge was instrumental in their use of ICT in teaching their subject matter. It was discovered that better understanding of the subject matter helped teachers identify the type of ICT resources needed for a given topic, and decide in which topics to integrate ICT. According to Sarah, ICT integration in a subject area, *inter alia*, 'depends on the needs, the type of topics we have selected and … the strategies for that purpose.'

Teachers' pedagogical content knowledge

Knowledge of how to teach was determined by teachers' knowledge on how students learn, the nature of the context, and the subject matter knowledge. Teachers' use of multiple teaching aids was partly influenced by their knowledge on how students learn. Karen illustrates:

There is no one way to give explanations. We show the whole process in the form of a flow chart too. Either we can do the explanation in the form of a model. May be with some animated picture or sometimes we can give the diagram to the students and ask them to label it.

The teachers reported that through the use of ICT students had become more independent and improved their presentation skills.
Students have become more informative and they collect information from different websites as they search by themselves (Karen).
Their presentation skills ... have very much changed from the previous times. Now they are more, you know … they present in such a beautiful manner (Nusrat).

Teachers' beliefs about using ICT for teaching and learning

All the four teachers strongly believed that ICT enhanced teaching and learning. However, in some cases, the teachers' beliefs were inconsistent with their pedagogical practices.

Internet is a big book

Teachers viewed ICT, especially the Internet, as a reliable source of information because recent information could easily be accessed. Naz explained: 'Internet is a book. A very large book On each and every page you can pick the desired thing.' Thus, they believed that the Internet is full of useful information. However, in reality, information available on the Internet needs to be critically scrutinised for its usefulness.

ICT brings the real life situations into the classroom

Through ICT, the teachers thought it was easy to simulate real life situations. Karen illustrates:
… in the computer when you show some things that are usually happening in the normal environment, then it gives the idea of the real life.

ICT caters for multiple learning styles

Teachers believed that ICT catered for multiple learning styles of the students. Thus, during teaching they used to involve several sense organs through simultaneous use of the video clips, the oral text from the video clips and the written text that accompanied the video clips as Karen explains: 'Students have different ways of learning; IT helps many students to understand the subject. They see, they hear.'

ICT promotes collaboration in learning

Teachers believed that ICT facilitated different students to engage in different activities in the class according to their abilities and needs as Sarah illustrates:

Through computers, we are teaching, some students are working on the presentations, the other students are collecting information, and some students are typing and are good in computers.

Classroom observations revealed that students who shared computers were also seen discussing. However, in lessons that involved Internet search, individual students were seen searching for information of interest to them. The division of labour for students sharing computers and working in groups appeared to be more for logistic purposes.

ICT saves other resources

Teachers were strongly convinced that ICT saved time, the teachers' and students' energy, and paper. Sarah justifies this: 'I cannot photocopy all the different diagrams. It is a waste of resources. If we are having these computers, why can't we see them, how colourful it is.'

On saving time and human energy, Karen adds:

Clip art in the computer becomes very interactive, less time is taken. So, instead of wasting this time, if we utilise them in this animated picture so it does not need much more efforts of the teacher as well as students.

ICT shifts the role of teachers and students

ICT made teachers and learners assume new roles. Teachers became learners, learning with the students, learning from the students and learning from their own practices as Nusrat illustrates: '… we both are learning. Like a teacher is a passive one. She also wants to become a learner. That is why I took part in this [Internet search].' Thus, the traditional notion of the teachers as sages on the stage and the only source of knowledge, and learners as *tabula rasa* was challenged.

Teachers as facilitators gave students opportunities to learn. For example, Karen presented the lesson with the students. Informal conversation revealed that she had planned the lesson together with the students as she realised that students were much better than her in some ICT aspects. This was also featured in Sarah's lesson:

A group of students, good at computers and they have computers at their homes, they work with me and they support some clip art for me.

Teachers' pedagogical practice in integrating ICT in curriculum areas

Teachers changed some of their teaching strategies to facilitate ICT integration in the curriculum. When tasks were specific and had a high degree of teacher supervision, their completion took less time, while, when they were general, with less guidance they took a longer time and, in some cases, they were not completed. A possible reason for the difference could be the immense amount of information available in the cyberspace distracted them. This, *inter alia*, calls for using more structured tasks to attain the lesson's objectives.

Conclusion

The teachers' technical knowledge of using computers, the subject matter knowledge and pedagogical content knowledge greatly influenced how ICT was integrated in different curriculum areas. The teachers' role was very significant in integrating ICT in the curriculum areas. It is the teachers who selected ICT resources and, to some extent, determined how they could be used. When teachers assumed the role of learners they were breaking the long-standing tradition where teachers were seen as the ultimate source and giver of knowledge and becoming lifelong learners. However, in some cases, teachers' beliefs about using ICT did not translate into their pedagogical practices. Often ICT was used as an add-on to existing resources. Overall, there was little evidence of teachers using ICT as a tool to radically change their pedagogical practices.

Direction for future research

Since, research on teacher cognition may be difficult because it involves some variables (knowledge and beliefs) that cannot be observed directly but have to be deduced from what people say,

intend and do; to get deeper insights on these aspects, a longitudinal study is needed to help understand the changes taking place in teachers' knowledge, beliefs and pedagogical practices over time.

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