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A model for integrating ICT into teacher training programs in Bangladesh based on TPCK

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ABSTRACT

Modern technology increasingly creates new challenges in various professional development and practice. However, in teaching, the mere adoption of new or innovative technology is not enough to meet the students' learning needs and opportunities. Technology alone could not sufficiently bring about the desired changes in students' competencies and behavior. It is the teachers' competencies to integrate ICT in their instructional tasks that can facilitate these desired changes to the maximum level. Therefore, there is an increasing demand for the inclusion of pedagogy and substantial content knowledge based use of ICT in teachers' professional development. In this paper, the author presents a model for integrating ICT in the professional development of teachers in Bangladesh based on the Technology Pedagogy Content Knowledge (TPCK) framework, to address the issue on effective use of ICT in teaching based on two perspectives. Firstly, how the teachers can undertake three different phases of improving their use of technology to facilitate effective instruction. This will be focused on understanding the challenges in the use of ICT in three phases of teachers' professional development in Bangladesh, particularly the pedagogical and contextual (specific subject content) issues concerning prerequisite conditions that ensure the effective use of ICT. Secondly, the paper highlights on conclusive suggestions to implement the proposed model demonstrating the potential benefits to the teachers, trainers, policymakers and other educators who are directly or indirectly accountable for teachers' professional development. Finally it concludes with emerging research issues and pertinent guidelines in the context of Bangladesh.

Keywords: *ICT integration; Teacher training; knowledge-content-technology.*

INTRODUCTION

The primary objective of 'teaching' is to promote the acquisition of necessary knowledge, skills, and attitudes individually (for a particular student) and collectively (for a society or a country). To achieve this objective, teachers play an important role in the teaching-learning context, where they continuously use and create different teaching models, strategies, and tools (Van Der Sijde 1989). Previous researches showed that teachers use these models, and tools differently (Freeman & Richards 1993; González 2012; Krajcik et al. 1994) and a substantial number of studies over the last three decades, explained how teachers use different teaching tools(Partridge 2000; González 2010; Fox 1983; Boling 2006). Different teachers use different tools to improve their teaching skills. Accordingly, teachers from all disciplines have widely integrated Information and Communication Technology (ICT) to improve their teaching styles (Liu 2011; Liu & Velasquezbryant 2003; Hew & Brush 2007; Donnelly, McGarr & O'Reilly 2011). Therefore, the effective use of ICT significant contribute to emergence of reforms in teaching and learning processes in all sectors of education (Pulkkinen 2007; Wood 1995). The use of ICT offers a facilitative teaching-learning culture that is essentially focused on the teachers' task of leading or engaging their students in an active; self-engaged, self-directed and motivated way of learning (Volman & van Eck 2001; De Corte et al. 2003). Presently, ICT plays an important role in

promoting new instructional methods for teaching and learning, such as: self-paced learning (Roberts 2003), network learning (González 2009) and online discussion(González 2010).

Developed countries had started reaping the benefits of ICT integration in teaching a long time ago while developing countries are in the process of understanding its value. Developing countries, such as: Bangladesh, Afghanistan, Nepal, Pakistan and Vietnam have found the consequence of redefining teachers' roles, and in response, many professional development programs have been introduced to train teachers into using ICT (UNESCO 2004). This article then is primarily aimed at presenting the existing scenario of incorporating ICT into teacher training in Bangladesh to evolve a model for teachers' professional development that considers pedagogy-content-technology (TPCK framework). This model depicts how teachers can undertake continuous improvement of their use of technology to provide effective instruction, through the different phases of teachers' professional development. The model likewise entails the investigation of the pedagogical and contextual (specific subject content) issues that are pertinent and required to be considered in order to effective use of ICT into teacher training programs. This study will further focus on the challenges (both positive and negative) of using ICT in professional development programs in Bangladesh. It will finally summarize conclusive suggestions to carry out the proposed model. Therefore, the practical significance of the study is related to teachers' professional development in Bangladesh through the valuable insights for teachers, trainers, policymakers and other educators who are directly or indirectly involved in teachers' professional development and the introduction of ICT supported teaching-learning processes. Likewise, the study contributes to the literature on the relationship between pedagogy, content and technology knowledge in education.

BACKGROUND

Over the last twenty years, the use of technology has become an essential facet in educational research (Drent & Meelissen 2008). Previous studies presented a significant proof that support the explicit effects of using ICT in the teaching-learning situation (Mumtaz 2000; Hattie 2009). For example, ICT is considered as an interactive media for engaging students, providing opportunities to group analysis and practice. It also provides better access to resource materials (subject content and other related resources) and relevant articles. ICT should be involved in the process of teaching in every subject and in every classroom, because of the very fact that ICT facilitates students' engagement in problem solving activities; decision-making to improve their thinking skills (Grabe 2001). Moreover, effective use of ICT can facilitate student-cantered active learning (Ellis et al. 2008), engage students in collaborative learning as well as enhance their social interaction (Dodge, Colker & Heroman 2003), improve their cognitive development, increase creativity, and improve their problem solving skills (khan, Hasan & Clement 2012).

In spite of the greater importance of using ICT in education, most of the teachers in Bangladesh (one of the developing countries) who have basic computer skills, basically use ICT for performing their administrative tasks. They frequently use ICT for their daily departmental activities, such as: preparing notes, upgrading knowledge, keeping administrative records, and searching information for basic purposes. This underlying argument is supported by Mahmud and Gope (2009), where they stated that very few teachers are using technology as delivery tools, such as in preparing effective presentation materials, and to engage students in active learning. Besides, they believe that introducing and using ICT into their teaching is time consuming. Very few teachers, in big cities of Bangladesh, are keen to use ICT supported delivery tools in their teaching while a significant number of them are still worried about using ICT in their teaching. These contentions were also found in the recent study conducted by Banu (2012) where she stated that teachers are facing many challenges in introducing ICT into classroom teaching due to lack of relevant knowledge and skills. Therefore, to improve this situation, emphasis should be

given in enhancing teachers' ICT skills that largely depend on teacher's professional development programs. Previous research has also shown that a developing country like Bangladesh, needs to concentrate on school-based technology and to improve the training of teachers for the overall improvement of the country's quality of education (Shohel & Banks 2010).

Integrating ICT as an effective delivery tool, is not as easy as learning how to use computers and the internet for basic administrative work. Therefore, teaching faculties need professional development programs not only in computer skills for administrative tasks but also on developing pedagogical knowledge and skills so that they could incorporate ICT in their teaching-learning tasks (UNESCO 2004; Jones 2004). In line with this argument, Balanskat et al (2006) pointed out that inaccurate training program is one of the hindrance for teachers to integrate technology into their teaching. They account this to lack of focus on teachers' pedagogical practices with ICT. Most of the teacher training programs in Bangladesh were criticized as poorly constructed as these failed to focus on teachers' actual needs such as the teachers' inability to integrate ICT into their real teaching-learning situation. The teachers, who had participated in training program to use ICT in teaching, still could not integrate it effectively into their tasks, except in demonstrating their basic generic skills such as operating a computer unit, a printer, and in performing simple administrative tasks. This argument is supported by Bingimlas (2009, p.240) who stated that the training programs only "focused on teachers acquiring basic ICT skills and did not often teach teachers how to develop the pedagogical aspects of ICT". Based on these arguments, this study proposes a model that is grounded on TPCK framework that entails the integration of ICT in terms of specific content and pedagogical knowledge

INTEGRATION OF ICT IN TEACHERS' TRAINING PROGRAMS IN BANGLADESH

Integration of ICT in teachers' training programs focuses on incorporating essential subject content, knowledge from their particular disciplines and also requires more hands-on practice of using ICT in their particular disciplines. Therefore, teachers' pedagogical knowledge and technical abilities on using ICT is the first issue to consider ICT integration in teaching in Bangladesh. The teachers' ability to use ICT in their administrative activities is not a condition to successful integration of ICT in teaching. There is more to preparing teachers to benefit from ICT integration along with pedagogy than just improving their computer skills. Integration of ICT cannot be archived in just one short training session. Extensive and enduring training is required for the integration of ICT and pedagogy together. This argument is supported by previous research. For example, Diaz & Bontembal (2000, p.50) noted, "using technology to enhance the educational process involves more than just learning how to use specific piece of hardware and software. It requires an understanding of pedagogical principles that are specific to the use of technology in instructional settings." Therefore, the development of proper pedagogical knowledge and its appropriate application to ICT are considered to be more crucial than the technical ability of using ICT (Bingimlas 2009). In contrast to this theory, the few teachers in Bangladesh who have technical mastery in using ICT in their teaching, still do not have sufficient competency to incorporate ICT and pedagogy for their particular disciplines. Moreover, most of the teachers typically do not have a comprehensive knowledge of the wide range of ICT tools and resources for integrating ICT effectively, even in the most technologically advanced schools in Bangladesh. For example, Viqarunnisa Noon School, International Turkish Hope School, Rajuk Uttara Model School & College, Willes Little Flower School have ICT courses but still cannot properly integrate ICT into their teaching-learning environment (Banu 2012). In order to improve, teachers' mastery in relation to using technology into their teaching, a three phases model for integrating ICT into teacher training programs in Bangladesh is proposed, which is based on TPCK, is illustrated in Figure 1 and 2. For the sake of clarity, TPCK framework is briefly elaborated in this paper before discussing the proposed model.

TPCK FRAMEWORK

Koehler and Mishra (2005, p.132) presented a framework in a paper entitled, 'What Happens when Teachers Design Educational Technology? The Development of Technological Pedagogical Content Knowledge', which described teachers complex understanding between technology, pedagogy, content and knowledge. The framework intends to facilitate thorough understanding of the fundamental components of knowledge for the effective use of technology, namely:

(i). *Content (C),* is the subject knowledge which students need to learn or be taught with. For example: different forms of mathematics, the structure of atoms, growth and heredity of living organism, agricutural practice in Bangladesh and international perspective, agricultural technology and climate, etc are the subjects content for the grade eight level.
(ii). *Technology(T),* includes modern technology, both hardware and software, such as: computer, internet, television, videos, interactive whiteboard, and overhead projector.
(iii). *Pedagogy (P),* is another element of knowledge which depicts the practices, processes, strategies, procedures and methods (instructions, assessment, etc) of teaching and learning.
However, they claimed that their framework proposed four elements, which is internally connected with the above there components. For instance, figure 1 below shows P and C components together constitute *'Pedagogy Content Knowledge'* which highlights the knowledge that makes the content of the particular subject area, difficult or easy to learn. Similarly, P and T components constitute *'Technological Pedagogical* Knowledge' which emphasizes how teachers' subject knowledge is transmitted with the use of technology and C and T components together constitute *'Technological Content Knowledge,* which focuses on how teachers' technological knowledge supports their pedagogical practices. Consequently, all these combinations collectively formed the TPCK framework.

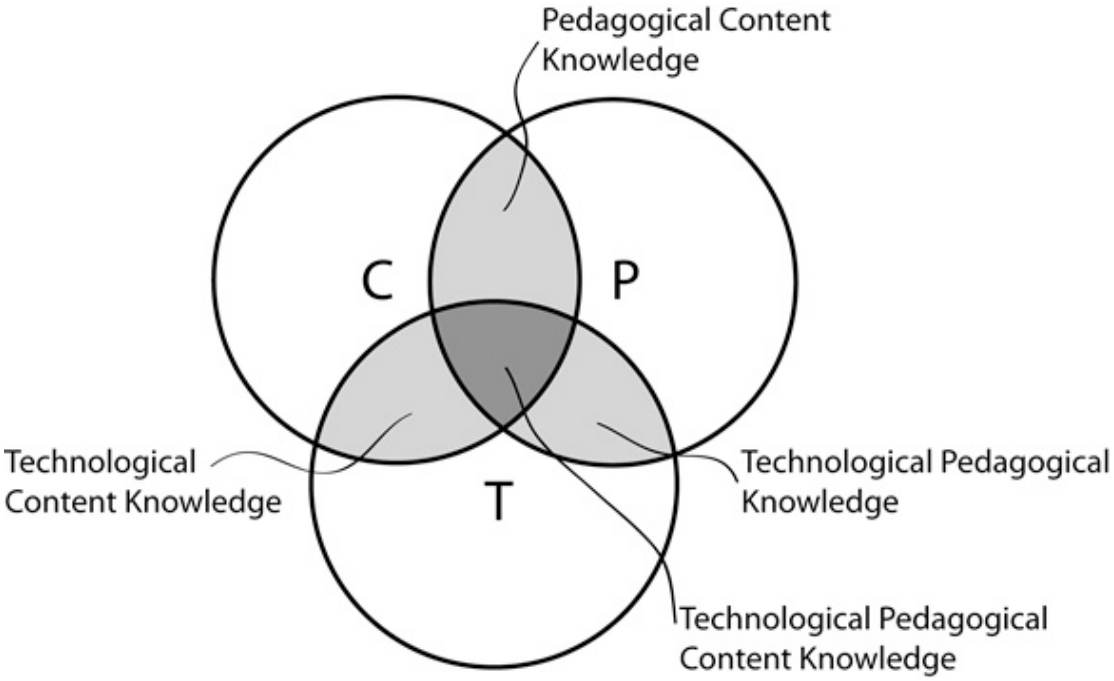

Figure 1: *ICT integration based on TPCK model (Koehler & Mishra 2005).*

TEACHER TRAINING MODELS

Based on the previous research and arguments, this paper envisions that the effective use of ICT in teaching in Bangladesh will be easier if the TPCK framework is applied in the three phase teachers' training models as follows:

Phase 1 (Pre-service): This is the first stage of the model where initially interested novice students, or the students who wish to enter teaching profession in the future, are enrolled. At the beginning, trainers should consider the trainees as novice in the professional development arena. The novice trainees typically have few common characteristics. For example, they might not have prior teaching experience, or they have very few content knowledge and they might not have any pedagogical knowledge in their respective disciplines. Considering such characteristics, the TPCK framework is implemented that comprises of preliminary training on pedagogy with content, use of various ICT supported teaching tools, and use of ICT in administrative and management tasks. Emphasis should be given on using ICT tools in teaching-learning situation in general content area. Both private and public (government) teacher training institutions can execute this phase successfully by focusing TPCK components. These teacher training programs are executed through degree program offerings such as Bachelor in Education.

Phase 2 (In-service): During this stage, experienced teachers currently work as teachers in educational institutions in Bangladesh are enrolled in enhancement training programs, referred to as in-service trainings. Before the conduct of such programs, trainers should consider few significant aspects, such as: characteristics of trainees, mode of training, and component of TPCK models. Here the trainee teachers typically have few familiar characteristics. For example, they have previous teaching experience; they probably have content and pedagogical knowledge in their particular disciplines that is not yet sufficient or they still lack the expertise for integrating pedagogy and content knowledge. The training program is carried out in planned face-to-face settings as well as in flexible learning opportunities such as: distance learning or in some extent e-learning. The TPCK components are selected based on the participants' pre-service training, their prior characteristics and their actual needs. For example, a science teacher who has been teaching science disciplines for ten years might have both content and pedagogical knowledge, but has yet to master the integration of ICT into content and pedagogy. This teacher then needs a training program that primarily focuses on integration of ICT with a connection of TPCK model. Bangladesh Open University, Islamic University of Technology and other private and government institutes can drive this phase.

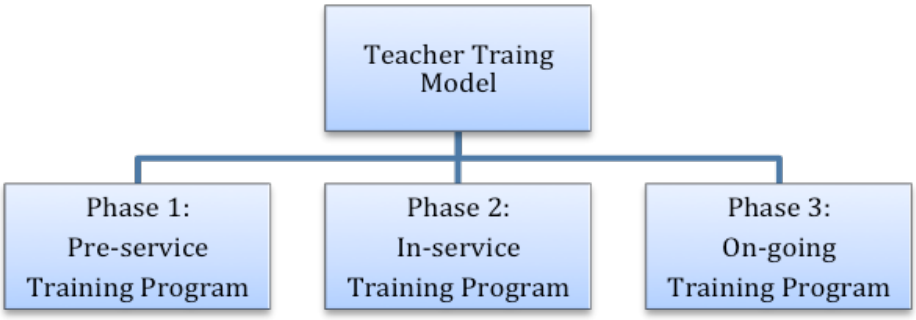

Figure 2: *Teacher Training Model of Bangladesh.*

Phase 3 (On-going): This is the continuing step for this model where on-going formal and informal training are offered based on the participants' specific needs and requirements. Therefore, The TPCK components are selected based on the participants' acquired knowledge from pre-service and in-service training programs. More specifically, a teacher who participated in the first two phases of the training model might not need intensive training if he can effectively apply his training experiences in teaching tasks. Since technology is changing rapidly and discontinuous ever changing (Levinthal 1998; Deeson 2006), teachers need to continuously update their teaching skills based on the recent contribution from TPCK model (Levinthal 1998; Deeson 2006). To be abreast with this change, teachers need to keep updating their teaching skills through continuous (on going) professional development programs, such as short training program, workshop, seminar, conference, action research, etc. The relationship between the teachers and the researchers is very important to update their content (both subject and pedagogy) and procedure (how to integrate technology) which is explained through TPCK model (Morais, Neves & Afonso 2005). This phase does not require any specific training institutions. Teachers' professional development, in this phase, includes the use of inquiry methods like the conduct of classroom-based (action) research or a small-scale experimental research. These are learning opportunities for teachers where they create and pilot test tentative teaching approaches and related activities that they are expected to use in their teaching-learning situations (Morais, Neves & Afonso 2005). Therefore, the target teachers in this model need to collaborate or work together with their institutions to carry out this phase so that they can cope up with an updated TPCK model.

THINGS THAT NEED TO BE CONSIDERED FOR EFFECTIVE INTEGRATION OF ICT IN PROFESSIONAL DEVELOPMENT PROGRAMS

Previous research showed that teachers' professional development programs played a significant role in the effective integration of ICT in education (Ho, Watkins & Kelly 2001; Hew & Brush 2007).Therefore, teacher training program has impact on teachers' attitudes and conceptions towards ICT which helps teachers to acquire necessary knowledge and skills to integrate ICT in teaching learning situation (Hew & Brush 2007) which can incorporate with TPCK model. Previous research also found that traditional one-time teacher training (workshop, short training) program is not effective in assisting teachers to build technical competency for using ICT in their teaching-learning situation (Carlson & Gadio 2005). This paper then offers the above three phases (pre-service, in-service and on-going) training model as a best practice, particularly when the following aspects are taken into consideration:

Teacher professional development model predominantly should be focused on pedagogy, content and technology. Unfortunately most teacher training programs do not focus the pedagogical principles which facilitate the use of ICT into teaching learning in Bangladesh. The multifaceted relationship among technology, pedagogy, and content has not been effectively addressed (Okojie, Olinzock & Okojie-Boulder 2006). Therefore, this relationship is to be considered in all the three phases of the training model, depending on the teachers' need. A training needs assessment should come first in all phases of the professional development programs. This model can only make an impact through regular monitoring and evaluation of each action along with having opportunities for feedback to immediately address the problems and obtain continuous support for the effective integration of ICT in the training program. The support could be through online whenever needed, such as: collaboration with trainers and trainees, group discussion, e-mail communities, radio or television broadcasts or other electronic media.

Bangladesh, a developing country, has only been recently bestowed with technology. To implement this training model, the country needs to build up an adequate potential trainers or "resource persons" for all the three phases. Therefore, it has to give emphasis on preparing

potential trainers who can conduct training programs effectively. In order to prepare resource persons, a team, with expert from outside and local trainers, could be formed. This team will facilitate an acceptable mode of training in each of the targeted areas. Multiple strategies, blended approach and flexible training could be offered where circumstance are more complicated and diverse for meeting this demand (UNESCO 2003). For example, individual school will be targeted for implementing this model, and e-learning, distance learning, and collaborative learning modes could be alternative training delivery tools in the remote areas.

Proper coordination should be maintained between the executive body and the training program implementers to ensure continued training of teachers from phase 1 (induction) to phase 2 (in-service) based on the TPCK framework. For executing this model, central coordination by signing MOE with other training institutions should be formed, if required. A centralized training administration system (which is not yet been established in Bangladesh), for all trainees including trainers and other administrative staff, is required to supervise and document the progress on the implementation of this model. The government should formulate policies for integrating ICT into professional development programs and proper initiatives should be taken to accelerate each phase of the model. More training institutions should be opened and necessary budget should be allocated for effective teacher training.

To facilitate the third phase (on going) of this model, teachers, researchers and trainers should have effective networking. In relation with this argument, Morais et al (2005) states that, "teachers' professional development does not depend only on the characteristics of the teacher training processes, but is also influenced by many personal, social and professional factors. The personal characteristics, the working environment at school, the relationships between colleagues, relationships with children's parents and with the community also influence professional development (p.434)". Considering this view, during the on-going professional development phase (third phase), network learning (both synchronous and asynchronous), web based training, which are more flexible and collaborative, are encouraged. In addition more online learning and training, based on all sorts of technologies, will be useful for both teachers and trainers for updating their knowledge and skills during the on-going phase. Moreover, these learning modes could be effective for offering training in diverse and remote training institutes in Bangladesh. These could also assist teachers to build a collaborative network with trainers, colleagues, administrators and other experts for developing their competency for the effective assimilation of technology into their teaching (UNESCO, 2003).

Research found that teachers active participations in their professional developmental programs required additional motivation and incentives (Spillane 1999; Afshari et al. 2009). Hence, teachers' motivation and willingness is considered as another imperative aspect for effective use of ICT during this training model as well as after completing this training. According to Spillane (1999), teachers who have a strong engagement towards their own professional development are more motivated to undertake changes, which lead to a better understanding of using the technology for an innovation. A variety of incentives, motivational techniques (both intrinsic and extrinsic) can be used, such as: formal certification of pre-service (phase-1), in-service (phase-2) teacher training which can be accredited as diplomas or degrees, could be one of the motivational strategies to encourage teachers to participate in their professional developmental program effectively. If teachers are provided with laptops, ICT supported teaching tools, TPCK resource materials and other essential software for integrating with pedagogy and subject content in the teaching-learning scenarios, then their interests in using ICT is stimulated and sustained. Apart from that, participated teachers should be provided with other sort of incentives, such as: teachers' salary could be continued while they are attending the training, and wage increase for those who could successfully implement the TPCK model. In addition, teachers should be encouraged morally through granting of awards and recognition, for upgrading their knowledge and skills in the domain of pedagogy-content-technology for effective integration of technology in

their teaching.

CONCLUSION

Teachers' academic development becomes an integral part of any successful technology and education-training program (Afshari et al, 2009). It has a potential influence on how effectively ICT is integrated in the teaching-learning situation. Many countries in the world, including Bangladesh, have acknowledged the significance of ICT in teaching and learning and they have introduced training programs in different variations (models). But still the country is far behind from integration of technology in education due to complexity and inappropriate training of teachers. Under these circumstances, this simple model, herein proposed in this paper, can open up new experience, inspiration or blessing for teachers' professional development program in Bangladesh.

To make this model effective for teacher training programs, the above strategies should be carried out to eliminate the constraints and accelerate the provision of all possibilities to improve quality of teacher training. It is already recognized that ICT in education is a comparatively new arena in Bangladesh (khan, Hasan & Clement 2012; Banu 2012). Therefore, more in-depth experimental research should be conducted in regards to integration of ICT in the staff (academic) training program to justify this model. In addition, it requires future investigations to find out its long-term effectiveness along with its cost benefits on different ICT-enhanced training programs (Jung 2005) and to monitor the activities during and after the training in the context of Bangladesh. Finally, a research should also be conducted on the impact of this model on teacher training.

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