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Analysis of Beliefs and Practices of Primary School Teachers for Solving Mathematical Problems

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Abstract: *This study aimed to investigate primary school teachers' beliefs and practices in solving mathematical problems, employing a mixed-methods approach within the pragmatic paradigm. The population included mathematics teachers in all public primary schools, with a sample of 50 teachers' selected using stratified random sampling. Data collection involved personal visits to the schools for classroom observations. Data analysis encompassed both qualitative thematic analysis and quantitative descriptive and inferential methods. A positive correlation was found between certain belief categories, emphasizing the interplay of teachers' beliefs. Recommendations included fostering professional development, cultivating positive belief systems, promoting reflective practice, strengthening collaboration, and supporting technology integration for teachers.*

Keywords: *Beliefs, practices, Mathematical Problems, Primary Schools*

Introduction

The relationship between the concepts and actions of math teachers throughout the problem-solving process is heavily emphasized in math education. Teachers' attitudes regarding mathematics and the process of problem-solving have a big impact on the choices, strategies, and approaches they make in the classroom. Teachers' and students' relationships may be affected by the ideas they have during problem-solving exercises (Zeegers, & Elliott, 2019). Teachers who value student independence and mathematical thinking may be able to provide a supportive environment where students may explore and share their answers to problems. These educators could facilitate student-driven discussions, provide open-ended questions, and create a welcoming classroom atmosphere (Land, 2000). Formative evaluations aim to identify students' misunderstandings, measure growth, and modify instruction accordingly (Yin et al., 2014).

Teachers may refine and broaden their perspectives by engaging in professional learning activities that introduce them to research-based teaching strategies, effective conflict resolution techniques, and the development of mathematical thinking (Beswick & Goos, 2018). By talking with colleagues, reflecting on their experiences in the classroom, and keeping up with developments in mathematics education, teachers may help shape their opinions and, therefore, make improvements to the way they teach (Leithwood & Steinbach, 1992).

When tackling numerical problems, pupils often repeat approaches without grasping the underlying ideas. This makes it more difficult for individuals to apply numerical knowledge to everyday circumstances and impairs their ability to make vital decisions. According to Ali and Mahmoud (2019), procedural knowledge is prioritized above theoretical knowledge in Pakistani standard arithmetic training. The review suggested more request-based and student-focused education to enhance students' numerical thinking. The findings showed that teachers find it challenging to incorporate these instructional modifications because of rigorous educator preparation programs and curriculum constraints. Critical thinking and practical knowledge are emphasized in US initiatives such as TIMSS and the Normal Center State Guidelines. Finland is renowned for its top-notch educational system, and scientific instruction there places a strong emphasis on theory and practical application. Teachers' attitudes and behaviors about numerical challenges are often connected. The views of educators have an effect on student involvement, critical thinking, and instruction. Professional experiences and introspection may alter these ideas. Organizing homerooms that provide students several opportunities to apply their knowledge might aid in the development of their critical thinking and decisive reasoning skills in science (Geiger, 2019).

This research study focused on the critical thinking habits and views of math instructors in grade school. It looks at how instructors feel and think about numerical challenges and how they run their homerooms. The test also looks at the teaching strategies and beliefs of the teachers. The goal of the research is to get a deeper understanding of the relationship between teachers' views and students' arithmetic learning results.

Literature Review

Teachers' Beliefs about Mathematics

Mathematical educators' beliefs might be seen as a person's perspective on how they engage with mathematical tasks and instructional strategies (Schoenfeld, 2015). Teachers use a range of approaches for solving issues, and Csikos and Szitányi (2020) discovered that most of them agree that pupils should be clearly taught how to solve mathematical problems. In general, not much research has been done on how successfully instructors handle difficulties and whether or not they use a range of techniques to address specific issues. In spite of this, the existing corpus of research on the topic of mathematical problem solving almost unanimously recognizes the importance of students' experiences using a range of techniques for resolving a variety of mathematical issues. 2020; Ling & Maat.

In their study article published in 2018, Nuryana and Rosyana (2019) and Ling and Maat (2020) identified two types of mathematical difficulties. Mathematics issues may be classified into two categories: routine problems and non-routine problems. On the other hand, non-routine problems need students to think more deeply and to be more adept at analyzing occurrences and looking for patterns, connections, or order (Ünlu, 2018). When given non-routine projects to complete, students often experience anxiety since these tasks include aspects of surprise and uncertainty.

Barham (2020) argues that instructors can teach the application of strategies, thus they should choose situations that allow pupils to practice a range of tactics. Furthermore, by using diverse approaches to problem-solving, students may validate previously posed inquiries. Several strategies should be anticipated to be used if the goal of the learning objective is for the students to become better problem solvers. This is true even in the event that the teacher had extraordinary teaching abilities in addressing mathematical problems (Singh et al., 2023).

The several 'units' in Swan's (2006) beliefs-and-practice-instrument don't pose any problems. However, there are instances in which drawing more precise quantitative comparisons between concepts and deeds that is, being able to say whether one is more than, somewhat less than, or about the same as the other is beneficial. One example of this is research on the causal relationship between ideology and conduct. If the instruments follow the same 'unit' and basic criteria of measurement, as described by Thurstone (1959), then such research may benefit from the use of instruments that evaluate both behaviors and beliefs. It is evident from Swan (2006) and Pampaka et al. (2012) that the constructivist orientation is focused on the student, while the transmission orientation is focused on the teacher.

Teacher’s instructional practices

Teachers form their opinions early in childhood, and by the time a prospective teacher starts college, their opinions are well-formed. Teachers' teaching actions are influenced by their views. As to the findings of Hiebert et al. (2002), professional development programs that are collaborative, long-term, school-based, student-focused, and curriculum-connected provide the best results. Teachers that subscribe to this school of thought think that kids can learn things even when they aren't explicitly taught. Teachers in urban schools serving low-income kids are more likely to support teacher-centered, highly regulated training that focuses on fundamental skills, according to research by Knapp et al. (1995).Even while the values align with mathematical reform, there is no guarantee that educators would act in a manner that aligns with their beliefs. Teachers were questioned about whether they believed it was a good idea for pupils to learn from their mistakes in a study published by Empson and Junk (2004). Despite these assertions, a number of educators reported acting in ways that were inconsistent with their professed philosophies when confronted with an educational environment. The condition of mathematics education may limit teachers' capacity to implement their ideas, according to Empson and Junk's investigation. According to Leatham (2006), educators may act in ways that seem to go against accepted beliefs since, at any given teaching moment, their primary goal is to accomplish something other than putting the supplied idea into practice (Bray, 2011).

A majority of prospective instructors do not believe enough in addressing challenges, especially when it comes to mathematical talents, the function of mathematics, and problem-solving perspectives, according to study (Memnun et al., 2012). By analyzing several aspects of the problem-solving process, such as content knowledge and pedagogical knowledge, other researchers provide an overview of problem-solving beliefs (Csíkos & Szitányi, 2020). A teacher's perspective and their capacity to assist pupils in problem solving are strongly correlated. Specifically, instrumentalists' opinions are consistent with their lack of experience solving problems, but constructivist and Platonist educators' opinions are consistent with their knowledge (Muhtarom et al., 2020). This emphasizes how crucial it is to foster future educators' self-assurance in their capacity to solve issues. Our goal was to find out how prospective teachers see the process of working through mathematical difficulties.

The primary target audience for Raufelder's program was current elementary and secondary school teachers. The project team developed a set of standards for effective math education, including the use of a variety of teaching techniques and the encouragement of critical thinking in the pupils. Counseling based on patient observation was the main mode of therapy. Through the analysis of project data, teacher profiles (ineffective, effective, and desirable) were created, allowing for an evaluation of the project's influence on each of the twenty teachers (N=20). The researchers see increases in student results and teacher change after two years of project work (Raufelder et al., 2016).

The connections between mathematical beliefs, mathematics instruction, and mathematics learning (refer to Table 1) (Raufelder et al., 2016).

Table 1

Summary of beliefs about mathematics

Beliefs about the nature of Mathematics	Beliefs about mathematics problem-solving
Instrumentalist	Content focused with an emphasis on performance
Platonist	Content focused with an emphasis on understanding
Problem-solving	Learner focused

Practitioners of reform-based mathematics education, drawing on constructivist theories of learning, hold that children build progressively sophisticated knowledge and understanding by introspective consideration of, and deductive reasoning about, their experiences.

Theoretical Framework

According to Viholainen et al. (2017), opinions about the nature of mathematics influence opinions regarding the solution of mathematical puzzles, and opinions regarding the acquisition of mathematics imply opinions regarding its instruction. The instrumental view of mathematics is likely to be associated with the instructor model of teaching and the strict adherence to text or scheme, according to Ernest, who also suggests that teachers' perspectives on the nature of mathematics have an impact on how they carry out their responsibilities for teaching and learning in the classroom (Viholainen et al., 2017). It is also probably connected to the child's well-behaved and skill-mastered demeanor. There are two ways to approach mathematics: as a Platonist unified body of knowledge, where the instructor explains concepts and students learn by receiving information; or as problem-solving, where students actively create understanding and may even pose and solve their own problems. The act of a teacher broadening and applying pupils' mathematical knowledge is known as expanding applying (& Wearne, 1996; Yin et al., 2020). This involves giving students the chance to apply their knowledge outside of the classroom, promoting the development of rich and related mathematical thinking, and giving them opportunity to integrate mathematical ideas into a variety of settings. When it comes to elementary school mathematics, reflecting on experiences has to do with teachers encouraging pupils to evaluate the ways in which they have solved problems (Schoenfeld, 2015). In order to promote a metacognitive awareness of the problem-solving process, this entails helping students to evaluate their methods, techniques, and results while solving mathematical puzzles.

Providing students with assistance in clearly and effectively expressing their opinions, ideas, and mathematical reasoning within the context of primary school mathematics is referred to as "articulating information" (Chang et al., 2018). This involves giving students the freedom to communicate their understanding, processes, and plans clearly and concisely. A teacher's methods for maintaining students' interest in developing numerical knowledge are part of making numerical information their own (Viholainen et al., 2017). Developing critical thinking skills, encouraging independent thought, and fostering a natural relationship between students and the numerical concepts they encounter are all included in this.

Since the capacity for critical thought is one of the indicators of understanding how to handle numerical problems, this investigation is particularly fascinating due to a specific critical thinking-related difficulty. Teachers possess the critical thinking skills necessary to succeed in a variety of roles, including applying critical thinking techniques to a range of numerical problems. The constructivism hypothesis that Ernest (1994) used as the foundation for the information on critical thinking in science fills in as the rationale for the structure, so it follows that the two educators' and the understudies' numerical convictions have a significant impact on trying to understand the numerical behavior of one or the other group (Ernest, 1994). Five cognitive processes—building relationships, extending and applying mathematical knowledge, reflecting on experiences, articulating one's knowledge, and making mathematical knowledge one's own—were identified by the researcher using Carpenter and Lehrer's (1999) constructivism theory to help solve problems in math classes. Enhancing primary school teachers' beliefs and practices in problem-solving education, the evaluations also emphasize the link between teacher beliefs and practices.

Research Objectives

1. To interpret the beliefs of mathematics teachers about solving mathematical problems.
2. To observe their practices for solving mathematical problems.
3. To assess the relation between the beliefs and practices of primary school teachers for solving mathematical problems.

Research Methodology

The research used a convergent parallel design and mixed methodologies. The study used a variety of particular research methodologies, such as belief scale surveys, observation scales, and qualitative interviews. This design allows the researcher to gather data for both the quantitative and qualitative stages at the same time. Both forms of data were analyzed separately before being combined during the interpretation stage (Creswell, 2011). Equal weight is given to each set of data. The terms qualitative and quantitative (QUAL+QUAN; Morse, 1991) may be used to represent the research process. The researcher selected individuals at random from a population using a stratified random sample approach; since the population was not equal, a disproportionate sampling type was utilized. There is an equal chance of selection for every member of the population. The researcher randomly chose 50 instructors in total, including 17 male and 33 female math teachers, after excluding the teachers who took part in the pilot testing. The quantitative information on primary school math instructors' solutions to mathematical problems was gathered using self-designed and organized instruments. Qualitative information about the methods employed by primary school teachers to solve mathematics problems was gathered via semi-structured observations and formal interviews. To gather qualitative data, structured interviews and in-class observations were used. To find recurrent themes and patterns in the qualitative data, thematic analysis was used.

Table 2

Reliability of the beliefs scale

Cronbach alpha Reliability of beliefs scale and its Constructs	α
Building relationships	.744
Expanding the application of knowledge	.774
Reflecting on experiences	.767
Articulating knowledge	.725
Making mathematical knowledge one's own	.805
Teachers beliefs about solving math's problems	.905

Findings

Table 3

Demographics of participants

	Frequency	Percentage
Gender		
Male	17	34.0
Female	33	66.0
Age		
20-29	8	16.0
30-39	13	26.0
40-49	24	48.0
50-59	5	10.0
Academic Qualifications		
Undergraduate	7	14.0
Graduated	38	76.0
M.PHIL	4	8.0
B.COM	1	2.0

Total	50	100.0
Professional Qualifications		
B.Ed.	29	58.0
M.Ed.	14	28.0
No	7	14.0
Total	50	100.0
Teaching experience		
1-8	15	30.0
8-16	16	32.0
16-24	16	32.0
24-30	3	6.0
Training attended by teachers		
1-4	8	16.0
5-8	14	28.0
9-12	24	48.0
More than 12	4	8.0

Table 3 show that total 50 participants, 34% were male and 66% were female. This gender distribution suggests a slightly higher representation of females in the sample. Among the 50 participants, 16% were in the age range of 20-29, 26% were in the 30-39 age range, 48% were in the 40-49 age range, and 10% were in the 50-59 age range. Among them, 14% had an undergraduate degree, 76% had graduated, 8% held an M.PHIL degree, and 2% had a B.COM qualification. It shows that 58% of the participants had a B.Ed. qualification, 28% had a M.Ed. qualification, and 14% did not have any professional qualification. . It also shows that 30% of the participants had 1-8 years of teaching experience, 32% had 8-16 years of teaching experience, 32% had 16-24 years of teaching experience, and 6% had 24-30 years of teaching experience. 16% of the participants attended 1-4 trainings, 28% attended 5-8 trainings, 48% attended 9-12 trainings, and 8% attended more than 12 trainings.

Table 4

*Descriptive Statistics of variables of belief*s **scale**

	N	Mean	Std. Deviation
Building relationship	50	3.58	.32
Expanding applying	50	3.98	.34
Reflecting on experiences	50	4.21	.35
Articulating knowledge	50	4.09	.37
Making mathematical knowledge one's own	50	4.24	.42

Table 4 show the descriptive statistics for the variables of belief scale.it shows that the mean score of the beliefs about building relationship is 3.58 and the standard deviation is 0.32, the low standard deviation regarding building relationship shows some consensus and moderate differences among participants. The mean score of the beliefs about expanding and applying is 3.98, and the standard deviation is 0.34, this shows moderate variation but this belief is strong as compared to building relationship. The mean score of beliefs about reflecting on experiences is 4.21, and the standard deviation is 0.35, that means participants bears strong and consistent beliefs on reflecting experiences. The mean score of articulating knowledge beliefs is 4.09 that shows the strongest consensus, and the standard deviation is 0.37and the mean score of teachers' beliefs about making knowledge one's own is 4.24 and the standard deviation is 0.42 that shows the strongest consensus and vast range of opinions.

The highest mean scores of all variables shows that the teachers use all techniques to solve mathematical problems in primary schools.

Observation scale was analyzed though percentages and frequencies. Each teacher was observed three times. Ahead from these 3 observation of each teacher, 2 yes was considered as 1 and 1 yes as 0 to measure the statistical relationship between the beliefs and practices scales.

Table 5

Frequency and percentage *analysis of Building relationship observation scale*

	STATEMENTS	YES		NO	
		F	%	F	%
1	Teacher actively involves students in the learning process.	26	52	24	48
2	Teacher connects new and prior knowledge.	16	32	34	68
3	Teacher assess students before introducing a new concept.	40	80	10	20
4	Teacher encourages students to share their perspectives about math concepts in the classroom.	24	48	26	52
5	Teacher asks students to participate in the new lesson by sharing their ideas through brainstorming.	26	52	24	48
6	Teacher uses technological aids to explain math concepts.	06	12	44	88
7	Teacher explains new concepts to students by giving examples from real life.	50	100	-	-
8	Teacher is aware of the strengths and weaknesses of their students.	30	60	20	40
9	Teacher provides opportunities for collaboration in solving math problems.	31	62	19	38
10	Teacher asks questions about students' previous knowledge before starting a new lesson.	26	52	24	48
11	Teacher identifies struggling students in the class and determine the reasons for their struggles.	16	32	34	68

The data from table 5 reveals several key insights into teaching practices. The highest percentage (100%) is observed in the statement "Teacher explains new concepts to students by giving examples from real life," indicating a strong emphasis on real-world applications. Conversely, the lowest percentage (12%) occurs in the use of technological aids, suggesting that technology is underutilized in explaining math concepts. Additionally, a significant majority of teachers assess students before introducing new concepts (80%), but only 32% actively connect new and prior knowledge, highlighting areas for improvement in instructional strategies.

Table 6

Frequency and percentage *analysis of Expanding and applying* knowledge *observation scale*

	STATEMENTS	YES		NO	
		F	%	F	%
12	Use of concrete materials such as blocks, real objects, and models in teaching	27	54	23	46
13	Providing students the opportunities to apply their mathematical knowledge in real-world situations	19	38	31	62

14	Demonstrating how different mathematical concepts build upon each other	20	40	30	60
15	Designing activities for students to apply the mathematical knowledge	16	32	34	68
16	Explanation by teacher for situations where mathematical knowledge can be applied	17	34	33	66
17	Application of math concepts by teachers to solve daily life problems	23	46	27	54
18	Use of technological aids in the classroom to enhance students' mathematical knowledge.	06	12	44	88
19	Assigning problems to students that involve information from other subjects as well	08	16	42	84
20	Use of real-world data problems in the classroom to apply mathematical concepts	19	38	31	62
21	Providing practical demonstrations of abstract mathematical concepts using manipulatives	18	36	32	64
22	Use of pictorial representations, by teachers, of different concepts to solve math problems	26	52	24	48
23	Developing an abstract understanding of math concepts through audio-visual aids	15	30	35	70
24	Explanation, by teacher, of math concepts through drawing	40	80	10	20
25	Paying attention, by teacher, to what is happening in the classroom	24	48	26	52

The table 6 indicates varying approaches to expanding and applying mathematical knowledge in the classroom. The highest percentage (80%) is for teachers explaining math concepts through drawing, suggesting this is a widely used strategy. However, technological aids are significantly underutilized, with only 12% of teachers incorporating them to enhance mathematical knowledge. Similarly, only 16% of teachers assign problems that involve interdisciplinary information, indicating a limited integration of math with other subjects. On the other hand, 54% of teachers use concrete materials like blocks and models to present concepts, and 52% use pictorial representations to solve problems, showing some engagement with hands-on and visual learning methods. Overall, there is room for improvement in applying mathematical knowledge to real-world situations and integrating technology in the learning process.

Table 7

Frequency and percentage *analysis of Reflecting on experiences observation scale*

	STATEMENTS	**YES**		**NO**	
		F	**%**	**F**	**%**
26	Teacher provides problems for students to solve using math concepts.	26	52	24	48
27	Teacher assess student understanding by asking questions during the lesson.	06	12	44	88
28	Teacher trains students to try out different ways to solve problems.	50	100	-	-
29	Teacher encourages students to ask questions.	30	60	20	40
30	Teacher discusses their experiences with other math teachers to improve their teaching practices.	30	60	20	40

31	Teacher provides a few minutes for students to reflect on their learning.	25	50	25	50
32	Teacher asks students to provide reasons for solving a problem in a particular way.	16	32	34	68
33	Teacher invites feedback from students to improve their teaching skills.	26	52	24	48
34	Teacher takes notes about their teaching to improve the teaching and learning process.	20	40	30	60
35	Teacher uses student performance data (test results) to improve the teaching and learning process.	20	40	30	60
36	Reflective journals help teachers improve their teaching skills.	16	32	34	68
37	Teacher must use more than one data source to assess students' learning.	17	34	33	66
38	Teacher adapts their teaching style according to the learning behavior of their students.	24	48	26	52
39	Teacher thinks about their teaching practice after class to improve it.	06	12	44	88
40	Math teachers observe each other's classes.	07	14	43	86

The table 7 reveals insights into teachers' reflective practices in the classroom. The highest percentage (100%) is for teachers training students to try different ways to solve problems, indicating a strong emphasis on problem-solving flexibility. However, only 12% of teachers assess student understanding by asking questions during the lesson, and the same low percentage (12%) think about their teaching practice after class, suggesting a lack of immediate and post-lesson reflection. Additionally, only 14% of teachers observe each other's classes, indicating limited peer observation as a tool for improving teaching practices. While 60% of teachers discuss experiences with peers and encourage students to ask questions, other reflective practices, such as using multiple data sources for assessment and keeping reflective journals, are less commonly employed, pointing to potential areas for growth in fostering a reflective teaching culture.

Table 8

Frequency and percentage *analysis of Articulating Knowledge observation scale*

	STATEMENTS	**YES**		**NO**	
		F	**%**	**F**	**%**
41	Teacher provides opportunities for students to share their understanding of math concepts.	19	38	31	52
42	Teacher sets manageable goals for student learning.	18	36	32	64
43	Teacher uses multiple representations to explain concepts.	26	52	24	48
44	Teacher makes sure students clearly state the step-by-step procedure for solving math problems.	16	32	34	68
45	Teacher asks open-ended questions during lessons to enhance the learning process.	40	80	10	20
46	Teacher develops math vocabulary necessary to understand mathematical concepts.	24	48	26	52
47	Teacher conducts dialogue in the classroom to improve learning.	26	52	24	48

The table 8 highlights various strategies teachers use to articulate mathematical knowledge in the classroom. The most prominent practice is asking open-ended questions during lessons, with 80% of teachers employing this strategy to enhance learning, indicating a strong focus on critical thinking and student engagement. However, only 36% of teachers set manageable goals for student learning, suggesting that goal-setting may be an area for improvement. Additionally, 52% of teachers use multiple representations to explain concepts, conduct classroom dialogues, and develop math vocabulary, reflecting moderate engagement with diverse instructional strategies. On the other hand, only 32% of teachers ensure that students clearly state the step-by-step procedure for solving math problems, which could impact students' ability to articulate their understanding clearly. Overall, while some effective practices are in place, there is room for improvement in areas such as goal-setting and explicit articulation of problem-solving procedures.

Table 9

Frequency and percentage *analysis of Making mathematical knowledge one's own observation scale*

	STATEMENTS	**YES**		**NO**	
		F	**%**	**F**	**%**
48	Teacher gives hints to students to help them solve problems.	06	12	44	88
49	Teacher encourages students to solve math problems on their own.	50	100	-	-
50	Teacher asks students questions about how to solve a given math problem.	30	60	20	49
51	Teacher provides math problems to students that are related to the math concepts being taught in each class.	30	60	20	40
52	Teacher encourages students to solve math problems to enhance their understanding.	27	54	23	46
53	Teacher gives students enough time to work on solving math problems until they are successful.	16	32	34	68
54	Teacher gives math puzzles in the classroom.	26	52	24	48
55	Teacher encourages students to select the most suitable solution for solving math problems.	20	40	30	60
56	Teacher provides students with routine problems to solve that are related to math concepts.	20	40	30	60

The table 9 reveals various approaches teachers use to help students internalize mathematical knowledge. The most prevalent practice, with 100% participation, is encouraging students to solve math problems independently, showing a strong focus on fostering self-reliance in problem-solving. However, only 12% of teachers give hints to students to assist in problem-solving, indicating a minimal use of guided support. Additionally, 60% of teachers ask students questions about how to solve problems and provide problems related to the concepts being taught, demonstrating a moderate engagement in reinforcing understanding through relevant practice. On the other hand, only 32% of teachers give students ample time to work on solving problems until they succeed, suggesting a potential gap in providing sufficient time for mastery. Moreover, 52% of teachers incorporate math puzzles, but only 40% encourage selecting the most suitable solution or provide routine problems, indicating room for improvement in diversifying problem-solving strategies and ensuring consistent practice.

Table 10

Correlation between building relationship beliefs and practice

	N	Mean	S.D	r	Sig. (2-tailed)
Building relationship (belief)	50	3.58	.32	.070	.629
Building relationship (practice)	50	0.52	.22		

Table 10 presents the correlation coefficients and their corresponding p-values for the variables. The correlation coefficient between "Building relationship" with mean score 3.58 and S.D .32 and "Building relationship observation" with mean score 0.53 and S.D .22 is 0.070 that shows more variability in building relationship (belief) and less variability in building relationship (practice) comparably. This indicates a weak positive correlation between the two variables. The p-value associated with this correlation coefficient is 0.629. Since the p-value is greater than the significance level of 0.05, researcher concludes that there is no significant correlation between "Building relationship belief" and "Building relationship practices."

Observation Analysis

Theme 1: Use of Genuine Setting and Cross-Curricular Combination

Instructors utilize genuine guides to make conceptual ideas more interesting and locking in. Cross-curricular tasks assist understudies with applying numerical information in more extensive settings, showing the pertinence of math in different subjects and day to day existence. Genuine information and situations are incorporated to foster decisive reasoning and pragmatic critical thinking abilities.

Theme 2: Evaluation and Criticism Methods

Educators as often as possible survey understudy understanding by addressing examples, which helps check appreciation and address confusions. Addressing procedures advances dynamic support, and decisive reasoning, and urge understudies to explain their thoughts. Instructors utilize different types of criticism (e.g., requesting purposes for critical thinking techniques) to upgrade understanding and further develop learning results.

Theme 3: Utilization of Innovation and Manipulative

Innovative instruments (WhatsApp, varying media help) are utilized to expand advancing past the homeroom and give extra assets to understudies. Educators use manipulative, substantial articles, and involved exercises to work on conceptual numerical ideas, even though there is changeability in how reliably these are utilized. Visual portrayals and certifiable information issues are used to improve commitment and perception.

Theme 4: Students Commitment and Joint effort

Educators empower dynamic understudy interest through cooperative critical thinking, bunch exercises, and meetings to generate new ideas. Open doors are given to understudies to share points of view, however, a few instructors limit investigation of elective critical thinking strategies. The coordinated effort helps encourage further learning, with understudies applying math ideas in down-to-earth, genuine settings.

Theme 5: Educator Reflection and Transformation

A few educators ponder their showing rehearses and adjust guidance given understudy needs and execution information. Study hall the board, time limitations, and congestion can present difficulties executing more intelligent or action-based learning techniques. Educators utilize intelligent devices like diaries and friend input to work on their educational methodologies and results.

Observation Analysis		Frequencies
Theme 1	Use of Genuine Setting and Cross-Curricular Combination	13
Theme 2	Evaluation and Criticism Methods	12
Theme 3	Utilization of Innovation and Manipulative	9
Theme 4	Students Commitment and Joint Effort	7
Theme 5	Educator Reflection and Transformation	9

Interview Analysis

Theme 1: Discussion for Improving Teaching Skills

The data collected to answer the first question is presented in the following segment; To what extent teachers discuss with their colleagues to improve mathematical teaching skills?

It gave accounts to understand how often mathematics teachers share their ideas for improving their teaching skills. Majority of the teachers argued that they share their ideas on regular basis so that they can make their teaching up to date and effective. One of the respondents replied that:

"I discuss with other mathematics teachers almost once in a week".

Theme 2: Multiple Assessment Techniques

This theme gives accounts of assessment techniques use to assess students learning. Majority of the teachers argued that they involve students in lecture and ask questions to assess them and take daily and weekly test sometimes board test or paper pencil test. Some of them argued that they assess the students by school bimonthly exams, but sometime they assess them during weekly class tests. Some of the participants argued that they use oral assessments, topic-wise worksheets with daily life examples, involve students in lectures by asking questions and use daily and weekly tests.

Theme 3: Reflection on Teaching Methods

This theme is related to how often teachers think about their teaching practice after the end of the class. Majority of the teachers responded that Self-evaluations is good for improving skills, so after every class, they always think about their weakness about the teaching method and improve them. They added that reflection was often triggered by assessing student responses and identifying areas for improvement. Moreover, few of them replied that they think about teaching practice only when checking tests or exams and Reflect on teaching practice once a week.

Some of them argued that students didn't take interest, so they think about their teaching style to change way of delivering lecture".

Theme 4: Usage of Previous Teaching Record

This theme tells about the use of previous year records of students learning experiences to guide them and explains how teachers use it to improve their teaching skills. Majority of the teachers replied that it's difficult to manage all record, but they know about their students". Some of them argued that they have all the record of their student which they use for future to develop student interest by their mindset. According to one of the respondents:

"I take daily notes to improve my teaching skills for the future".

Interview Analysis		**Frequencies**
Theme 1	Discussion for Improving Teaching Skills	18
Theme 2	Multiple Assessment Techniques	17
Theme 3	Reflection on Teaching Methods	24
Theme 4	Usage of Previous Teaching Record	33

Convergence Analysis

Real-Life Examples and Cross-Curricular Assignments:	**Qualitative Data:** Observations indicate that teachers frequently use real-life examples and integrate cross-curricular assignments to make mathematics more engaging and relevant.	**Quantitative Data:** The belief in expanding and applying knowledge and making mathematical knowledge one's own is strongly held by teachers, which aligns with their observed practices.

Assessment Techniques:	**Qualitative Data:** Interviews reveal a variety of assessment techniques, including oral assessments, worksheets, and tests.	**Quantitative Data:** Teachers' beliefs in reflecting on experiences and articulating knowledge show significant positive correlations, indicating a strong emphasis on assessment and self-evaluation practices.
Teacher Collaboration and Professional Development:	**Qualitative Data:** Teachers regularly discuss with colleagues to improve teaching skills, reflecting a collaborative approach to professional development.	**Quantitative Data:** The moderate to high belief in building relationships and expanding and applying knowledge supports the idea of ongoing professional development and collaboration among teachers.
Reflection and Self-Evaluation:	**Qualitative Data:** Teachers frequently reflect on their teaching methods and use previous records to guide their practices.	**Quantitative Data:** High scores on reflecting on experiences and articulating knowledge indicate that teachers value self-evaluation and use it to enhance their teaching practices.
Impact of Demographic Factors:	**Qualitative Data:** Insights from interviews suggest that experience and training influence teaching practices, though specific details vary.	**Quantitative Data:** Age and teaching experience significantly affect certain beliefs and practices, while other demographic factors show less consistent influence.

Discussion

One major problem that affects educational institutions all across the globe and crosses national borders is the continued use of rote learning in mathematics instruction. González and Ponce (2024) highlight how commonplace conventional teaching approaches are in Pakistan, where procedural knowledge is valued more highly than conceptual comprehension. González and Ponce's (2024) results underscore the pressing need of transitioning to student-centered and inquiry-based methods in the teaching of mathematics.

The results confirm that collaborative and professional teaching is necessary. Large obstacles, such as curricula limits and a dearth of programs for educator training, undermine the implementation of innovative educational methods in Pakistan despite the justifiable need for change (González and Ponce, 2024). A universal test that necessitates a shift in teaching strategies is the problem of math repetition learning. Global trends indicated that math instruction needed to be improved by emphasizing the value of reasonable understanding and the development of decisive reasoning skills to better prepare students for challenges in the future. To resolve this problem, concerted efforts must be made on a worldwide and public scale, with a focus on changing educational programs, preparing educators, and pledging to foster a deep and meaningful dedication to science (Singh et al., 2023).

Numerous research confirm the results, which show a favorable association between the studied variables. The importance of this topic, both in Pakistan and globally, is further shown by an analysis of educators' beliefs and efforts on the handling of numerical problems in primary schools. Science education is crucial for fostering students' mental processes and critical thinking skills, thus it's important to look at how teachers' beliefs and teaching methods affect students' learning experiences (Hattan et al., 2023). Teachers' beliefs on teaching arithmetic are heavily influenced by societal influences in Pakistan. Customary teaching techniques, which are characterized by repetition, learning, and retention, are deeply ingrained in the local educational context, and many educators continue to rely on them (Geiger, 2019). Understudies may advance a deeper and more meaningful understanding of numerical concepts by challenging these ingrained beliefs (Saadati, 2019).

All throughout the world, opinions on math education have drastically changed. The finest research and instructional practices now available aim to shift the focus away from memorization via repetition and toward calculated comprehension and critical thinking skills (Nuryana & Rosyana, 2019). This change responds to a global recognition that assistance methods must be modified to better prepare students for the challenges of the modern world (González and Ponce, 2024). In the Pakistani context, it is crucial to address asset needs and traditional beliefs on math education (Nuryana & Rosyana, 2019). The reception of creative teaching practices might be disrupted by limited resources and inadequate foundation. Policymakers should prioritize their support for educators creating curricula that enhance critical thinking instruction to address this problem (Hattan et al., 2023). According to Tall and Stewart (2020), these initiatives need to question prevailing beliefs about education in addition to providing teachers with effective teaching strategies. Effective math education systems throughout the world have undergone significant organizational changes, emphasizing skillful developments, curriculum modifications, and assessments that align with the approach of critical thinking (Huang et al., 2022). Pakistan may learn valuable lessons from these international experiences (Tall & Stewart, 2020). Through the imitation of successful methods and their adaptation to the local educational landscape, Pakistan may make substantial progress toward the advancement of math education (Alfaro Víquez, 2022).

Conclusions

This study addressed elementary school numerical problems and provided insights for math instructors. The findings showed how much instructors appreciate relationships, knowledge, experience, effective communication, and a solid grasp of education. The primary school teachers had advanced numerical perspectives. Repetition and process were prized by certain educators. Education and society both shaped these opinions. Moderate knowledge and critical thinking were encouraged by several academics. These perceptions have been modified by good professional growth and modern educational methodologies. Progressive instructors emphasized a problem-solving and student-centered strategy. Interpretations were connected to behaviors, demonstrating how instructors' beliefs affect their instruction. Additionally, attitudes and methods for teaching arithmetic may be included in professional development.

According to the study, instructors in elementary schools use active knowledge creation, explicit attention, moderate observation, and mathematical self-knowledge to solve mathematical issues. While instructors are consistent in their work, their differences in actively creating new information and using their mathematical understanding in lessons provide areas for further investigation and enhance instructional strategies. Researchers, legislators, and educators may all benefit from these discoveries as they work to improve primary school arithmetic. Math difficulties were approached differently by elementary school instructors. A few lecturers challenged pupils to solve problems while others just spoke and remembered information. The focus of these educators was on arithmetic and critical thinking. Teachers' progressive beliefs aligned with these practices.

It is recommended the school authority may provide opportunities for primary school teachers to enhance their understanding and knowledge of effective strategies for solving mathematical problems. Workshops, seminars, and training sessions can be organized to promote continuous professional development in this area. It is also recommended that policymakers emphasize the use of technology tools and resources that can enhance problem-solving skills in mathematics. Encourage primary school teachers to explore and incorporate digital tools, such as educational apps, interactive websites, and online simulations, into their instructional practices. Providing training and support in using these technologies can help teachers effectively integrate them into their teaching.

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