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Uses of Pedagogical Content Knowledge in Classroom Transection of Mathematics Teacher in Relation to Gender at Elementary Level

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Abstract:
Mathematics teachers play a vital role to create a mathematics learning environment in such a manner that learners can construct their mathematical knowledge on their own. Research question: How the maths teacher is using pedagogical content knowledge in classroom transaction varies in relation to gender Research question: How the maths teacher is using pedagogical content knowledge in classroom transaction varies in relation to gender. Objective: To study the uses of pedagogical content knowledge in classroom transection of Maths teachers in relation to gender. There is no difference in pedagogical content knowledge scores between male and female maths teachers who teach maths to students in grade.

Introduction

mathematics is a crucial topic to master because it helps kids develop their computational and mathematization skills. Its application to real-life situations in both familiar and foreign contexts aids learners in developing logical thought. One of the main goals of school mathematics is to help students develop "useful" skills, especially in numeracy numbers, number operations, measurements, decimals, and percentages. The higher goal is to help students develop their mathematical thinking and reasoning abilities, allowing them to follow

presumptions to their logical conclusion. Since mathematics is essential for brain exercise, which helps people think abstractly, mathematics teachers have a greater responsibility than teachers of other subjects. As a result, mathematics teachers must create multidimensional learning environments so students can build their own understanding.

Rationale of the Study

Kaya(2022) was investigated that whether preservice science teachers'(PSTs) Lesson Plans (LP; N = 631) may serve as a source for acquiring rich data on their pedagogical content knowledge (PCK), as well as to qualitatively describe preservice science teachers' reasons for the degree to which their L.P.s contain rich data on PCK. The handwritten L.P.s that were provided by PSTs were analysed with the use of a rubric, and 79 PSTs were selected at random to take part in semi-structured interviews. The study's findings disclosed five descriptive categories of the PSTs' reasons for the richness of L.P. data on PCK and a range indicating the quantity of data richness included within the PSTs' L.P.s. According to the study's findings, researchers should incorporate the likelihood ratio test (L.P.) as a valid instrument into their triangulation design. Despite this, they should balance the variables that affect the acquisition of rich data in their PCK investigations to triangulate results more effectively and provide a complete picture of PCK. **Dustin (2022)** studied that to ascertain the levels of pedagogical content knowledge (PCK) that pre-service physics teachers possess. It also aims to throw insight into how teacher education could make it easier for students to advance to greater competency levels. The field of teacher education plays a significant role in preparing aspiring educators for their moral and professional obligations. Proficiency levels are a helpful resource for analysing this PCK development since they outline what knowledge learners are most likely to possess at a given level. They are thus a valuable gauge of development. In prior research, a model of the various proficiency levels in pre-service physics instructors' PCK was presented; however, there is no proof of the model's validity. The Refined Consensus Model of PCK states that a teacher's content knowledge (C.K.), teaching experience, and beliefs towards the teaching and learning of science may all impact the development of PCK. In light of this, knowing how and when the pre-service physics teachers' content knowledge, teaching experience, and beliefs affect their competency may offer insights into how teacher education might promote the development of PCK. **Jaiswal (2022)** researched the pedagogy, learner-centeredness, and self-concept of secondary school science instructors and their impact on students' academic success and sense of self-efficacy. The research sample comprised 400 secondary school pupils and 100 secondary school science instructors. The three main facets of teaching that were the study's focus were the teachers' pedagogy, learner attitudes, and self-concepts. The results suggest a

relationship between secondary school students' degree of academic achievement and secondary school science teachers' pedagogical skills, attitudes, and self-concept. **Johannes et. Al. (2022)** investigated the connections between pedagogical expertise, instructional excellence, and Mathematical achievement in lower secondary school classrooms. **Mishra (2021)** Conducted research on a framework of pedagogical content expertise in Mathematics for primary school teachers. The attitudes and misconceptions pupils have about Mathematics were the contents of this study. Based on the research that has been done and the perspectives of different stakeholders, a framework has been constructed based on the investigation of many pedagogical content knowledge models. **Tanak (2020),** researched that Designing a TPACK-based course for preparing student teachers to teach science with technological pedagogical content knowledge. The research demonstrates how different the current educational system is from the one that existed in the past. The modern educational system lays greater emphasis on the pedagogical and technical content expertise of educators. the study's findings, the pedagogical knowledge component had a significantly more significant impact on the TPACK of student instructors. **Sathiyaraj (2013)** conducted a study on techno-pedagogical competencies of teachers as related to certain variables. A sample of 627 teachers working in higher secondary schools was selected using the random sampling technique. The majority of teachers have an average level of perceived techno-pedagogical competence, which needs to be increased to prepare them to tackle the problems of modern classrooms, according to this survey.

Statement of the Problem:

After careful study of the previous research finding, and the existing situation of pedagogical content knowledge of mathematics teacher, the researcher formulated the following research problem in relation to gender.

"Uses of Pedagogical Content Knowledge in Classroom Transection of Mathematics Teacher in Relation to Gender at Elementary Level."

Research question:

- How the math teacher are using pedagogical content knowledge in classroom transection varies in relation to gender.

Objective:

- To study the uses of pedagogical content knowledge in classroom transection of Maths teacher in relation to gender.

Delimitations Encountered in the Study:

- The current study only included 30 schools.
- The study was limited to Bihar Government Schools.
- The study was only conducted in the Begusarai district of Bihar.
- The research was only open to students in the seventh grade.
- The investigation was limited to only one field, namely mathematics.

Operational Definition of Key Terms Used:

Pedagogical Content Knowledge: It consists of five parts: understanding of the student's understanding, understanding of the curriculum, understanding of pedagogy, and understanding of the classroom environment.

Mathematics Teacher: The math teacher utilised in the study refers to the teacher who teaches mathematics as a subject to 7th graders in the Bihar Government.

Classroom Transaction: refers to the activities and instructional methods the teacher uses to teach mathematics in the classroom. It includes activities for establishing preparation, presenting topics, fostering self-learning, meeting the needs of various learner types, and assessing students' progress, among other things.

Elementary level: It refers only to class 7 in school.

Gender: It refers to male and female.

Research Design:

The researcher chose to conduct a descriptive type of research, which involves discovering and analysing the current situation after considering the nature and purpose of the current study, the sample, measuring tools to collect data, statistical techniques to analyse the data, and resources available.

The current research design focuses on explaining the strategy and process used in sample selection, variable descriptions, tool creation and selection, study trialling, data collecting, data analysis, etc.

Population: In this study the population were all the Mathematics teacher of a government school of Begusarai district who taught in class VII and their students of that same grade. For the present study, the researcher used random sampling method.

Sample: The researcher selected the schools randomly from the Begusarai district, Bihar. Further, math teachers were selected from these schools. The researcher consciously decided to choose 30 Maths teachers from the various 30 government schools in the Begusarai district of

Bihar, which comprises 18 blocks. These schools are where elementary-level instruction is being offered. When choosing the sample, factors such as educational level, experience, and gender were given the same amount of weight. To achieve the objectives of the Research, investigators divided the Begusarai district into four major parts among which 30 schools were selected randomly. In the selected school mathematics teacher who taught in grade 7 was a sample for the research, at the same time students of the same grade taught by these teachers were also part of the sample for the achievement of the objective of this research. The researcher chose the teachers based on various criteria, including their gender, education qualification, and experience of teaching. The investigator were also involved class- 7 students of same school where their PCK (Pedagogical content knowledge) test has to test as sample for this study.

Tools for Data Collection:

The researcher gathered data using the following self prepared measuring tools which are listed below.

- Pedagogical content knowledge test.
- Classroom observation schedule.

Source of Data

The first three objectives of this research were accomplished with the help of a chosen school teacher. In This study's fourth and final objective was accomplished with the help of concerned school students in class seven.

Procedure of Data Collection

The investigator has collected data from teachers and students by personal visit to sampled schools. It took a total of six months to collect the data. After obtaining his guide official letter of authority, the researcher went to Begusarai in Bihar to collect data. The researcher did not begin the data collection process using the devices until they were granted permission by the principal of the school in question. The researcher sought to collect data from 30 different government schools in the Begusarai district of Bihar. Therefore, the first month was spent to visiting each school to gather the information.

The researcher conducted a pedagogical content knowledge test to the concerned Mathematics teacher who taught in class 7. This Test was carried out to achieve first objective of this research. As a result of the researcher's deliberate effort to create a welcoming environment for the respectful teachers to provide their honest responses on the various five dimensions of

pedagogical content knowledge(PCK). Researchers tested class 7 students in all 30 government schools in Bihar who concerned teachers were taught.

Analysis and Findings

Level of Pedagogical Content Knowledge of Teachers in Relation to Gendar

Researcher attempted to evaluate teachers' levels of pedagogical content knowledge based on their gender. A test of the pedagogical content knowledge was administered to 30 teachers of mathematics from different schools, 15 of whom were male and 15 of them were female. The data was analysed by the researcher using suitable statistical methods, which are presented in the following table and their graph in the following figure.

Table-1 Measure of central tendency and variability of pedagogical content knowledge score of teachers based on sex

Description measure	N	Min.	Max.	Mean.	SD	SE	KU	SK
Female	15	16	26	19.66	3.29	0.85	0.67	0.72
Male	15	12	28	19.8	5.14	1.32	-0.80	0.11

The table 1 depicts the compression of means of pedagogical content knowledge in mathematics of male and female mathematics teacher. Investigator obtained mean value 19.6 and 19.8 respectively of female and male in mathematics. Researcher obtained the value of kurtosis and skewness of the female maths teachers are 0.67 and 0.72 respectively. It is explain that the obtained value are leptokurtic and positively skewed. The value of the male maths teachers' kurtosis and skewness obtained by the researcher are -0.85 and 0.11, respectively. Researcher obtained that the results are platykurtic and positively skewed. Researcher found that the average level of pedagogical content knowledge of male and female mathematics teachers is just marginally different from one another. The descriptive measure of male and female teachers' level of pedagogical content knowledge acquired by them are shown in the figure 1.

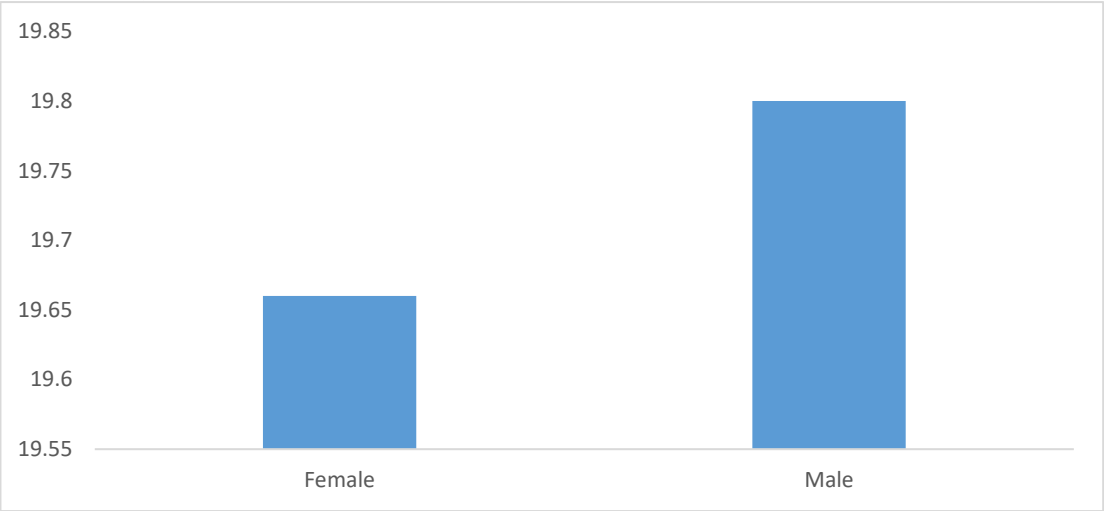

Figure-1 Histogram showing the descriptive measure of male and female teachers

Compare Mean Score of Teachers Based on Gender.

The investigator used inferential statistics to compare the mean score of teachers pedagogical content knowledge in relation to gender (female and male).

Table- 2 Mean score of pedagogical content knowledge based on sex.

Group	N	mean	Sd	mean difference	Df	't' value	level of significance
Female	15	19.7	3.42	0.13	28	-0.08	not significant
Male	15	19.8	5.32				

The mean difference in pedagogical content knowledge scores between male and female is -0.133, while SD of 3.42 and 5.32, respectively, according to the table 4.7. The calculated 't' value is -0.08, which is not significant at 0.05 level of significance. It shows that there is no difference in pedagogical content knowledge scores between male and female maths teachers who teach maths to students in grade 7.

Use of Pedagogical Knowledge in Classroom Transaction in Relation to Sex

The investigator compared the pedagogical knowledge of Mathematics teachers to use in classroom transactions in relation to sex (male and female) which is presented in the table -3.

Table- 3 Use of pedagogical knowledge in relation to sex

Pedagogical Knowledge	Sex	Poor F(%)	Fair F(%)	Good F(%)	Very Good F(%)	Excellent F(%)
Use of teaching methods.	Male	0	8 (17.7%)	18 (45%)	17 (37.7%)	2 (4.4%)
	Female	0	07 (15.5%)	20 (44.4%)	13 (28.8%)	5 (11.1%)
Use of teaching maxim.	Male	0	6 (13.3%)	15 (33.3%)	16 (35.5%)	8 (17.7%)
	Female	0	8 (17.7%)	17 (37.7%)	16 (35.5%)	4 (8.8%)
Use of relevant teaching aid.	Male	3 (6.6%)	14 (31.1%)	18 (40%)	8 (17.7%)	2 (4.4%)
	Female	2 (4.4%)	11 (24.4%)	16 (35.5%)	10 (22.2%)	6 (13.3%)
Systematic presentation of the topic.	Male	0	8 (17.7%)	13 (28.8%)	19 (42.2%)	5 (11.1%)
	Female	1 (2.2%)	9 (20%)	15 (33.3%)	15 (33.3%)	5 (11.1%)
Commitment towards profession	Male	3 (6.6%)	8 (17.7%)	10 (22.2%)	16 (35.5%)	8 (17.7%)
	Female	1 (2.2%)	4 (8.8%)	17 (37.7%)	16 (35.5%)	7 (15.5%)

The table-3 indicates the comparative difference of pedagogical knowledge of mathematics teachers in relation to sex (male and female) during the classroom transactions. In this dimension of PCK, 45% male and 44.4% female teachers are good whereas 11.1% female teachers and only 4.4% male teachers are excellent for using teaching methods. 35.5 % male and female teachers are very good for using teaching maxims whereas 17.7% male and only 8.8% female teachers are excellent for using teaching maxims. 40% male and 35.5% female teachers are good for use of relevant teaching aid while 13.3% female teachers are excellent for use of relevant teaching aid but only 4.4% male teachers are excellent for use of teaching aid. 42.2% male teachers and 33.3% female teachers are very good in systematic presentation of the topic while 11.1% both male and female teachers are excellent in systematic presentation of

the topic. 35.5% male and female both are committed towards profession whereas 17.7% male and 15.5 % female teachers are excellent towards professional commitment.

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