



Relationship of Pedagogical Skills and Content Knowledge with Pedagogical Design Capacity in Higher Education of Pakistan

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Abstract

Pedagogical content knowledge is a special type of knowledge possessed by the teachers that not only unravels the teachers' understanding of the content but also explains how to teach content (Knowledge of Pedagogy) effectively. The purpose of study was to check the relationship of teacher educators' pedagogical content knowledge and pedagogical skills with their pedagogical design capacity. Purposive sampling technique was applied for selecting 200 teachers' educators of the Departments of Education of public universities of Punjab and colleges of education in Pakistan. The questionnaire was used for data collection and Pearson's correlation used for data analysis. The results revealed that a significant and moderate relationship existed between teachers' PCK and PDC. The result showed a significant and strong relationship between teachers' PS and PDC. It is concluded there was a noteworthy and moderate connection between educators' PCK and their PDC and positive connection existed between educators' PCK, PS, and their PDC.

Key Words: Pedagogical Skills, Content Knowledge, Pedagogical Design Capacity

Introduction

Pedagogy is the act of teaching together with its attendant discourse. It is what one needs to know, and the skills one needs to command in order to make and justify the many different kinds of decisions of which teaching is constituted (Alexander (2003). Watkins and Mortimer (1999) define it as 'any conscious activity by one person designed to enhance the learning of another'.

Shulman (1986) described pedagogical content knowledge (PCK) as the most useful forms of {content} representation.....the most powerful analogies, illustrations, examples, explanations, and demonstrations -- in a word, the ways of representing and formulating the subject that makes it comprehensible for others".

Pedagogical design capacity (PDC) is the capacity enabling teachers to engage in the design activities of teaching through two actions: perceiving and mobilizing existing resources (personal and curricular) to design instructional episodes (Pea, 1993; Ball & Cohen, 1999; Brown, 2002; Brown & Edelson, 2003; Brown, 2009). The main purpose of this study to investigate the relationship of pedagogical skills and content knowledge with pedagogical design capacity between teacher educators of colleges and universities in Pakistan. This paper focuses on the actual performance of teacher educators at colleges of education and university. The study was delimited to all teacher educators of colleges of education and education department of public universities of Pakistan.

Statement of the Problem

The main focus of this research is to find out the relationship of teachers educators' content knowledge regarding subject matter, knowledge about their pedagogy and skills regarding assessment and evaluation and discipline in teaching and pedagogical design capacity regarding their performance in real classroom.

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Objectives of the Study

The objectives of the study included exploring the teacher educators' pedagogical skills, pedagogical content knowledge with pedagogical design capacity at higher level.

Research Hypotheses

H₀₁: There is no significant relationship between Pedagogical Content Knowledge scores and pedagogical design capacity scores of teacher educators.

H₀₂: There is no significant relationship between pedagogical skills scores and pedagogical design capacity scores of teacher educators.

Significance of the Study

This study would be significant for the teacher educator to understand their problems rooted in content knowledge in real classroom setting. This study also provided a strong implication for the teachers to utilize their PCK into practice. It might also help the teachers by utilizing the findings of the study which provided ways to manage control and discipline of the classroom for creating conducive learning environment. The results of this research would be best asset in the current literature as it was the first attempt to find PCK, PS, and PDC in a single study. The results of the research would be implacable for improving or modifying the teacher education programs to focus on content knowledge and teacher skills in relation to pedagogical design capacity.

Literature Review

Pedagogical Content Knowledge (PCK)

The knowledge of teaching content is deeply rooted in the daily work of teachers (Opasola, 2009). However, it is not the opposite of theoretical knowledge. It includes theories learned during teachers' preparation and the experience gained from ongoing school education activities (Nkkuhe, 1995). The development of knowledge of teaching content is influenced by factors related to the teacher's personal background and work environment. PCK is deeply rooted in the experience and assets of students, their families and communities (Prosser, & Trigwell, 1999; Raheem, 2010).

It is considered as a mixture of content and pedagogy. It is uniquely constructed by teachers and is, therefore, a "special" form of educator's expertise and understanding. PCK is also called 'process knowledge'. It contains comprehensive knowledge of the wisdom that teachers have accumulated in teaching practice. The four elements i.e. education, students, subjects and courses are considered by the teachers while considering PCK. It needs to be addressed in the context of a diverse approach to teaching (Chou, 2008).

Shulman (1986) who was the pioneer of introducing this term states that the concept of PCK is not new in the field of education. He was interested in expanding and improving the knowledge of teaching and teachers' preparation. He views that the content of the curriculum ignores the pedagogical practices of the teachers. Furthermore, education only emphasizes CK while he believes that the development of general teaching skills is not enough to prepare for content teachers. In his view, the key to distinguish the basis of teaching knowledge lies in the intersection of content and pedagogy (Shulman, 1986; Iyewarun, 1989).

Shulman also throws light on the purpose of PCK lies in interpretation and transformation of the subject knowledge by the teacher in the context of promoting students' learning. The key elements of PCK mentioned by Shulman (1986) are as under.

1. General teaching knowledge (or teaching strategy).
2. Topic representation knowledge (CK)
3. Understand the theme of the student and the meaning of learning and teaching related to a specific topic; (teaching needs)-

In order to achieve what he calls teaching-based knowledge, he includes other elements such as course knowledge, educational background knowledge and knowledge of educational purposes (Shulman, 1987). Singh and Rana (2004) and Abuseji (2007) suggested that if a teacher wants to be effective in classroom he/she needs to be more than subject-oriented. He/she has to be more concerned about the pupil rather than to be only good at the subject. It is certain that if one tries wholeheartedly and consciously, one can become quite effective and accomplish wonders in the class.

Theories related to Pedagogical Content Knowledge

PCK is generally considered to be a transformation of at least two knowledge components: general teaching knowledge and subject knowledge. In this context, the views of Tamir (1988) are most interesting who view that PCK includes teaching knowledge and subject knowledge. Furthermore, the knowledge possessed by the teachers in Tamir's point of view consists of two sub-groups i.e. professional teaching knowledge and general teaching knowledge. PCK explains how to change the theme of a particular topic to communicate with learners. It includes an understanding of what is difficult to understand on a particular topic, the concepts students bring to learn these concepts, and the teaching strategies tailored to this particular teaching situation. To teach all students to meet today's standards, teachers need to understand the depth and flexibility in the subject so that they can help students to draw their own ideas, connect one idea to another, and redirect their thinking to create powerful learning. Teachers also need to understand how to provoke thoughts in the field and everyday life.

In summary, there are many definitions, perceptions, and models of PCK in the literature. Although many researchers have studied the nature of PCK, still the definitions and components are unclear or ambiguous (Abell, 2007; Gess-Newsome, 1999). To understand the teaching process and understand the influence of teacher knowledge on teaching, it is necessary to reduce the complexity of teaching concepts and context: "Scholars must narrow the scope, focus on thinking, and formulate problems in a simple, not a complex way" (Shulman 1986). Each researcher defines and interprets PCK through different models and components. Therefore, each model of PCK has different knowledge components and subcomponents and provides a different interpretation of the relationships between these components. However, subject knowledge and teaching knowledge are common in every model. Therefore, this study includes these two components of the PCK and considers them important for research because:

- When teaching a topic, the teacher's behavior depends to a large extent on their in-depth knowledge of the content of the lesson, making it an important part of their continuous learning.
- Research on teachers' CK links PK with the subject matter knowledge. Hence PCK is a strong knowledge base for creating skillful teachers.

In this connection, the next section will discuss the research status of PCK and its impact on the development of teacher education programs.

Research Status of Pedagogical Content Knowledge

Friedrichsen (2008) views that PCK is an exclusive form of knowledge that directed by the teacher educators as well as researchers about what type of knowledge is required for effective teaching. As mentioned earlier, Shulman (1986) maintained out that teachers should have specific knowledge about the subject matter, program-related content through the introduction of the concept of Pedagogical Knowledge in the area of teacher education. He continues PCK is the unique knowledge that needs to transform the knowledge required for teaching. Moreover, it is also required to express subject knowledge which is a unique component of teaching-learning process. In addition, Magnusson et al. (1999) unambiguously adopted Shulman's point of view and commented that PCK is a transformation of several forms of teaching knowledge (including subject knowledge). It also symbolizes the specific areas required for teacher's knowledge. In contrast, Masters(2010) argues that PCK and CK cannot be clearly discernible as components of knowledge. Cochran et al. (1993) also agreed and stated that teachers' General Pedagogical Content Knowledge (PCK) evolved over time because the teachers became aware of the needs of students with the passage of time and experience. Veal and MaKinster (2001)

referred to another level of knowledge that contributed to the development of teachers' PCK. It ranges from the lowest general PCK to PCK for specific topics and also from the domain-specific PCK to PCK for specific topics.

Loughran, J., Mulhall, P., & Berry, A. (2008). have studied theoretical aspects of the components of PCK and identified 12 interactive elements of the PCK. Padilla et al. (2008) investigated four elements of PCK. On the other hand, Halim and Meerah (2002) surveyed 12 in-service teachers from different scientific backgrounds. They asserted that rich CK was critical to develop a comprehensive PCK. De Jong et al. (2005) and van Driel et al. (2002) studied novice chemistry teachers engaged in macro/micro change and found that university workshops and high-quality coaches helped to focus on their tendency to rebound between macro and micro levels.

Some more researches on PCK indicated that it influenced teaching interaction and experience (de Jong, van Driel, & Verloop, 2005), helped teachers to develop expertise through longitudinal research (Mulholland & Wallace, 2005). Most importantly, PCK could further develop PCK by determining the actual experience of the content (Van Driel, De Jong, & Verloop, 2002).

Pedagogical Skills

Skills constitute a set of abilities of communication, delivery and managing learning in the classroom. Clark and Walsh (2002) argue that with the rise of professional teachers rather than trainee ones, especially classical Greek sophistry, the distinction between topic preparation and subject teaching creates the concept of skills and knowledge. These are independent of discipline and focus especially on pedagogy. Therefore, teachers' knowledge about classrooms, personal knowledge about specific students and their families, assessments, students' motivation, and social interaction skills are considered as PS by Clark and Walsh (2002). Hence, they consider managing classroom as an important pedagogical skill to be learned by the teachers besides seeking the PCK.

The PS enables teachers to understand how to create, organize and relate to other areas of knowledge. In addition, teaching skills enable teachers to understand the preconceptions and background knowledge that students typically bring to each subject. Furthermore, they focus on the strategies and instructional materials, rather than understanding and resolving possible difficulties in the classroom. On a multidimensional scale, Mckenzie (2003) identified seven elements (categories) that are necessary for developing PS of the teachers. These elements include needs assessment, establishing classroom culture, using appropriate teaching strategy, nurturing problem-solving ability, ensuring professional development, managing resources, and orchestration. On administrative aspect, Clark and Walsh (2002) identified teachers' skills to maintain control and discipline in classroom and use of teaching resources to assess and evaluate the students are the key components to determine the PS of the teachers. Hence, this study included 'maintaining control and discipline' and 'assessing and evaluating the students' as key PS.

Pedagogical Design Capacity

Brown (2002) describes PDC as the capability of teachers to recognize materials and decide how to practice them to develop teaching activities that achieve their goals. Furthermore, Brown further concisely outlines it by considering it as an ability of teachers to detect and mobilize existing resources to create educational plays. While the Design Capability Enactment (DCE) framework is primarily about resources and Brown calls it the terminology of communication between teachers and resources, PDC spread over to collaborating verbs and teachers' capability to use their knowledge to complete new things (Ball & Cohen, 1999). Explaining this, Brown adds that PDC represents the skills of teachers in recognizing usability, creating resolutions or decisions and implementing strategies. However these design choices are manifested by way of delivery, adaptation or improvisation is a distinct matter. This is a technique for weaving various modes of use, as well as techniques for weaving several portions of the classroom arrangement, which are markers of teachers with great PDC, rather than they are unloaded, modified or improvised at any given moment. Instead, the PDC describes how teachers create conscious and effective designs to help in achieving their teaching or educational goals.

Brown (2002) uses PDC to describe the differences between the two teachers in terms of the curriculum through comparable properties or instructions designated by framework of DCE. Although the DCE framework

describes different resources, the PDC is also used to describe teachers with similar developments. While Brown has shown that over time, PDCs can know about resources, further research is needed to understand how PDCs are developed. It is also necessary to develop measures for the PDC and to better recognize its role in attaining results.

PDC is the ability of teachers to participate in instructional design activities through two actions: perceiving and mobilizing existing resources (individuals and courses) to produce instructional drama (Pea, 1993; Ball & Cohen, 1999; Brown, 2002; Brown & Edelson, 2003; Brown, 2009). Referring to Brown and Edelson (2003), perception is defined as the ability of teachers to identify and interpret existing resources, assess the limitations of classroom settings, and balance teaching-learning activities. Remillard (2005) describes it as the ability of teachers' identification and attention to potential resources. On the other hand, mobilization emphasizes teachers developing "strategies" and relying on assets or resources (Brown & Edelson, 2003; Land, 2011). To be more specific, ideas and mobilizations are forward-looking and interactive (Clark & Peterson, 1986; Richards, 1996; Borg, 2006; Remillard, 2005). In order to enter the background of the research, active perception means that teachers identify, care, explain and evaluate curriculum resources and student behavior before teaching, while interactive perception represents all actions taken in the course. Similarly, the selection and adaptation of course materials by teachers prior to class is called pre-school activities, and the selection and adaptation of materials completed during the course are called interactive mobilization.

Some research conducted in the context of education has examined PDC and how it can be developed among novice and experienced teachers. Davis, Beyer, Forbes, and Stevens (2007) studied how to promote PDC through teacher narrative. When investigating how four expert teachers mobilized their resource design teaching activities to attract students, Land (2011) found that these advanced PDC expert teachers showed strong knowledge about students. The above studies reveal the possibility of developing a teacher's PDC through on-the-job and ongoing teacher professional development, as well as knowledge of teachers about their students, results in high teachers' PDC. These studies confirm that there is a bridge between the two research lines: teachers use PCK and PS. Nonetheless, their focus is on education and only one type of teacher knowledge is identified. The next section will address the implications of PDC in the classroom.

Method and Procedures of the Study

Research design

The research was descriptive in nature and a survey method was conducted for data collection.

The Population of the Study

The accessible population of this study consisted of all teacher educators of Departments of Education from 11 public universities and 9 colleges of education of Pakistan.

Sample of the Study

The sample was selected through purposive sampling technique and select all teachers (200) of Departments of Education of eleven public universities of Punjab and nine colleges of education as research sample for taking their opinion regarding teachers' PS, PCK, and PDC.

Research Instrumentation

To collect data one self-developed questionnaire was used on five-point Likert scale (i.e. strongly disagree, disagree, neutral, agree, strongly agree) for taking opinion about teachers' PCK and PS, and teachers' PDC.

Data Collection

Data were collected through personal visits to sample colleges and universities of Pakistan.

Data Analysis

The researcher used inferential statistics to infer some generalizations for the target population. The researcher used Pearson correlation to find out the relationship between PKC, PS, and PDC.

Analysis of the Relationship between Pedagogical Content Knowledge, Pedagogical Skills and Pedagogical Design Capacity

This table provides the relationship of pedagogical content knowledge with pedagogical design capacity.

Table 1. Correlation between PCK and PDC

Variables	Pearson <i>r</i>	<i>p</i> -value	Null Hypothesis
Subject Matter Knowledge Pedagogical Design Capacity	0.40	0.011	Rejected
Knowledge of Pedagogy Pedagogical Design Capacity	0.165	0.307	Accepted
Total Pedagogical Content Knowledge Pedagogical Design Capacity	0.367	0.020	Rejected

Table 1 indicates that there was a significant correlation between teachers' subject matter knowledge with pedagogical design capacity as $p = 0.011 < 0.05$. The value of Pearson $r = 0.40$ showed a significant and moderate relationship between teachers' subject matter and pedagogical design capacity.

There was no significant correlation between teachers' Knowledge of Pedagogy and PDC as $p = 0.307 > 0.05$. Furthermore, the value of Pearson $r = 0.165$ showed a non-significant and weak relationship between teachers' Knowledge of Pedagogy and PDC.

The table also showed that there was a significant correlation between teachers' PCK and PDC as $p = 0.020 < 0.05$. Whereas the value of Pearson $r = 0.367$ showed a significant and moderate relationship between teachers' PCK and PDC.

Table 2. Correlation between Pedagogical Skills and PDC

	Pearson <i>r</i>	<i>p</i> -value	Null Hypothesis
Assessment and Evaluation Pedagogical Design Capacity	0.276	0.085	Accepted
Control and Discipline Pedagogical Design Capacity	0.619	0.00	Rejected
Total Pedagogical Skills Pedagogical Design Capacity	0.667	0.00	Rejected

Table 2 showed that there was a non-significant correlation between teachers' skills regarding Assessment and Evaluation and PDC as $p = 0.085 > 0.05$. Furthermore, the value of Pearson $r = 0.276$ showed a non-significant and weak relationship between teachers' skills regarding Assessment and Evaluation and PDC.

It also showed that there was a significant correlation between teachers' skills regarding Control and Discipline and PDC as $p = 0.00 < 0.05$. Furthermore, the value of Pearson $r = 0.619$ showed a significant and strong relationship between teachers' skills regarding Control and Discipline and PDC.

The table also showed that there was a significant correlation between teachers' PS and PDC as $p = 0.00 < 0.05$. Furthermore, the value of Pearson $r = 0.667$ showed a significant and strong relationship between teachers' PS and PDC.

Findings

Major findings of the results indicated that there was a significant correlation between teacher educators' PCK and PDC as $p = 0.020 < 0.05$. Additionally, the estimation of Pearson $r = 0.367$ demonstrated a significant and moderate connection between PCK and PDC.

Results regarding pedagogical skills showed that there was a non-significant correlation between teachers' abilities in regards to assessment and evaluation and PDC as $p = 0.085 > 0.05$. Moreover, the estimation of Pearson $r = 0.276$ indicated a non-critical and frail connection between educators' aptitudes with respect to assessment and evaluation and PDC.

Discussion

The purpose of conducting this study was to explore the relationship of Teacher Educators' PCK and PS with PDC. It was also intended to observe the correlation between Teacher Educators' PCK and PS with PDC beside their comparison based on college and university.

Regarding pedagogical content knowledge, a research was conducted by Sibuyi (2012) in which a case study method was used to examine the PCK of effective teachers and collected qualitative data through classroom observations, course plan analysis, and interviews. The results of the study showed that teachers had sufficient subject knowledge, seemed consistent with the results of the current research. Mishra and Koehler (2006) argued that teachers who had a good understanding of the subject would find a different way to express it and gave learners access to it.

Regarding pedagogical skills research conducted by Angell, Ryder & Scott (2005) how investigated that effective teachers used tools and presentations to improve their teaching efficiency. Westwood (2004) asserted that although the actual management style of expert teachers was different, they were good behavior managers and they were good at motivating learners to learn. The research conducted by Chick, Pham, and Baker (2006) involved teaching techniques for teachers. A qualitative research methodology using a case study design was used in the study. Data were collected through questionnaires, course observations, and interviews. The results show that teachers demonstrated problem-solving skills and had the tools to measure students' learning in the subject.

Regarding pedagogical results, research was conducted by Westwood (2004). He asserted that although expert teachers have different practical teaching styles, they all used teaching strategies to maximize student learning time and participate in learning tasks. Furthermore, they encouraged students to actively participate in the classroom. Also, they ensured that students understood what they needed to do. They also set tasks and activities at the right level to ensure high success rates. Cockburn (2008) declared that while content knowledge was critical to the effectiveness of educators in pedagogy, teaching methods played an equally important role if any learning was to be carried out.

The main objective of this study was to find out the relationship between PCK, PS, and PDC of teacher educators. The results revealed that a significant and moderate relationship existed between teachers' PCK and PDC. Furthermore, a significant and strong relationship exhibited between teachers' PS and PDC. The results of this study are in line with the study conducted by Madeira (2010). The study conducted design-based research which investigated the development of PCK among nine teacher-participants. The results of the study yielded that there was a positive relationship between PCK and PDC of teacher educators. Furthermore, there was also a positive relationship between PS and PDC of teacher educators.

Conclusion

According to the findings of the research, it is concluded there was a noteworthy and moderate connection between educators' PCK and their PDC (Hypothesis 1). In like manner, there was a huge and solid connection between instructors' PS and their PDC (Hypothesis 2). Likewise, the talks of the investigation affirmed positive connection existed between educators' PCK, PS, and their PDC.

Recommendation

This study makes the distinction that college teachers had more PCK as compared to university teachers. Contrary to this, the university teachers exhibited more PS as compared to the college teachers. This implied that the college teachers had to utilize their PCK into practice. On the other hand, the university teachers were utilizing them well in the classroom environment. This conclusion has a strong implication for college teachers to utilize their PCK into practice. Universities are power-generating institutions and their vision, scholarship research and educational conferences have to address these issues on regular basis.

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