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The potential of directed instruction to teach effectively technology usage

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Abstract

Currently, teacher educational systems tend to develop their teachers' knowledge to effectively integrate technology in teaching. Consequently, numerous studies have attempted to describe strategies, models and approaches to develop teachers' knowledge for teaching with technology. However, most teachers are still following their traditional teaching methods regarding their cultural, individual and situational conditions. While teaching technology in traditional form and separated from pedagogy and content has already shown its failure in many studies, this study suggests an advanced directed instruction teaching model for preparing teachers for teaching with technology. In this study, directed instruction teaching model offers a step-by-step process to individually guide pre-service teachers how to infuse the appropriate technology for teaching the selected content. Subsequently, Technological Pedagogical Content Knowledge (TPACK) is selected to define and measure technology integration. The result of this study demonstrated that participating teachers learned technology integration in the new directed setting as well as a constructivist setting. In particular, this study pointed out how the suggested directed instructional teaching model could be easily situated in the traditional setting and helped non-constructivist teacher educators in collaborative or individual learning.

Keywords: directed instruction, instructional technology, teacher education, technology integration, TPACK

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1. Introduction

Considering the important role of computer technology in the 21st century, there is no doubt that preparing students for the future requires equipping them with computer technology skills. Thus, for engaging students with appropriate technology-based learning experiences and preparing educators for successfully structuring and supporting students' experiences, developing teachers' knowledge seems essential (Sivin-Kachala & Bialo, 2000). However, according to Cradler et al. (2002), the current educational system is facing a new challenge of determining how to establish and implement strategies for developing teachers' knowledge to effectively use technology in teaching.

In this regard, some studies attempted to describe strategies, models and approaches that help to develop teachers' knowledge for teaching with technology. In particular, a number of studies have yielded consistent findings on the accommodation of constructivism paradigm for the development of teachers' integration knowledge based on TPACK (Angeli & Valanides, 2008; Niess, Suharwoto, Lee, & Sadri, 2006; Wang, 2009; Willis, 2001).

While, many studies acknowledged constructivism as a fruitful environment for developing technology integration knowledge and particularly TPACK, some evidences indicated that teachers are not able to establish this environment. In fact, studies showed that teachers and students are not easily able to adapt their traditional method and condition with constructivist requirements (Hosseini and Tee, 2012). For instance, one of the important requirements of the constructivist environment is doing collaborative activities in which students usually work as a team and learn through discussion (Han and Bhattacharya, 2001). Lack of a collaborative culture in traditional educational systems can result in some behaviour of the learners that appeared to bring tension in the class. Also, culture affected the participants' behaviour in the class and often appeared as a hindrance to develop their knowledge in many forms. The culture of giving importance to competition more than collaboration made many participants to be secretive during their work (Hosseini and Tee, 2012).

On the other hand, directed instruction which has been refined and developed for decades offers detailed packages and training materials suitable for almost any teacher. Further, it has been proven successful with students of virtually any background. It is focused on a classical education, giving real competence in reading, writing, and math to enable kids to soar in their educational future. While constructivist environment needs a teacher who has accepted constructivism as the philosophy of teaching, many current teachers are used to teach in directed instruction and are not able to easily adapt themselves with constructivism assumption. Also, many students in the current educational system have a wrong expectation from a teacher. They prefer the teacher who gives them lectures and assignments and fulfil the role of transmitter of the content (Hosseini and Tee, 2012; Tee and Lee, 2011).

Now, there are two important facts. On one side, many studies have indicated that teaching technology isolated from the context and just as technology skills cannot prepare teachers for teaching with technology (Ikpeze, 2009; Koehler et al., 2007; Niess, 2006; Reeve, 2008). On the other side, creating the constructivist environment in traditional systems needs some requirements such as teachers' philosophy, cultural background of student and teacher and some institutional conditions. This conflict has created a big challenge for educators who are responsible to prepare pre-service and in-service teachers for teaching with technology. Hence, this study attempts to introduce an advanced directed instructional teaching model as a potential model which can be used in the traditional systems for preparing student teachers to integrate technology in teaching.

2. Methodology

A case study was conducted to understand the effectiveness of the directed instructional approach to increase teachers' knowledge for integrating technology in teaching. The participants of the study included the students in the field of instructional technology in bachelor degree who enrolled in the

'Individual Project' course as the one of compulsory courses in their degree. All students were in the last year of their study.

Directed instruction teaching method was used as the approach to develop teachers' knowledge for teaching with technology. The term 'Direct Instruction' refers to a rigorously developed, highly scripted method for teaching that is fast-paced and provides constant interaction between students and teacher. This study is suggesting the advanced model of directed instruction which has potential for developing teachers' knowledge for technology integration. Concurrently, technological pedagogical content knowledge (TPACK) was used as the framework to define and measure the ability of participant to integrate technology into teaching. TPACK, introduced by Mishra and Koehler (2006), refers to the complex interrelationship among a teacher's technological knowledge, pedagogical knowledge and content knowledge. TPACK emphasises the use of technology as a new tool which is not merely added as an item to the curriculum. TPACK is the intersection of three kinds of knowledge: Technology knowledge, Pedagogical knowledge and Content knowledge. The data was collected through observations, interviews, documents and projects to track participant's development of technology integration knowledge. The data was coded according to TPACK development, regarding directed instruction stages.

3. The Suggested Teaching Model: Directed instructional

As mentioned before, many studies have indicated the failure of traditional method to develop teachers' knowledge for technology integration. However, implementing the constructivist environment needs many requirements which cannot easily fit in traditional educational systems. In this study, the researcher asserts the suggested model of directed instruction as an approach which can offer thick and clear steps for development of technology integration and particularly TPACK (see Fig. 1).

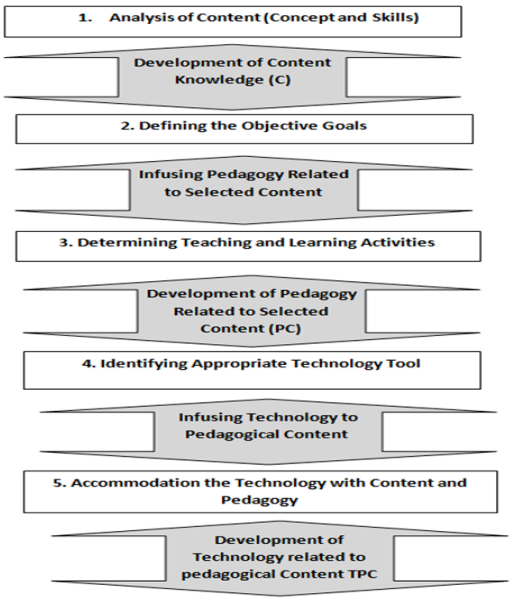

Fig. 1. The suggested directed instruction model for teaching technology integration

Directed instruction suggests teaching – learning activities while doing individual projects. It can be assumed as a guidance for experienced and inexperienced educators and helps them to guide and

track student teachers for learning how to integrate technology into teaching. The process of implementing the suggested directed instruction model includes five steps.

3.1. Step one: Analysis of the Content

3.1.1. Selecting the Subject

To start the project, the participants were asked to select a subject. They were suggested to select the topic which they were proficient at or they were able to gain knowledge about easily. Math, Science or Literature were main fields that different participants may select according to their interests.

3.1.2. Limiting the Topic

Each subject or topic should be specific to be considered as the content for teaching. Since each learning subject belongs to unlimited content area, in the first step participants were asked to determine the limitation of content to specify it.

3.1.3 Determining the Key Concepts and Skills

In this stage, the participants were asked to find and define main information, concepts and skills related to the content. However, there were some key concepts for understanding the course which might not be included in the student books, but it would have been necessary for students to learn it as the prerequisite for the new concepts. Analysis of content helped the participants to develop their content knowledge, which is the basic knowledge for developing technology integration.

3.2. Step Two: Defining the Objective Goals

3.2.1. Recognising the Domain of Learning

When the content and its concepts were specified, the participants were asked to describe the expectations of learning for the particular content. These learning expectations should have been described as learning outcomes or objective goals. Bloom taxonomy (1994) was suggested as a guide for this activity. According to Bloom taxonomy, domains of knowledge is categorised to three domains namely cognitive, affective and psychomotor (see Fig. 2).

3.2.2. Demonstrate the Level of Learning

Each level of learning goal requires special learning activities and specific technology. Therefore, when the key concepts were determined and domains of learning goal were recognised, the participants were asked to define the level of learning for every learning goal.

In step 2, the participants involved the activities which helped them to make strong relationship between content and pedagogy.

3.3. Step Three: Determining the Teaching- Learning Activities

3.3.1. Elaborating Teaching Method

To achieve objective goals, different methods of teaching were estimated. There were many methods that participants could choose for teaching the particular content such as Lecture, Class

discussion, Debates (informal and formal) Panel discussion, Gaming and simulation, Oral reports and Brainstorming.

3.3.2. Establishing Student Activities and Assignments

To reach every objective goal some activities are required. These activities should be predicted and organised in every good instructional design. The suggested activities could be simple and passive such as listening and watching or could include more action like some real experiences and implementing.

3.3.3. Selecting Evaluation Method

Evaluation is the process that cannot be limited to an exam or quiz at the end of the program or session. Therefore, during designing for technology integration, the participants were asked to think about continuous learning evaluation of students. The continuous evaluation provides right feedback to enhance teaching and learning process.

3.4. Step Four: Identifying the Appropriate Technology Tool

3.4.1. Finding Out the Technology of the Content

Finding information such as graph, image and video related to the selected content was the task in this stage for identifying appropriate technology tools. Availability and accessibility of digital resources helped designers to find and select the proper technology according to the content.

3.4.2. Studying Different Tools for Different Teaching Methods

Knowledge about learning tools was a need for the participants to be able to develop their technology integration knowledge. Tools for presentations, collaborative learning or problem solving methods are different. Edgar Dale (1900-1985) cone can guide the designers to select appropriate technology according to the field or level of learning goals (see Fig. 2).

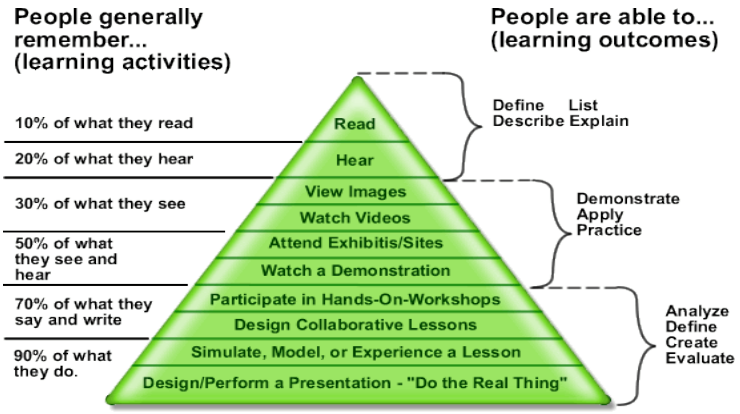

Fig. 2. Edgar Dale Cone for Selecting Technology Tools

Dale's 'Cone of Experience' provides an intuitive model of the concreteness of various kinds of audio-visual media. Also, it refers the "Cone of Learning," which informs viewers of how much people remember based on how they encounter information.

1.1. Step Five: Accommodating Technology, Content and Pedagogy

At the last part of designing in directed instruction model, the participants need to accommodate content, pedagogy and technology together. The priorities due to individual differences among the designers make them to decide and implement teaching and learning differently. They decide how to implement their technology integration according to their views. They may decide teaching with more or less interaction among students and teacher. They may decide to use technology in the teacher-oriented or student-oriented contexts. They can select when and how to receive or give feedback to their students. However, in every decision, technology is an amalgam with their pedagogy and content.

2. Results

In this study, the participants were asked to provide their instructional design according to suggested directed instructional model. In fact, they were directed by the instructor to go through each step for learning how to integrate technology in teaching. Table 1 indicates the summary of the part of instructional design which Case A prepared. Her instructional design explains the sequence of infusing technology to pedagogy and content. She selected "*Subtraction*" as the subject to teach with technology. In the first step, she decided to teach this topic for the

Table 1. Case (A) activities for designing "Subtraction"

Key concepts	Objective Goals	Teaching and Learning Activities	Finding Appropriate Technology	Fitting Technology, Content and Pedagogy
1. concept of lessening [the basic concept in subtraction]	Student learns how 'eating' makes a subject get less.	A basket of apple is given to students and students are asked what happens when they eat apples.	Experience by doing activity in the real condition.	Teacher starts her teaching with offering an apple from the basket and asked them what is happening every time one student pick of and eat the apple. Then teacher asked students to repeat together "it gets less". Again she asks the student to count how many is in the basket and again after eating ask student to repeat together "it is lessening" she repeats the concept of lessening many times and then ask students if they know any other ways that things get less. Make a discussion before going to the next concept of lessening as "going".
	Student learns how 'going' makes a subject get less	A video is shown to students and they watch how animals leave their group one by one and group gets less.	Watching a video or clip [movement is needed]	
	Student learns how 'fading' makes a subject gets less	A video or clip is shown to students and they watch how clouds in the sky fade and get less.	Watching a video or clip [movement is needed]	
	Student learns how 'flying' makes a subject get less.	A video or clip is shown to students and they watch how birds are flying one by one and get less in their group.	Watching a video or clip [movement is needed]	
	Student learns how 'picking up' makes a subject get less.	A couple of pencils are put on the table and students are asked what happens when they are removed one by one.	Experience of observation in a real location	

first grade in primary school. According to the level of her learners, she identified the main concepts as "*lessening, remaining, expressions of subtraction and symbol of subtraction*".

PCK was developing when the student-teacher as Case (A) selected the proper teaching and learning activities. When she decided how to teach the subject matter, she was asked to study many technology tools to find out the appropriate techniques for teaching a particular content. In this way, she made a relationship between technology and pedagogical content. Finally, she made

interrelationship between three basis knowledge as content, pedagogy and technology and formed TPACK as the knowledge of technology integration. All these activities of the participants were directed and conducted under supervision of the instructor in a guided learning environment. Other students were guided in the same path although their subjects were different. They were following the instructor's guidance step-by-step until they could make a good relationship between pedagogy, technology and content.

3. Conclusion

The current educational systems are well adapted with traditional teaching methods but have been shown to fail in preparing teachers for teaching with technology (Flick and Bell, 2000; Koehler, Mishra & Yahya, 2007; Vrasidas & McIsaac, 2001). Therefore, many studies acknowledged using constructivist environment to develop the knowledge of teaching with technology (Angeli and Valanides, 2008; Niess, Suharwoto, Lee and Sadri, 2006; Wang, 2009; Willis, 2001). However, some social, individual and situational barriers have been reported to change the traditional educational systems to constructivist environment (Tee & Lee, 2011; Hosseini & Tee, 2012). It has created a new challenge for teacher educational systems. In this regard, the result of this study demonstrated that participating teachers learned technology integration in the new, adapted setting as well as a constructivist setting. In particular, the study pointed out how directed instruction could be easily situated in the traditional setting and helped non-constructivist teacher educator to teach pre-service teachers with a guided learning method in individual activity. Accordingly, this study suggests the advanced form of directed instruction model for teacher-centric environments and applicable in traditional systems. Simultaneously, directed instruction was suggested as the potential approach to develop teacher's knowledge for technology integration.

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