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Needs Analysis of Pre-Service Science Teachers about Pedagogical Content Knowledge through Learning Activities

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Abstract

Pedagogical Content Knowledge (PCK) is a composite of content knowledge and instruction knowledge, which can demonstrate the aptitude of to teach a content by accessing what they know about the material ways of teaching that content. PCK develop in learners through different learning activities so that when they come in passion the deal more effectively with students. The objectives of study were; to find out the need of Content Knowledge in Pre-service Science Teachers, to explore the Pedagogical Content Knowledge in Pre-service Science Teachers, to evaluate the performance of Pre-service Science Teachers through Pedagogical Content Knowledge and to compare the Pedagogical Content Knowledge of Pre-service Science Teachers at IIUI and NUML. This study focused on "Need Analysis of Pre-service Science Teachers about Pedagogical Content Knowledge through learning activities". The random sampling technique was used to conduct the study. The study was delimited to the public universities of Islamabad. To achieve objectives of the study mixed method research approach was selected. Keeping in view the research method, survey was conducted through self-developed questionnaire. Furthermore, semi-structure interview was also drawn. Descriptive and Inferential Statics was used to analyze data. Findings of the study showed that the, pre-service science teachers study different courses related to Pedagogy and from those courses they know the method and techniques of Pedagogy.

Keywords:
Knowledge Pedagogical Content Knowledge, Pre-service Science Teachers, Pedagogical knowledge, content, science teaching.

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Introduction:

One of the ways that the role of teachers has the potential to change is the expectation or the desire for teachers to become researchers. Stenhouse persuasively argued that, “it is not enough that teachers’ work should be studied: they need to study it themselves” (Stenhouse, 2012, p. 143). In early times teacher focuses on what to teach the students, which content was taught whereas now in a modern world the term Pedagogical Content Knowledge (PCK) is being used. PCK focus on the strategies, ways and skills used in teaching, those that brings a best learning experience for the students. PCK makes learning more beneficial for the learners through different teaching styles and approaches. The term PCK was first used by Lee Shulman in 1986 in the field of Education.

PCK is a set of traits that support someone transmission the information to others (Geddis, 1993). According to Shulman it embraces “most useful form of representation of these ideas, the most powerful analogies, illustrations, examples, explanations, and demonstration-in a word, the way of representing and formulating the subject that make it comprehensible to others” (Shulman, 1987, p.9). In our opinion, the defining element of PCK is its conceptualization as the result of a transformation of knowledge from other domains (Wilson, Shulman, & Richert, 1988 PCK is defined as a teacher knowledge that plays a crucial role in transferring content knowledge into teaching practice (Kulgemeyer & Riese, 2018)

It is a which is diverse in field of knowledge that was different from both knowledge of the content and general knowledge of teaching (Shulman,1986. Role of teacher is to reduce the gap between understandings of students with learning (Grossman, et al. 1989). A distinctive knowledge to the teacher and is the central knowledge enables to make clear understanding of what to teach and how to teach, (Pesno, 2002). In PCK students will also involve in teaching learning process, they response to teachers if they are confident with their knowledge and easily share their point of view. By this way, teacher knows the errors and misconception if occurs. This helps the teacher to overcome their difficulties/errors. Hence teachers need a proper and brief understanding of the content they teach and the learning strategies through which they make students understanding more easily (Prosser, & Trigwell , 1999; Raheem, 2017). Shulman argued that PCK included “an understanding of how particular topics, problems, or issues are organized, presented, and adapted to the diverse interests and abilities of learners, and presented for instruction (Shulman, 1987, p.8).

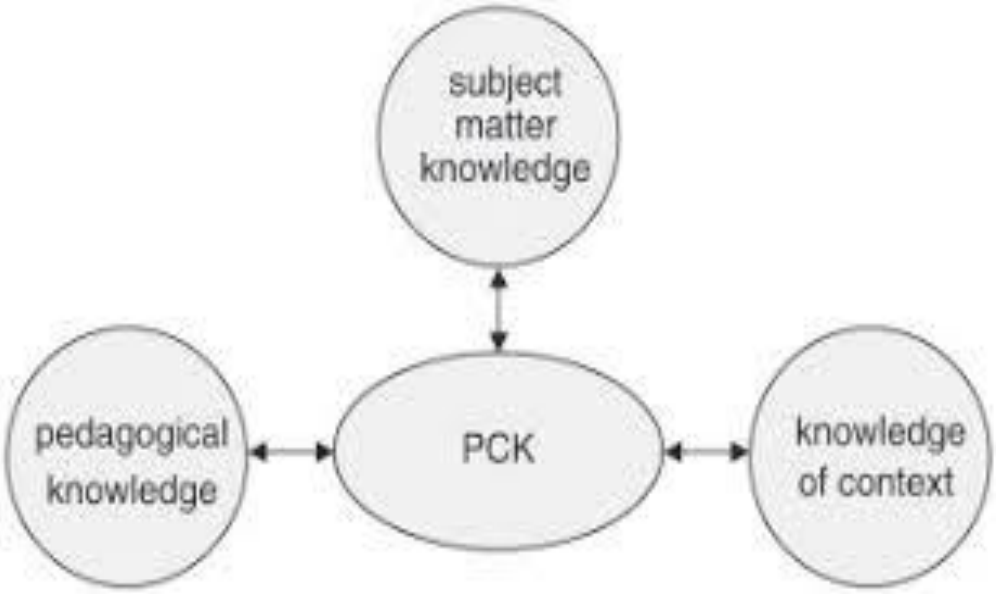


Fig. #1: The model of teacher knowledge

Teaching without understanding is useless and meaningless. Teachers with differentiated and innovative knowledge effects students greater as compared to limited and old knowledge. A best teaching includes both a successful transformation of knowledge and to guide their students for the best understanding of the knowledge given to them. PCK is an ability of teachers so that they help the student in understanding content. Having a PCK in science teachers helps to overcome all technical and academic problems. This study would be significant for Pre-service science teachers, science teachers and departments of social sciences. Its help teachers to clear the concept of students and make their understanding easy and effective by using PCK in their teaching. Faculty of Social Sciences and Department of Education have to introduce pedagogy courses because it is an essential for students as well as for our teachers so that learning become effective and efficient. This study also significant for science teachers to understand their mistakes and errors in real classroom setting. This study provides a strong implication for science teachers to use PCK in their teaching so that, teaching become effective.

Objectives of the Study

1. To find out the need of PCK for pre-service science teachers.

2. To explore the development of PCK in pre-service teachers through learning activities.

3. To evaluate the performance of pre-service science teachers through PCK.

4. To compare the Pedagogical Content Knowledge of pre-service Science Teachers at International Islamic University Islamabad and National University of Modern Languages.

Research Questions

1. Why there is a need of PCK in pre-service science teachers?

2. How PCK can be developed in teachers through learning activities?

3. How PCK are effective in teaching for pre-service science teachers?

4. What is the Performance of PCK in pre-service science teachers through PCK?

5. How PCK helpful for the Pre-service science teachers for improving their teaching?

Hypothesis of the Study

H 01: There is no significant difference between Pedagogical Content Knowledge of Pre-service Science Teachers in IIUI and NUML through learning activities

Delimitations of the Study

1. Study was delimited at university level.

2. It was delimited at National University of Modern Languages and International Islamic University Islamabad.

Literature Review

Pedagogical Content Knowledge

The knowledge of teaching of specific content is intensely fixed in the day-to-day effort of teachers (Opasola, 2019). Conversely, it is also similar to theoretical field of knowledge. It deals with the experience and practices which were experienced by Pre-service teachers during teaching practice (Nkuuhe, 2015). 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, 2016). 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 student's learning. The key elements of PCK mentioned by Shulman (1986) are as under.

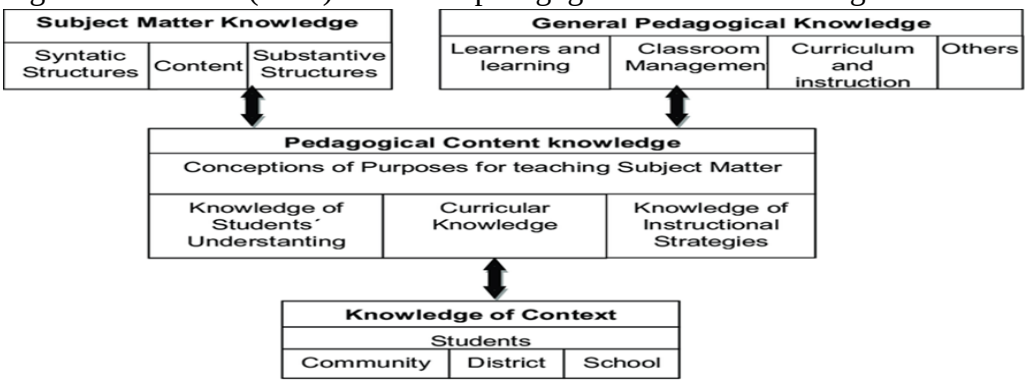
1. General teaching knowledge (or teaching strategy).

2. Topic representation knowledge (CK)

3. Theme based learning of the student and teaching and align to a specific topic; (teaching needs)

To achieve the dimensions of teaching-based learning and mentioned various elements on the course of knowledge and its background and particular purposes. (Shulman, 1987). Singh (2016) and Abuseji (2015) recommended subject orientation is vital for effective teaching in classroom instruction. So, teachers need to be highly concerned with readiness and potential of students as well. It is assured that if teacher tries wholeheartedly and consciously, one can become fairly effective and achieve wonders in the class. The Nature and Key Element of Pedagogical Content Knowledge PCK is a distinctive sphere that is conversant by, but does not totally subsume, some other areas of knowledge. There appears to occur with a mutual relationship between PCK and other basic frame of domains on knowledge, subject and content related topics contextual and pedagogical framework (Fig. 1). The initial knowledge fields inform PCK and PCK impact the teacher's knowledge those defined components (Gess-Newsome, 1999).

Fig. #2: Grossman (1990) model for pedagogical content knowledge



The Grossman (1990) model integrates beginnings of commitments for teaching of subject matter, role of learner, grip on curriculum domains, and instructional approaches as PCK and classifies contextual knowledge, content, and common pedagogical knowledge as mechanisms of the model which play role and impact teachers' PCK. Foundations of teacher knowledge recognized by the

Grossman (1990) model include (a) observation of experienced teachers, (b) education within the background of a definite discipline (e.g., biology, chemistry, etc.), (c) courses during the teaching practice, and (d) experience during classroom instructions. Magnusson et al. (1999) introduces the first model which categorizes on the association among the various domains of teacher's knowledge which include: (1) subject matter knowledge (both substantive and syntactic organizations), (2) general pedagogical knowledge, and (3) knowledge of context, and the centerpiece of teacher knowledge (4) pedagogical content knowledge (PCK).

Magnusson et al. (1999) argue that subject matter knowledge, pedagogical knowledge, and knowledge of context strongly influence the pedagogical content knowledge held by the teacher. Thus, the model depicts the significant influence of subject matter knowledge, pedagogical knowledge, and knowledge of context in shaping teacher PCK.

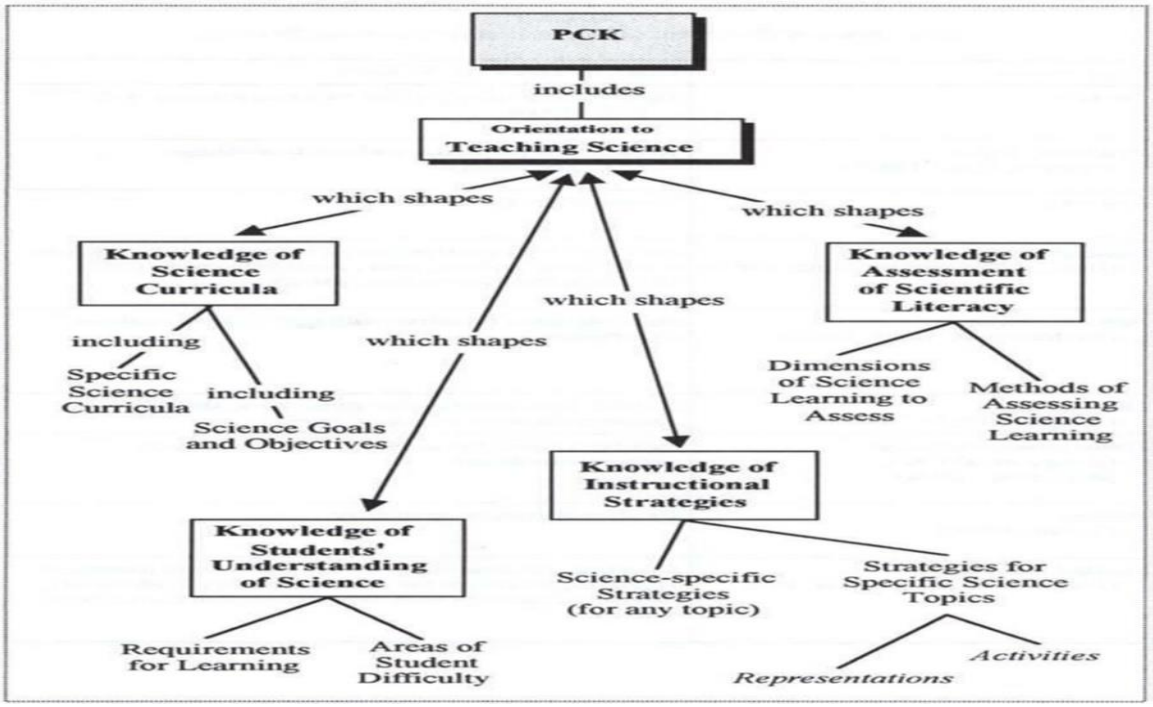


Fig.#3. Magnusson et al. (1999) model of PCK showing the components of PCK for Science Teaching

The Magnusson et al. (1999) model of PCK (see Figure 2.4) is parallel to the Grossman (1990) model with two types of adjustments: (1) conception purpose is converted towards the orientation of science subject teachers; and (2) addition of knowledge of assessment in PCK. Thus,

Magnusson et al. (1999) also unite "five constituents into their PCK model including: (a) orientations toward science teaching, (b) knowledge and beliefs about science curriculum, (c) knowledge and beliefs about assessment in science, (d) knowledge and beliefs about students' understanding of specific science topics, and (e) knowledge and beliefs about instructional policies for teaching science" (p. 97) Magnusson et al. (1999) suggested the alignment to teaching science is dominant to PCK as the lens through which all constituents of PCK are understood, inferred, and combined resulting in an exceptional form of knowledge held by teachers. The model depicts PCK as the result of "transformation of knowledge of content, pedagogy, and context" (Magnusson et al. 1999, p.96). An explanation of the PCK components included in the Magnusson et al. (1999) model of teacher knowledge follows

 Orientation to teaching: Magnusson et al. (1999) describe alignment to teaching science as "the knowledge and beliefs possessed by teachers about the purposes and goals for teaching science at a particular grade level" (p. 97). The orientation that the teacher has for teaching science is a way of conceptualizing science teaching and learning. Teacher orientation acts as a "conceptual map" which focus on the learning objectives and their alignment with curriculum and evaluation strategies (Magnusson et al. 1999, p. 97)

 Knowledge of science curricula: Knowledge of curricula refers to concept of objectives, goals and particular sequence activities for conceptual learning. Teacher's knowledge in this regard reflects on two majors: (a) the required goals and objectives and (b) specification of al learning resources (Magnusson et al. 1999).

 Knowledge of students' understanding of science: This component of PCK refers to the teachers' competencies with respect of individual differences of students. It focusses on the teachers'' abilities to identify the potentials in students and specific difficulties. (Magnusson et al. 1999).

 Knowledge of instructional strategies: As. Instruction methods are the clear reflection of alignment of objectives with actual implementation in classroom settings. So, general methods of teaching e.g., learning cycle General teaching strategies such as the learning cycle are considered for science subject which are included in this component of PCK, as well as topic-specific strategies including ways to represent concepts (models, diagrams, pictures, tables, and/or graphs)

and involve students with instructional strategies (inquiries, conduction of experiments, demonstrations, recreations,) to enable student learning (Magnusson et al. 1999).

 Knowledge of assessment: Knowing facts for effective assessment is significant component of PCK which is further categorized as (a) Domains of assessment in science subject (b) implementation of assessment strategy (Magnusson et al. 1999).

Research Design

Mixed methods research design was used to conduct the study. Population of the study. The population of this study were Pre-service Science Teachers of Islamabad universities. The education department of International Islamic University Islamabad and National University of Modern Languages. The study included BS 7th and 8th semester, MA 3rd and 4th, MS 3rd and 4th and B. ED 3rd, 4th, 5th and 6th Pre-service science teachers. The numbers of Pre-service science teachers were shown in the table below.

Table #1 Population of Pre-service Science Teachers in two universities of Islamabad

Universities	Population of Pre-service Science Teachers	Population of Interviews
IIUI	275	122
NUML	103	85

Sample and Sampling Technique

The Random Sampling Technique was used in this study. The sample of the study were Pre-service science teachers of BS 7th and 8th semester, MA 3rd and 4th, MS 3rd and 4th and B.ED 3rd, 4th, 5th and 6th from International Islamic University Islamabad and National University of Modern Languages. The sample of Pre- service science teachers were shown in the table below.

Table#2 Sample of Pre-service Science Teachers in two Universities of Islamabad

Universities	Sample of Pre-service Science Teachers	Sample of Interviews
IIUI	159	92
NUML	80	73

Data Analysis and Interpretation

Descriptive statics used to analyze qualitative data.

I. Tabular and Graphical representation of demographic factors

II. Percentages, Mean, Standard Deviation and Frequencies of Responses

III. Percentage of Open ended questions

Pre-service Science Teacher's Demographic Factors

Table#3 Groups Wise Representation

Groups	Frequency	Percentage
IIUI	159	66.5%
NUML	80	33.5%

Table# 3 shows the group wise representation of Pre-service science teachers of IIUI and NUML. 66.5% of Pre-service science teachers from IIUI were involved in the study and 33.5% of Pre-service science teachers from NUML were involved in the study as a sample.

Table# 4 Program Wise Representation

Universities	Perceptions	BS	MA	B.Ed.	MS

IIUI	Percentage	34%	39.6%	16.4%	10.1%
	Frequency	54	63	26	16
NUML	Percentage	23.8%	60%	00	16.3%
	Frequency	19	48	00	13

Table #4 shows that program wise representation of Pre-service science teachers. 34% Pre-service science teachers of BS program, 39.6% Pre-service science teachers of MA program, 16.4% Pre-service science teachers of MS program and 10.1% prospective science teachers of B.Ed. program from IIUI while 23.8% Pre-service science teachers of BS program 60 prospective science teachers of MA program and 16.3% Pre-service science teachers of MS program from NUML were participated in the study. Necessity of PCK for teaching in future

I. International Islamic University Islamabad Responses

98% of the respondents stated that yes PCK is necessary for future teaching because it enables the students to understand well and perform well in learning and it gives new ideas to teachers and in teaching effectively. Few responses of the respondents were:

- It helps teachers to give their best understanding to students.
- It facilitates students to learn new strategies
- It is necessary for future teacher to guide their students in a systematic and effective way.
- It is need of learners
- It help teachers to plan and execute their lecture in better way.
- Due to this teacher understands the student's ability and develop critical thinking.

II. National University of Modern Languages Responses

96% of the respondents said that yes PCK is necessary for future teaching because all students are not equal they want different methods of teaching and to learn some extra and to develop new ideas of learning. Some of the responses of the respondent were following:

 It provides the same platform to each and every individual regardless of their sense of individuality when it comes to picking power or now, he/she perceives it.

 By this both students and teachers get benefits to explore their mind in each coming knowledge in the way of their learning.

 Everyone in today world must be educated up to some extent because we know that every field is growing much day by day so it is important for teaching in future.

Effectiveness of PCK for Science teacher

I. International Islamic University Islamabad Responses

99% of the students stated that yes PCK is effective for science teachers, because it helps teachers in creating effective teaching and learning environments for all students. Some of the responses of respondents were:

 It talks about teaching methods to be adopt by teachers while teaching.

 It helps in teaching new concepts which are inter-connected to previous concepts.

II. National University of Modern Languages Responses

93% of the respondents stated PCK is effective for future teaching because it plays an essential role and can foresee the possibility of better understanding and knowledge. Few responses were following:

 It has certainly left its impacts on students and helps in many ways.

 It is worthy for learning

Teaching Science by doing Different Activities

I. International Islamic University Islamabad Responses

100% of the respondents said that only lecture is not enough practical work and different activities are also important for learning science. Most of the respondents said that it is easy for students to understand and because science is an experimental subject in which you demonstrate things in front of your students then your students may understand well and learn efficiently. Some of the responses were following:

 Activities help in understanding of content

 It is effective for science teaching

 Doing different activities gives more grip to knowledge

 Activities enhance the learning process

 Doing activities are essential for learning

 In order to build students interests or in order to enhance their creativity it is important.

II. National University of Modern Languages Responses

100% of the students are agree with doing activities during class, most of the respondents said that it ease the understanding for a variety of reasons and students can start taking interests in various projects and easily confronts the practical aspects of their subjects. Few responses were:

 It builds students interests towards the subjects

 By this student can learn beyond the imagination

Problems faced by teachers during teaching

I. International Islamic University Islamabad Responses:

77% of the respondents said that they face difficulties like shortage of time, students un active role, problems regarding student's behaviors, lack of AVAIDS, understanding of student's psyche, and lack of interests in subjects. Some of the responses of respondents were

 Lack of interaction with students

 Sometimes students do not cooperate

 Class strength issues

 Course content are sometimes beyond the limit of understanding of students.

 Unavailability of proper material for practical demonstration

 Different mental levels of the students

 Discipline issues

 Language problems

 To cover the whole topic with activities in a period of 45 minutes

II. National University of Modern Languages Responses

61% of the respondents stated following problems like handling the students is one of the most difficult problem and different mind levels of the students, strength issues, and cooperation of the students. Some of the responses of respondents were:

 School environment as well as class environment.

 Students' interests in subjects.

 How to deal with students, how to motivate and socialize them

 How to convey knowledge/lecture perfectly according to students need

 Sometimes students are hard to be taught mainly because of adopting and picking power or in few cases attitude and dedication towards the subjects which sometimes is little hard to deal with

 Different students from different ethane groups, individual differences, do occur among students and teaching staff as well

 To understand every student's perception

 Lack of team work

 Working towards long goals

 Arguments and student's excuses

 Lots of paper work

Evaluate effectiveness of teaching

International Islamic University Islamabad Responses

83% of the respondents said that they evaluate their teaching by asking different questions to the class at the end of Lecture. One of the respondents said that. "I evaluate my effectiveness of teaching by taking feedback from the students".

National University of Modern Languages Responses

86% respondents said that they evaluate their effectiveness of teaching by asking questions to the students after lecture.

Findings from Qualitative Data Obtained from Pre-service Science Teachers

1. PCK was necessary for future teaching because it enabled the students to understand well and perform well in learning and it gave new ideas to teachers and in teaching effectively. PCK played a vital role because all students were not equal they want different methods of teaching and to learn some extra and to develop new ideas of learning. It provided the same platform to each and every individual regardless of their sense of individuality when it comes to picking power or now he/she perceives it.

2. It is found that PCK was effective for Pre-service science teachers because it helped for conducive learning environment. PCK played an essential role and can foresee the possibility of better understanding and knowledge.

3. Pre-service science teachers stated that classroom activities, accessing students learning in multiple ways by using wide range of teaching approaches, good environment and new methodologies of teaching, delivery of content in an efficient way and good communication skills helped them during teaching practices.

4. Seminars and workshops were important because it met the practical aspects of academics and theories which students come across to read each and every day, it leaves an enormous impact on their knowledge.

5. Pre-service science teachers read different courses related to Pedagogy and from those courses they know the method and techniques of Pedagogy. Through those pedagogies course they knew how to deliver content effectively by using different teaching techniques

6. Most of the Pre-service science teachers knew where students face difficulty in understanding content and performing activities, and they removed their difficulties by adopting different teaching methods and techniques or suggesting extra information related to the content.

Findings from the Analysis of Quantitative Data Obtained from Pre-service Science Teachers

7. Mean score of IIUI Pre-service science teachers (4.1572) and mean score of NUML Pre-service science teachers (3.9875) indicates that prospective science teachers agreed about PCK provide a way to root a genuine understanding for students. Therefore, it can be stated that PCK plays a great part in developing a genuine understanding for students.

8. Mean score of Prospective science teachers IIUI (4.1258) and mean score of NUML prospective science teachers (3.8500) agreed about that they know how to manage students. Pre-service teachers of IIUI had higher mean score than Pre-service teachers of NUML. Therefore, it can be stated that Prospective Science Teachers know how to manage students while performing activities and during the class.

9. Mean score of Pre-service teacher's science teachers IIUI (3.8931) and mean score of Pre-service teacher's science teachers NUML (3.8375) agreed about that they develop interest toward science in students. Pre-service teachers of IIUI and NUML had almost same mean score. Therefore, it can be stated that Pre-service Teachers Science Teachers know how to change the mind and develop interest toward science in slow achievers and able to encourage them.

10. Mean score of IIUI Pre-service teacher's science teachers (3.8239) and mean score of NUML Pre-service teachers science teachers (4.0875) agreed about that they can deal with student's misconception. Pre-service teachers of NUML had higher mean score than pre-service teachers of IIUI. Therefore, it can be stated that Pre-service Teachers Science Teachers know how to understand student misconception and deal with using best practices.

11. Mean score of Pre-service teacher's science teachers of IIUI (3.7673) and mean score of Pre-service teacher's science teachers NUML (3.8375) agreed about that they are able to raise creativity in science students. Therefore, it can be stated that Mean score of NUML had higher mean score than IIUI. science teachers IIUI (3.8742) and mean score of NUML Mean score of IIUI Prospective science teachers (3.8742) and mean score of NUML had higher mean score than IIUI. Science teachers NUML (4.1125) agreed about that PCK enable to adopt different teaching styles. Therefore, it can be stated that PCK enables to adopt different teaching styles which meet learners need.

12. Mean score of pre-service science teachers IIUI (3.8742) and mean score of NUML Mean score of IIUI pre-service science teachers (3.8742) and mean score of NUML pre-service science teachers (4.1125) agreed about that PCK enable to adopt different teaching styles. Therefore, it can be stated that PCK enables to adopt different teaching styles which meet learners need.

13. Mean score of Pre-service science teachers of IIUI Prospective (3.8805) and mean score of pre-service science teachers NUML (4.0250) agreed about that PCK enable them to control the abusive behavior. Therefore, it can be stated that Prospective Science Teachers are able to control the abusive behavior of student by PCK.

14. Science teachers (4.1125) agreed about that PCK enable to adopt different teaching styles. NUML had higher mean score than IIUI. Therefore, it can be stated that PCK enables to adopt different teaching styles which meet learners need.

15. Mean score of IIUI Prospective science teachers (3.8805) and mean score of NUML prospective science teachers (4.0250) agreed about that PCK enable them to control the abusive behavior. NUML had higher mean score than IIUI. Therefore, it can be stated that Prospective Science Teachers are able to control the abusive behavior of student by PCK.

16. Science teachers (3.8805) and mean score of NUML prospective science teachers (4.0250) agreed about that PCK enable them to control the abusive behavior. NUML had higher mean score than IIUI. Therefore, it can be stated that Prospective Science Teachers are able to control the abusive behavior of student by PCK.

17. Science teachers (4.1125) agreed about that PCK enable to adopt different teaching styles. NUML had higher mean score than IIUI. Therefore, it can be stated that PCK enables to adopt different teaching styles which meet learners need.

18. Mean score of IIUI Prospective science teachers (3.8805) and mean score of NUML prospective science teachers (4.0250) agreed about that PCK enable them to control the abusive behavior. NUML had higher mean score than IIUI. Therefore, it can be stated that Prospective Science Teachers are able to control the abusive behavior of student by PCK.

19. Science Teachers know how to raise creativity in science students by arranging workshops for science students

20. Mean score of IIUI Prospective science teachers (3.9874) and mean score of NUML prospective science teachers (4.0375) agreed about that they are able to link content with learning activities. IIUI had higher mean score than NUML. NUML had higher mean score than IIUI. Therefore, it can be stated that Prospective Science Teachers know how link content with learning activities.

21. Mean score of IIUI Pre-service teacher's science teachers (3.9434) and mean score of NUML prospective science teachers (3.9750) agreed about that they are able to use many of appropriate gestures. Therefore, it can be stated that Prospective Science Teachers know how to use appropriate gestures in teaching science.

22. T-Test showed t-value = .647 and p value = .518 which was greater than 0.05 therefore, the null hypothesis supported. Hence there was no significant difference between pedagogical content knowledge of prospective science teachers in IIUI and NUML through learning activities.

Conclusions

Following conclusions were drawn according to the findings of the study;

1. PCK played an important role for science teaching because students and teachers both got benefit from it. PCK enabled the teacher to bring some innovative ideas and make science teaching understandable by using different teaching methods and strategies. PCK made the student's understanding and learning easy and build their interest level by using different activities and projects. PCK helped the NUML had higher mean score than IIUI. science teachers in creating effective teaching and learning environment for students.

2. Classroom activities, accessing students, wide range of teaching methodologies, good communication skill and delivery of content in an efficient way helped the prospective science teachers in their teaching practices.

3. Problems like shortage of time, student's inactive role, student's behavior, lack of AVAIDS and lack of student's interest in subject created allot of difficulty for pre-service science teachers.

4. Seminars and workshops were important for pre-service science teachers as well as for students. Through seminars and workshops pre-service teachers knew about the new teaching methodologies and their effective use. Seminars and workshops met the practical aspects of academics and theories which students comes across to read each and every day, it leaves an enormous impact on their knowledge.

5. Pre-service science teachers knew how to link content with previous knowledge and clear their doubts about topic. They knew how to link activities with the content?

6. Pre-service science teachers used different technologies in the class so that students familiar with the use of technologies.

7. Pre-service science teachers understand the psychology of students. They were able to understand physical behavior of students and controlled the abusive behavior of students in the class.

8. Pre-service science teachers knew how to organize and manage classroom along with delivering lecture. There was no significant difference between PCK of pre- service science teachers at IIUI and NUML.

Recommendations

Following recommendations are made on the basis of finding and conclusion.

1. Pre-service science teachers said in interview that they used different teaching skill but they did not use their emotional skill. It is recommended that prospective science teachers may improve their emotional skills so that they also know student's emotional attitude. University may organize some workshops on emotional skills for prospective science teachers and arrange seminars on emotional skills. University may introduce course on emotional behavior or emotional attitude.

2. Pre-service science teachers evaluated their teaching by asking questions at the end of class and do not used any other technique for evaluating their teaching. It is recommended that prospective science teachers might be use other criteria for evaluating their teaching instead of asking questions at the end of lecture. Prospective science teachers may evaluate their teaching by taking reviews from students and may viewing videotape of your teaching.

3. Pre-service science teachers faced difficulty in controlling student's behavior. It is recommended that prospective science teachers might be improve their control on student's behavior and attitude in the classroom. University may organize seminars on controlling student's behavior in classroom. University may arrange workshops in which prospective science teachers learn how to control students in a real classroom setting.

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