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Perspectives of Practicing Mathematics Teachers on the Six Steps Strategy (Pettec) in Developed Jordanian Curricula

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Abstract

The main objective of the study is to know the perceptions of practicing mathematics teachers on using the six steps (PETTEC) in teaching mathematics based on mathematics curricula developed in Jordan, and determining the effect of academic qualification (Non educational qualification, and educational qualification) on the perceptions. The researcher used a descriptive research approach by distributing a questionnaire. The population under investigation consists of all currently employed math teachers who are studying the basic stage math curricula created by the Directorate of Education for the 2023-2024 school year, where there are 179 math teachers. A teacher made up (135) of the study sample that was chosen using the random sample approach. The Finding showed the degree of perceptions of practicing mathematics teachers regarding the six steps strategy (PETTEC) according to the mathematics curricula developed in Jordan is high. Besides, there are no statistically significant differences in perception degree depending on the academic qualification variable for mathematics teachers. The study concluded that mathematics teachers have high perceptions of the six steps strategy (PETTEC) in teaching mathematics. And mathematics teachers provide explanations and all lesson examples, and use the instructions in the teacher's guide.

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Introduction

Globally, movements for educational reform have demanded that school curricula be developed, with a focus on mathematics. Among the curricula that schools have concentrated on are curriculums, considering their function in satisfying societal demands. Teachers consistently stress the significance of mathematics curriculum in supporting students advance their knowledge and proficiency through the acquisition of mathematical ideas and problem-solving techniques.

Curriculums are considered a primary and crucial source of information; in certain cases, they are the sole way to give the student the subject content

(Alzubi & Alobeidan, 2014). The primary organizer of the mathematical abilities that we expect pupils to acquire is the mathematics curriculum (Chiappetta & Fillman, 2007). Preferences in teaching and learning are connected to the idea of instruction and education. Constructivist and conventional approaches are the two main teaching-learning philosophies in education. Concurrently, educational programs are being created in accordance with this comprehension. The current curricula in mathematics also exhibit it (Kılıcaslan, 2022).

Druken (2023) suggested six goals for teaching mathematics: comprehend reform standards, concentrate on student thinking, create pedagogy, encourage teamwork, create curriculum materials, and acquire mathematics. Examining the curriculum involved creating objectives regarding the education of students additionally broader, school-based goals, as well as guidelines, curricula, and other resources to organize activities, instructor inquiry and expected student responses.

Students' interest in mathematics should be piqued and their understanding of the vertical as well as horizontal connections between mathematical concepts should be reinforced through the study of mathematics (Yanhui, 2018). It is undeniably difficult to teach mathematics since kids need to be exposed to a variety of rich experiences that will inspire them to look ahead to their future (Aires & Catarino, 2019). The improvement of mathematical thinking is the main goal of mathematics curricula, and language employed in the classroom has a big influence on the students' learning results (Fernandez et al., 2022).

Mauch & McDermott (2007) looked at the advantages and disadvantages of three major primary mathematics Curriculums, as well as for pre-service primary school mathematics teachers. A rubric was created that identifies students' and teachers' concerns regarding the curriculums. The curriculums were then 'ranked' according to these criteria to find the best in each area, and which were strong overall. These findings were used to provide suggestions for an elementary mathematics Curriculums that would better promote students' understanding of mathematics.

Curriculums can be an effective tool in helping students gain a deeper knowledge of mathematics (Purnomo et al., 2019). Because curriculums affect how teachers explain and apply concepts in the classroom, they are important in the teaching of mathematics (Yunianta et al, 2023). Curriculums have a big influence on how teachers teach mathematical concepts and use their understanding of learning processes in the classroom, according to Valverde et al. (2002). One of the most important connections between curriculums and instruction in schools is this one. Thus, mathematics curriculums are considered significant in this context since they are the result of human thoughts, acts, and behaviors documented in a document for learning mathematics.

Review of Literature

There are many studies that have verified some of the most effective strategies in teaching mathematics, such as: The purpose of Ghunaimat & alawneh (2024) was to find out how Prince Faisal Technical College students' understanding of coordinate geometry topics was affected by applying the SOLO taxonomy levels. to fulfill the purpose of the study. A coordinate geometry acquisition test was created by the researchers. The study employed a pre-post design and a semi-experimental technique, with 51 college students divided into two groups: the experimental group (25 students) examined using the SOLO taxonomy levels, while the control group (26 students) studied as usual. The SOLO taxonomy was found to be an effective teaching technique for mathematics, particularly when it came to students' grasp of coordinate geometry principles.

The relationship and impact of mathematics instructors' perceptions and readiness on the use of critical thinking skills (CTS) in the implementation of instructional procedures in secondary schools were identified by Thinwiangthong et al. (2024). The study's conclusions also demonstrated how CTS has helped teachers become more proficient educators, particularly in terms of addressing the demands of teaching in the twenty-first century classroom. Through a range of carefully thought-out learning tools, the highest standard of teaching methodologies is continued with the focus on higher-order thinking abilities.

Alzoebi et al. (2023) looked into how Prince Faisal College students' development of algebraic thinking skills was impacted by the flipped classroom approach, which was based on the ADDIE Model. An assessment of the development of algebraic thinking skills was created by researchers. The study employed pre-post design and quasi-experimental methodology. It involved 53 students who were split into two groups: a control group consisting of 26 students and an experimental group consisting of 27 students. The outcomes demonstrated that the technique had a positive impact on the growth of every algebraic thinking skill.

Okeke et al (2023) investigated the effect of symbolic form model on students' interest in logic content of the mathematics curriculum was investigated in this study. The study used a quasi-experimental design. The population of the research was 2,342 students in Enugu State, Nigeria. A sample of 172 students was used. The symbolic form model in teaching significantly boosted students' interest in logic content of the mathematics curriculum, according to the findings.

The learning objectives for the middle school 5th–8th grade mathematics curriculum was examined by Oztas and Tunca-Guclu (2023). The Ministry of National Education in Turkey revised the curriculum for the 2018–19 academic year. The deductive content analysis approach was used to analyze the data. According to the study, 70% of the 275 learning outcomes were deemed inadequate when the learning outcomes in the middle school mathematics curriculum were analyzed in terms of mathematical communication abilities. According to the findings, the middle school mathematics curriculum's learning objectives should be reorganized to support the development of students' mathematical communication abilities. Additionally, mathematical communication should be more specifically organized in terms of its reading, speaking, listening, and writing components.

In 2022, Alabdulaziz conducted research on the impact of implementing the PDIODI (prediction, discussion, interpretation, observation, discussion, and interpretation) math teaching technique on the growth of students' conceptual understanding and problem-solving abilities in the primary stage's fourth grade. The design of the study was quasi-experimental. The 76 students in the research sample were split into two groups: the experimental group, which included 38 students who studied with PDIODI support from the e-learning environment, and the control group, which included 38 students who studied using the conventional technique. The findings demonstrated that there are statistically significant differences in favor of the experimental group pupils on the conceptual comprehension exam and in problem-solving skills at the significance level.

Alzahrani (2022) aimed to investigate the effectiveness of the seven-stop IMPROVE program (Introducing new concepts, Metacognitive questioning, Practicing, Reviewing and reducing difficulties, Obtaining mastery, Verification, and Enrichment) on the achievement of preliminary students at Taif University, Saudi Arabia, at the first three levels of the Bloom's taxonomy (Knowledge, Comprehension, Application). The researcher used experimental design. In order to achieve the purpose of the study, the sample was chosen in a deliberate manner from groups that were taught using cooperative learning in mathematics classes. The experimental group (32 students) who studied using the IMPROVE program was compared with the second group (32 students) who were taught in the traditional lecture style. The results of the study showed the effectiveness of using the IMPROVE program in mathematics teaching at the knowledge, comprehension and application levels. Alshawara (2021) used the descriptive analytical approach to assess the fourth-grade math textbook (the developed one), based on the opinions of Jordanian teachers. Thirteen things total, divided into four categories by the researcher (the content, the aims, the assessment, and the technical form). 150 teachers were chosen at random to receive a sample of the questionnaire. The findings demonstrated that each of the four areas' evaluation values was at a low level. Content, objectives, technological direction, and evaluation are listed from lowest to highest. Gender and experience do not differ statistically significantly, according to the results. Ulker (2020) presented a brand-new, four-step approach to enhance the idea of teaching and learning algorithms. He used four steps in succession when doing the tutorials and real-world applications. A set of questions was given to the stu-

dents in order to assess not only themselves but also the new approach and the teacher's ability to manage the course using the four stages. In comparison to the previous semester, the evaluations showed that the 4-stage technique achieved excellent success rates in meeting the course learning outcomes and objectives.

Al Assaf (2019) looked into how well Jordanian ninth graders' academic performance and problem-solving abilities were developed by the learning cycle-5 Es model, or "Bybee." Sixty students from the University Education Directorate in Amman participated in his study during the second semester of 2017–2018. The sample was split into two groups at random; thirty students made up the experimental group, which received instruction based on the Bybee model. The other group, known as the control group, had thirty pupils and received instruction as usual. The cognitive accomplishment test and the problem-solving capacity scale made up the study tools. The study's findings demonstrated that the teaching method's positive effects on the experimental group led to statistically significant differences in the ninth-grade students' average achievement. Additionally, it revealed statistically significant changes in the average achievement of ninth-grade pupils, favoring the experimental group and attributable to the problem-solving skills teaching style.

The National Center for Curriculum Development (NNCD), working with the Ministry of Education, aimed to modernize and develop curricula to help students' cognitive level rise and keep up with peers in developed countries. This was motivated by the Hashemite Kingdom of Jordan's strong belief in the value of empowering the Jordanian individual and arming him with science and knowledge. The Center gave mathematics a lot of attention because it is one of the most crucial academic disciplines for helping students improve their critical thinking and problem-solving abilities. It was also eager to publish mathematics books using the finest practices that Jordanian experts worldwide adhere to. to guarantee that it satisfies our students' requirements and is in line with recognized national values (NNCD, 2022). The mathematics curriculum was amended in 2019 in accordance with the Collins World Series. The updates started with the basic first grade and basic fourth grade curricula, and they continued in a progressive manner for the remaining classes. (Ghunaimat, 2023).

Alzoubi & Ghunaimat (2024) indicated; In Jordan, mathematics is considered one of the essential and important academic subjects and is taught at many educational levels. One of the main goals of mathematics education is to help students develop their abilities, especially in the subject of mathematics. Only by providing math instructors with the necessary preparation skills to do their jobs effectively will this goal be achieved. Despite Jordan's efforts to develop math curricula since 2019, the need to comprehend the credentials and proficiencies of math teachers has increased. The mathematics curricula contained a project for each unit; to enhance and enrich students' learning of the concepts and skills contained therein. Because intensive training in solving problems is one of the most important ways to consolidate mathematical concepts and increase procedural fluency among students; The exercise book was prepared to accompany the curricula in such a way that students are provided with a worksheet in each lesson, which can be solved as a homework assignment, or in the classroom if there is sufficient time (NNCD, 2022).

The mathematics teacher's guide for mathematics curricula developed in Jordan provides a clear strategy for teaching mathematic, containing six steps strategy (PETTEC): Preparation, Exploration, Teaching, Training, Enrichment, and Conclusion. Each of these steps includes suggestions and instructions that help present the lesson successfully (NNCD, 2022). Figure 1 shows the six steps strategy (PETTEC)

Fig. 1: The six steps strategy (PETTEC) for teaching mathematics according to the developed mathematics curricula

for teaching mathematics according to the developed mathematics curricula in Jordan.

Figure 1 The six steps strategy (PETTEC) for teaching mathematics according to the developed mathematics curricula

Below is an explanation of each step according to what was stated in the mathematics teacher's guide issued by the National Center for Curriculum Development (NNCD, 2022)

1) Preparation:

This stage aims to prepare students for the topic of the lesson, but without mentioning any of its ideas. This item may contain an activity based on the students' previous knowledge. Therefore, during this stage, some conceptual errors can be detected and corrected before the lesson begins.

- Goal: Set the stage for learning and activate existing knowledge.
- The role of the teacher is to pique students' interest by posing challenging questions, using real-world examples, or posing an obstacle.
- Student Engagement: Pupils mentally get ready for the new idea by recalling prior knowledge.

Exploration:

This stage aims to arouse students' curiosity about the lesson topic, but without providing them with ready-made information. At this stage, the teacher must play the role of facilitating learning, by directing the students to read the issue contained in the student's book, giving them sufficient time to study and think about it, and then asking the students to answer the questions suggested in the (Exploration) section of this guide. It is not a requirement that students be able to answer these questions correctly; Therefore, the teacher must accept the answers, then consider them later after the end of the lesson, and ensure their correctness, bearing in mind that the exercises in some lessons refer the students to the problem, to solve it at the end of the lesson.

- Goal: Motivate pupils to research and uncover mathematical concepts.
- The role of the teacher is to lead group discussions, problem-solving exercises, or practical exercises.
- Student Engagement: Through guided inquiry, students investigate correlations, patterns, or tactics.

Teaching

It is expected that the (exploration) stage will lead to a state of imbalance in concepts among students, and then the (Teaching) stage will begin to restore balance among students, to be able to form specific joint experiences that help them understand concepts and master processes and skills. This stage takes up a lot of lesson time; It includes providing explanation paragraphs and all lesson examples. Therefore, the mathematics teacher must use the instructions contained in the (Teaching) section of this guide. To be able to implement this important stage successfully.

- Goal: Make mathematical ideas more understandable and formal.
- The role of the teacher is to model methods, give clear instructions, and explain rules.
- Student Engagement: To solidify their understanding, students listen, pose questions, and take notes.

4) Training:

At this stage, students practice different types of abstract and real-life problems in the item I practice and solve problems (and the item) higher-order thinking skills (inside the classroom); To consolidate new concepts and increase their procedural fluency. Students may complete them at home. As well as the exercises and problems the lesson in the exercise book.

- Goal: Use practice to strengthen what has been learned.
- The role of the teacher is to provide structured activities and track students' development.
- Student Engagement: To improve their fluency, students can work alone or in groups to solve challenges.

Enrichment:

Expansion of concepts, processes, and skills is the primary goal of this stage, which involves engaging students in tasks that involve broader and deeper

concepts and processes. The developed mathematics curricula provide several sources to enrich students with an upper-intermediate level, including the enrichment item in this guide, which contains a question, classroom activity, or computer activity, in addition to the unit project that enriches students' knowledge of the unit topics.

- Goal: Expand education beyond the parameters of the traditional curriculum.
- The role of the teacher is to provide complex issues, interdisciplinary connections, or imaginative assignments.
- Student Engagement: By applying ideas in new contexts, students get a deeper comprehension of the material.

Conclusion:

It is the last stage of presenting the lesson. It aims to collect the various ideas included in the lesson, then present them in a coherent manner, as well as including suggestions that help to present this stage successfully.

- Goal: Evaluate comprehension and reflect on what has been learned.
- The role of the teacher is to summarize the main ideas, go over the goals again, and assist students with self-evaluation.
- Student Engagement: Learners express their understanding and pinpoint areas in which they need to grow.

The mathematics teacher must apply the 6-step strategy as stated in the teacher's guide, starting with the configuration step and ending with the conclusion step. Table 1 shows an application (actions) to the "Trigonometric Ratios" lesson from the Tenth grade developed curriculum for the first semester based on six stages strategy (PETTEC).

Table 1 *An application (actions) to the "Trigonometric Ratios" lesson based on six stages strategy (PETTEC).*

N	Stages	Actions
1	Preparation	▪ I draw a group of angles on the board (acute, obtuse, straight), and remind the students of the concept of an angle. ▪ I remind the students of the basic trigonometric ratios of the acute angle, then ask them: What is the largest value of the sine ratio of the acute angle? What is the smallest value? Then I repeat the question about the cosine ratio.
2	Exploration	▪ Direct the students to read the problem in the item (Today's Question). ▪ Draw on the board the angle between the blades of the electric power generating fan roughly. ▪ Draw a triangle containing an angle whose measure is 120, then ask the students: » How can we find the trigonometric ratios of this angle? ▪ Listen to the students' answers, then ask them each time: » Who supports the answer? » Who has another answer? » What is this answer?
3	Teaching	▪ Explain to the students that an angle drawn in the coordinate plane is in the standard position when the following two conditions are met: the vertex of the angle is at the origin, and its starting side is in the x-axis. ▪ Explain to the students that the position of the end side of an angle has nothing to do with whether it is in the standard position or otherwise, and explain to them what is meant by the positive (counterclockwise) measure and the negative (clockwise) measure of the angle. ▪ Ask the students to write down in their notebooks the necessary conditions that make the angle in the standard position. ▪ The emotional field is no less important than the cognitive field. Therefore, I should not say to one of the students: (Your answer is wrong), but rather I should tell him: (You have come close to the correct answer.)

N	Stages	Actions
4	Training	▪ I direct the students to the item (I practice and solve problems), then I ask them to solve problems (26-1) in pairs in the classroom. These problems in particular are directly related to the lesson examples, and they are used specifically to train students on the concepts themselves, regardless of whether they are Questions are odd or even. ▪ If students have difficulty solving any problem, I choose one of the students who was able to solve the problem; To discuss his/her strategy for solving the problem on the board, motivating students to ask any questions about the solution steps presented by his/her colleague.
5	Enrichment	▪ I ask the students to justify their answer to Question 29 by drawing or preparing a tool or model that shows the largest value of the sine ratio and its smallest value, and then I present it to colleagues.
6	Conclusion	▪ At the end of the lesson, I ask the students to summarize what they learned in their own words. Then I ask each of them to choose a topic from the lesson that they have mastered, write a question about it, and a topic that needs more practice to master it, and write a question about it.

The mathematics teachers' guide for the developed curricula includes procedures that help the teacher teach mathematics, according to the six steps strategy (PETTEC). The teacher's guide shows how the teacher should teach, clarifying the procedures and actions of each stage that the mathematics teacher must take to ensure effective teaching. Therefore, this study attempts to investigate the perceptions of practicing mathematics teachers who teach mathematics in Jordanian schools regarding the six steps of teaching mathematics.

The main objective of the study is to know the perceptions of practicing mathematics teachers on using the six steps in teaching mathematics based on mathematics curricula developed in Jordan, and determining the effect of academic qualification on the perceptions. The study includes answers to the following questions:

1) What is the degree of perceptions of practicing mathematics teachers regarding the six steps strategy (PETTEC) in teaching mathematics according to the mathematics curricula developed in Jordan?
2) Are there statistically significant differences at an indicative level (¤= 0.05) in the degree perceptions of practicing mathematics teachers towards the six steps strategy (PETTEC) in teaching mathematics according to the variable academic qualification of mathematics teachers?

Methodology

Research Design

The researcher used a descriptive research methodology by dispersing the study tool, computing the frequencies and means of the responses from math teachers, using descriptive research in field research, and assisting in ascertaining the views of math teachers in practice regarding the six steps strategy (PETTEC) of teaching math in accordance with the content of the math curricula created in Jordan.

Participants

The study participants consists of all currently employed math teachers who read the math curricula created for the foundational stage in the Bani Obeid region of the Irbid governorate for the year 2023–2024. The Directorate of Education's data for the same year indicates that there were 175 math teachers in the Bani Obeid region of the Irbid governorate. The study sample, which comprised 135 teachers, or 75.4% of the study population, was chosen using the simple random sampling approach, that suggests a larger sample size is better for representing the population. The academic qualifications of math teachers in practice include both non-educational (science-related specializations like mathematics) and educational (educational) specializations. Repetition and percentages by scientific qualification are displayed in Table 2.

Table 2: Repetitions and percentages of practicing mathematics teachers by type of academic qualification (educational qualification, non-educational qualification)

Groups	Repeated	percentage
Educational qualification	25	18.5%
Non educational qualification	110	81.5%
Total	135	100%

Instruments

The study's purpose was confirmed by the researcher through the development of a 12-item questionnaire that was based on the study material. On a fifth Likert scale, it was graded. The fifth level shows that practical math teachers have extremely high opinions on the six stages technique (PETTEC) for teaching arithmetic, and the lower the teacher's response. At about the first level, impressions became less intense. The following equation was used to categorize the arithmetic averages for the degree of inclusion into five levels: very high, high, Medium, few, and extremely few. (Maximum - Minimum Value) ÷ The quantity of levels.

This value is equal to the length of the levels, and therefore:

1.00 - 1.8 Very few 1.8 - 2.6 few
2.6 - 3.4 Medium 3.4 - 4.2 High
4.2 - 5.00 Very High.

Validity

The researcher showed the questionnaire's draft version to a group of reviewers with relevant expertise in order to confirm its validity. Six arbitrators made up the initial picture of the identification. The arbitrators made several recommendations based on their observations, including revising some paragraphs, adding more subparagraphs, shortening and clarifying some paragraphs, emphasizing that each paragraph should have a single, clear purpose, and recommending that the paragraphs be connected to mathematics curricula. Eight previous arbitrators were then given a revised questionnaire that had been produced in accordance with the recommendations of the previous reviewers. Their recommendations were few and restricted. and the final identification was prepared by the researcher on the basis of the suggestions and guidance of all reviewers.

In order to obtain the indicators of validity construction for the scale, the correlation coefficients between the overall grade and each paragraph were extracted from a survey sample of thirty teachers that was drawn from outside the study sample. The correlation coefficients between the paragraphs and the tool as a whole ranged from 0.38 to 0.89.

Reliability

The reliability of the study tool was verified through the use of the test-retest method. Two weeks after the initial administration, the scale was given to thirty individuals who were not included in the study sample. The two estimations were compared using the Pearson correlation coefficient. The reliability coefficient was also ascertained using the Cronbach Alpha equation and the internal consistency approach. The results showed that the repeat reliability was (0.84) and the internal consistency coefficient was 0.86.

Findings

The study presents its results, as the number of study questions was two, and they were answered through the questionnaire prepared for this study.

The first question:

What is the degree of perceptions of practicing mathematics teachers regarding the six steps strategy (PETTEC) in teaching mathematics according to the mathematics curricula developed in Jordan?

In order to respond to this question, the arithmetic means and standard deviations were used to determine how practicing math teachers felt about the six steps strategy (PETTEC) for teaching math in accordance with the math curricula created in Jordan. The rank and degree for each paragraph are displayed in table 3 below.

Table 3 shows the degree of perceptions of practicing mathematics teachers regarding the six steps strategy (PETTEC) according to the mathematics curricula developed in Jordan is high with arithmetic mean 3.75. The highest paragraph is

Table 3: Arithmetic means and standard deviations for the degree of perceptions of practicing mathematics teachers regarding the six steps strategy (PETTEC) in teaching mathematics according to the mathematics curricula developed in Jordan.

Rank	Number	Paragraphs	Arithmetic mean	standard deviation	Degree
12	1	Preparing students for the lesson topic makes it easier to move directly to the lesson. (Preparation)	3.4	.79	High
10	2	Relying on students' prior knowledge in mathematics. (Preparation)	3.70	1.08	High
11	3	Arousing students' curiosity about the lesson topic, but without providing them with ready-made information. (Exploration).	3.69	1.10	High
4	4	The mathematics teacher must play the role of facilitating learning (Exploration).	3.82	.97	High
3	5	Rebalancing students to create specific shared experiences that help them understand concepts and master processes and skills. (Teaching).	3.83	.97	High
1	6	The mathematics teacher provides the explanation paragraphs and all the lesson examples. And use the instructions contained in the teacher's guide. (Teaching).	3.90	.95	High
2	7	Students practice different types of abstract and real-life problems, solving higher-order thinking skills problems in the classroom. (Training)	3.84	.97	High
8	8	Students may complete the exercises and problems in the exercise book at home. (Training)	3.79	1.00	High
6	9	Engaging students in tasks that involve broader and deeper concepts and processes. (Enrichment)	3.80	1.00	High
7	10	Focus on the unit project that enriches students' knowledge of the unit topics. (Enrichment)	3.79	.95	High
5	11	Collect the different ideas included in the lesson, then present them in a coherent manner. (Conclusion)	3.81	.97	High
9	12	Finish the mathematics class after ensuring that the topic has been fully presented. (Conclusion)	3.70	.98	High
The degree of perceptions of practicing mathematics teachers regarding the six steps strategy (PETTEC)			3.75	.97	High

"The mathematics teacher provides the explanation paragraphs and all the lesson examples. And use the instructions contained in the teacher's guide" with arithmetic mean 3.90 in stage teaching. And the lowest paragraph is "Preparing students for the lesson topic makes it easier to move directly to the lesson" with arithmetic mean 3.4 in stage configuration.

Preparing students for the lesson topic received the lowest rating (Mean = 3.40, Rank = 12), and "Relying on students' prior knowledge" received a higher rating (Mean = 3.70, Rank = 10). Interpretation: Teachers may not be making the most of interesting warm-up techniques to get pupils ready for new material, even while they value making connections to existing knowledge. This implies that more dynamic or participatory preparation methods are required.

In Exploration stage, "Arousing interest without providing prefabricated knowledge" (Mean = 3.69, Rank = 11) and "Learning is facilitated by the teacher" (Mean = 3.82, Rank = 4). Interpretation: Teachers feel more at ease facilitating learning than letting pupils do it on their own. This shows a chance to improve inquiry-based learning and might be a reflection of a traditional teaching style.

In Teaching stage, Highest-rated item overall: "Teacher explains using guide and examples" (Mean = 3.90, Rank = 1), and "Creating shared experiences" (Mean = 3.83, Rank = 3). Teachers feel most confident in the direct instruction phase, especially when supported by structured materials. This reinforces the importance of well-designed teacher guides and lesson plans.

In Training stage, "Practicing higher-order thinking problems in class" (Mean = 3.84, Rank = 2), and "Homework practice" (Mean = 3.79, Rank = 8). There is strong emphasis on in-class problem-solving, particularly with complex tasks. However, homework may be seen as less impactful, possibly due to lack of follow-up or student engagement outside the classroom.

In Enrichment stage, "Broader and deeper tasks" (Mean = 3.80, Rank = 6), and "Unit project for enrichment" (Mean = 3.79, Rank = 7). Teachers recognize the value of enrichment but rate it slightly lower than teaching and training. This suggests enrichment activities are present but may not be fully integrated or prioritized.

In Conclusion stage, "Summarizing ideas coherently" (Mean = 3.81, Rank = 5), and "Ensuring full presentation before ending class" (Mean = 3.70, Rank = 9). Teachers are committed to wrapping up lessons effectively, though some may end sessions without thorough checks for understanding. This points to a need for stronger formative assessment tools during closure.

The results reveal that mathematics teachers show strong confidence in the teaching and training phases of the PETTEC strategy, particularly when supported by structured materials and classroom activities. However, the lower ratings for preparation and exploration suggest a need to enhance student-centered approaches that activate prior knowledge and stimulate curiosity. To address this gap, professional development should focus on equipping teachers with practical strategies for designing engaging lesson introductions and facilitating inquiry-based learning, thereby fostering deeper student involvement from the very start of the instructional process.

The Second question:

Are there statistically significant differences at an indicative level ($\propto$= 0.05) in the degree perceptions of practicing mathematics teachers towards the six steps strategy (PETTEC) in teaching mathematics according to the variable academic qualification of mathematics teachers?

To answer this question, the arithmetic means and standard deviations were extracted the degree perceptions of practicing mathematics teachers towards the six steps strategy (PETTEC) in teaching mathematics according to the academic qualification variable. To show the statistical differences between the arithmetic means, the "t" test was used, and the table 4 below shows this.

Table 4 shows that there are no statistically significant differences in the degree perceptions of practicing mathematics teachers towards the six steps strategy (PETTEC) in teaching mathematics according to the variable academic qualification of mathematics teachers. There is strong agreement among teachers about the efficacy of the PETTEC approach, as evidenced by the average rating of 3.75 for all items and a standard deviation of 0.97. Every item was given a "High" degree, indicating that the six teaching phases were consistently viewed favorably.

Table 4: Arithmetic means, standard deviations, and the "t" test for the effect of academic qualification on the degree perceptions of practicing mathematics teachers towards the six steps strategy (PETTEC) in teaching mathematics.

	academic qualification	Numbers	Arithmetic mean	standard deviation	F Value	Degrees of freedom	statistical significance
The degree of perceptions of practicing mathematics teachers regarding the six steps strategy (PETTEC)	Non educational	110	46	9.47	.133	133	.71
	Educational	25	41.2	9.48			

Discussion

Regarding the first question:

The study's findings demonstrated that, in accordance with Jordanian mathematics curricula, practicing math teachers had a high degree of perception regarding the six-step technique (PETTEC) used to teach mathematics. This shows that mathematics teachers accept this strategy because they feel it helps them teach mathematics effectively and makes the standardization process successful, which benefits students' acquisition of the mathematical concepts and skills included in the developed mathematics curricula. Instructors of mathematics believe this strategy helps them teach mathematics effectively.

From the results of the study, it appears that practicing mathematics teachers are satisfied with the six-step strategy, because the strategy includes all the educational moves that mathematics teachers must take while teaching mathematics, starting with the preparation step, with which the mathematics teacher begins the lesson and prepares the students towards the topic of the lesson. Figure 3 shows an example of the preparation step from "Solving a System of Linear and Quadratic Equations lesson". Preparation for the lesson is done through the following:

- Write the following system of equations on the board: x y = 10, x + y = 7, then ask the students:
- How is this system different from what you know?
- How can it be solved?
- listen to the answers of the largest number of students, and I always ask them: Who supports the answer? Why? Who has another answer? What is this answer? This is to enhance students' communication skills (expressing opinions and respecting other opinions).
- ell the students that they will learn about a solution like the previous one in this lesson.

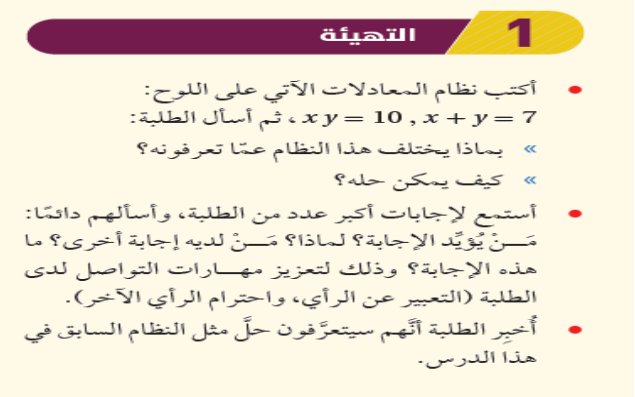

Fig. 2: An example of the preparation step from "Solving a System of Linear and Quadratic Equations lesson".

In the exploration stage, the strategy encourages students to build on their previous knowledge and reach results with the aim of smooth transition towards the lesson and its objectives. This is what the constructivist theory of learning calls for, as the constructivist theory is based on students building their knowledge and providing motivation for learning. The exploration phase also makes the teacher's role a facilitator and guide for the students. Figure 3 shows an example of applying the exploration step to "Solving a System of Two Quadratic Equations" lesson as stated in the teacher's guide. as follows:

- Direct the students to read the problem in the item (Today's Question).
- Write the two equations in the problem on the board. Ask the students:
  What type of equations are in this system?
  » Two quadratic equations.
- How can this system be solved? By substituting the value of y from the first into the second, or deleting y from the two equations, then solving the resulting equation.
- Listen to students' answers without providing them with feedback.

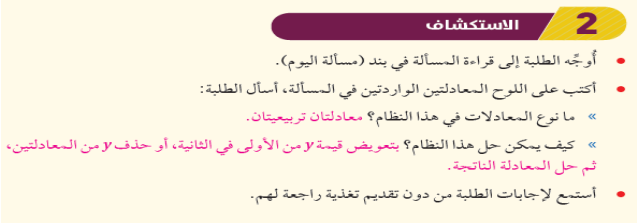

Fig. 3: An example of the exploration step from "Solving a System of Two Quadratic Equations" lesson.

The teacher's role begins in the teaching phase. The teacher moves on to introduce the lesson by presenting lesson ideas supported by various examples. In addition to asking students questions, students participate in this stage by answering the teacher's questions and participating in the learning process. Figure 4 shows an example of the teaching phase of the "Simplifying Exponential Expressions" lesson as stated in the teacher's guide. as follows:

- Write the definition of the rational exponent, then explain it to the students, supported by examples.
- Ask the students:
  » What is the meaning of simplifying exponents? Writing it in its simplest form.
  » How do I simplify a given algebraic term? Applying the laws of foundations.
- Listen to one of the students' answers, then ask his colleagues:
  » Who agrees with him?
  » Who has another answer? This is to enhance students' communication skills (expressing opinions and respecting other opinions).
- Discuss the solution of example 1 with the students, focusing on justifying each step.

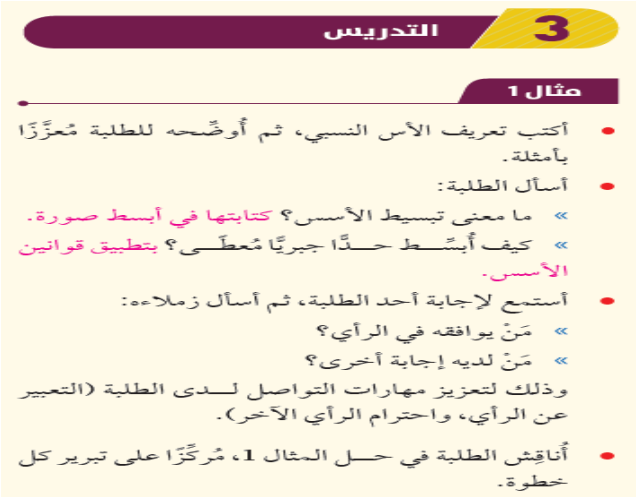

Fig. 4: An example of the teaching step from "Simplifying Exponential Expressions" lesson.

Students practice exercises and questions within the developed mathematics curricula, and seek to apply all the lesson ideas that were covered in the exercises contained in the lesson. The training phase gives mathematics teachers an opportunity to ensure that students master the concepts, procedures, theories, and laws contained in the lesson, in addition to applying pair and group learning methods. Figure 5 shows an example of the training phase of the lesson "Solving Exponential Equations" as presented in the teacher's guide. as follows:

I practice and solve problems

- I direct the students to the item (I practice and solve problems), then I ask them to solve problems (21-1) in pairs in the classroom. These problems in particular are directly related to the lesson examples, and they are used specifically to train students on the concepts themselves, regardless of whether the questions were odd or even.
- If students have difficulty solving any problem, I choose one of the students who was able to solve the problem. To discuss his/her strategy for solving the problem on the board, motivating students to ask any questions about the solution steps provided by his/her colleague.

Figure 5 An example of the training step from "Solving Exponential Equations" lesson.

Fig. 5: An example of the training step from "Solving Exponential Equations" lesson.

Student learning is enhanced through the enrichment stage, where questions and ideas are asked to develop students' ideas, enhance their learning, and enrich them with questions that require prior skills and knowledge. The enrichment stage deepens students' mathematical understanding. Figure 6 shows an example of the enrichment step from "Chords, Diameters and Tangents of a Circle" lesson as stated in the teacher's guide, as follows:

- Ask the students to solve the following question as an enrichment for them:
  - » Find the average by calculating the perimeter of the following triangle ABC whose sides touch the circle at the points: E, and F. And G.

In the conclusion phase, the mathematics teacher ends the lesson by emphasizing and grouping the lesson ideas and providing a quick and comprehensive summary of the lesson. Figure 7 shows an example of the conclusion phase of the "Bearing" lesson as stated in the teacher's guide, as follows:

- Ask the students the following two questions:
  - » What is meant by the direction from the north?
  - » How can we find the direction of point A from point B?
- isten to the answers of as many students as possible, then ask them:

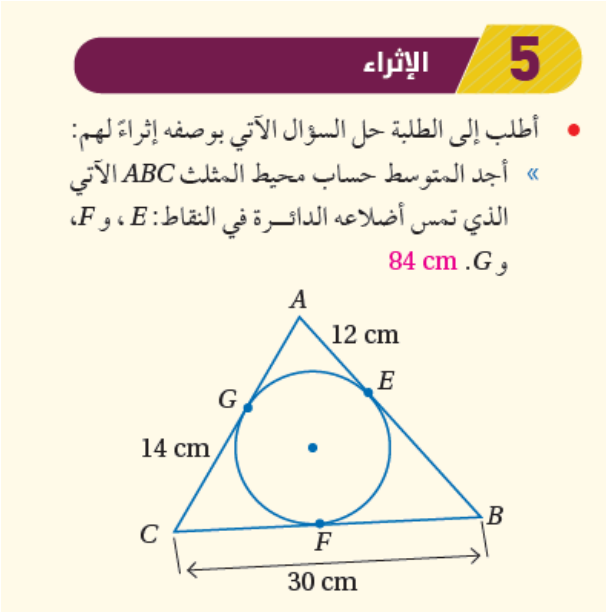

Fig. 6: An example of the Enrichment step from "Chords, Diameters and Tangents of a Circle" lesson.

- » Who supports the answer?
- » Who has another answer?
- » What is this answer?

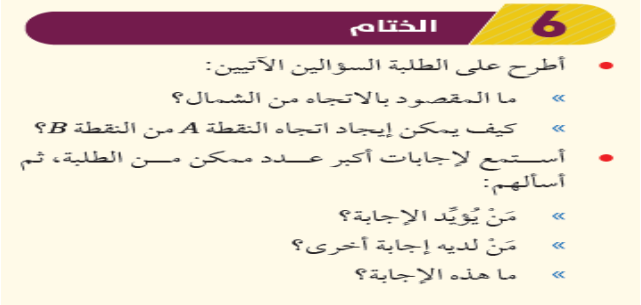

Fig. 7: An example of the conclusion phase of the "Bearing" lesson

The findings from the PETTEC strategy reveal a strong consensus among mathematics teachers regarding its effectiveness, with all six instructional phases—Preparation, Exploration, Teaching, Training, Enrichment, and Conclusion—receiving high ratings. This aligns with several contemporary studies that emphasize the value of structured, multi-phase teaching models. For instance, Alzahrani (2022) demonstrated the success of the seven-step IMPROVE

program in enhancing students' performance across Bloom's taxonomy levels, while Al Assaf (2019) showed that the 5Es learning cycle significantly improved problem-solving and academic achievement among ninth-grade students. These studies, like PETTEC, highlight the importance of clear instructional sequencing and active engagement.

However, the PETTEC results also revealed relatively lower ratings for the Preparation and Exploration phases, suggesting that teachers may be less confident in implementing student-centered or inquiry-based approaches. This contrasts with studies such as Ghunaimat & Alawneh (2024), which found that applying the SOLO taxonomy significantly enhanced students' understanding of coordinate geometry through exploratory learning. Similarly, Alabdulaziz (2022) emphasized the role of prediction and observation in developing conceptual understanding, pointing to the need for more dynamic and curiosity-driven strategies in the early stages of instruction.

Another notable finding from the PETTEC study is the absence of statistically significant differences in teachers' perceptions based on academic qualification. This mirrors the results of Alshawara (2021), who found no significant differences in textbook evaluations based on gender or experience. Such consistency suggests that effective teaching practices may be more influenced by professional development and classroom experience than by formal academic credentials.

On the other hand, PETTEC does not explicitly address mathematical communication skills, which were found to be lacking in the Turkish middle school curriculum according to Oztas & Tunca-Guclu (2023). Their study recommended a more deliberate integration of reading, writing, speaking, and listening components in mathematics instruction—an area PETTEC could expand upon to enhance its comprehensiveness.

Finally, the emphasis on higher-order thinking in PETTEC's Training and Enrichment phases aligns well with Thinwiangthong et al. (2024), who highlighted the importance of critical thinking skills in modern classrooms. Likewise, Alzoebi et al. (2023) demonstrated that the flipped classroom approach, grounded in the ADDIE model, effectively developed algebraic thinking skills, reinforcing the value of active learning and cognitive engagement.

In summary, while PETTEC shares many strengths with contemporary instructional models—particularly in structured delivery and cognitive development—it would benefit from deeper integration of exploratory learning, communication skills, and student autonomy. These enhancements would align it more closely with global trends in mathematics education and further support its application in diverse and evolving classroom contexts.

Regarding the second question:

The finding that there are no statistically significant differences in mathematics teachers' perceptions of the PETTEC strategy based on academic qualification is both insightful and encouraging. It suggests that the strategy's core principles—Preparation, Exploration, Teaching, Training, Enrichment, and Conclusion—are universally understood and valued across different levels of academic attainment. This uniformity may be attributed to the clarity and accessibility of the PETTEC framework itself, which provides structured guidance that can be effectively implemented regardless of whether a teacher holds a bachelor's or a postgraduate degree.

One possible explanation is that professional experience and ongoing pedagogical training play a more influential role in shaping instructional practices than formal academic credentials alone. Teachers often develop their classroom strategies through hands-on experience, peer collaboration, and exposure to curriculum standards, which may lead to a shared understanding of effective teaching methods. The high average rating (3.75) and consistent "High" degree across all items further reinforce this idea, indicating that the PETTEC model resonates with teachers at all levels and supports their instructional goals.

Moreover, the absence of significant variation may reflect the success of national training programs or curriculum guides—such as those issued by the National Center for Curriculum Development—in standardizing teaching approaches and promoting best practices. When instructional strategies are clearly defined and supported by practical examples, teachers are more likely to adopt them consistently, regardless of their academic background.

In essence, this result highlights the strength of the PETTEC strategy as a unifying framework for mathematics instruction. It underscores the importance of accessible, well-structured teaching models that empower educators across the spectrum to deliver high-quality learning experiences. Rather than relying solely on academic qualifications, educational systems should continue to invest in professional development, mentoring, and resource design to ensure that all teachers can implement effective strategies with confidence and clarity.

Conclusion

The overall results indicate a strong and consistent agreement among mathematics teachers regarding the effectiveness of the PETTEC six-step instructional strategy—Preparation, Exploration, Teaching, Training, Enrichment, and Conclusion. All twelve items received a "High" rating, with an overall mean of 3.75 and a standard deviation of 0.97, reflecting a unified perception of the strategy's value in classroom practice.

The Teaching and Training phases were rated the highest, suggesting that teachers feel most confident when delivering structured content and guiding students through problem-solving activities. In contrast, the Preparation and Exploration phases received relatively lower scores, pointing to potential areas for improvement in activating prior knowledge and encouraging inquiry-based learning. Importantly, the data also show no statistically significant differences in teachers' perceptions based on their academic qualifications. This implies that the PETTEC strategy is broadly accessible and applicable across varying educational backgrounds, reinforcing its practicality and relevance in diverse teaching contexts.

Overall, the findings support the PETTEC model as a well-received and effective framework for mathematics instruction, while also highlighting opportunities to strengthen student-centered practices in the early stages of the lesson.

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