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Teachers' Perceptions towards Practical Instruction Approach in Teaching Mathematics: A case of Selected Teachers in Ugandan Secondary Schools

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Abstract. Globally, there is a need to address learners' academic achievement, which has historically been poor, particularly in underdeveloped countries. Practical instruction (PI) approach has been perceived by many teachers as a better teaching strategy. Students in Ugandan secondary schools have consistently performed poorly in their O'Level national mathematics examinations. This has been attributed to teachers' failure to teach these students with practical approach in some examinable topics, making the subject very abstract to candidates. This qualitative case study analyzed teachers' perceptions of the practical instruction approach to teaching mathematics and its impact on students' academic achievement in mathematics. Sixteen teachers from chosen secondary schools in Kigezi and Ankole regions were interviewed for the study in order to understand more about their opinions on the value and use of practical instruction in the teaching and learning of mathematics. The data gathered were analyzed using thematic analysis. The study showed that teachers regard PI as one of the best teaching methodologies since it incorporates components that help improve students' creativity and critical thinking. The study also indicated that teachers' perceptions of practical instruction approaches for teaching mathematics are diverse and influenced by a variety of circumstances. Creating supportive settings, offering professional

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development opportunities, and providing access to resources can assist teachers in effectively incorporating practical instruction methodologies into their teaching practice, resulting in improved student learning outcomes in mathematics. It is recommended that teachers should be well prepared before commencing the teaching and learning process, including all PI components.

Keywords: teachers' perceptions; attitude; practical instruction; students; mathematics

1. Introduction

Numerous activities that people perform on a daily basis involve mathematics (Mumcu, 2018; Rangel et al., 2016). Teachers are key players in the learning process because they can predict students' academic success (Al-Ansi, 2017). Developing countries face significant educational difficulties, one of which is the scarcity of highly educated teachers with good perception towards teaching and capable of imparting quality knowledge to the learners (Al-Ansi, 2017). Providing residents with a high-quality education has been at the forefront of the agendas of many nations worldwide (Guerriero, 2017). Since many students struggle to study science, one of the main concerns is raising the caliber of science education (Lin et al., 2016). In Uganda, for example, secondary school students continue to perform poorly in science subjects, including mathematics (Uganda National Examinations Board (UNEB), 2019, 2021).

The concept of teachers' perceptions towards practical instruction approach in teaching mathematics describes the attitudes, convictions, and points of view that educators have about the application of experiential, hands-on, and real-world learning to the teaching of mathematical ideas (Ismail et al., 2019). These perceptions include the ways in which educators see the value, applicability, and viability of incorporating hands-on learning activities, problem-solving strategies, and real-world examples into their methodology for teaching mathematics (Ismail et al., 2019; Tok, 2015). PI approaches encompass a variety of tactics and techniques meant to help students understand mathematical ideas in a more concrete and approachable way (Millar, 2009).

Teachers with a high level of qualification and competence are essential in educational systems and their perceptions to using active teaching approaches are positive (Boaler et al., 2022). In order to assist students in realizing their full potential and contributing to society in the twenty-first century, teachers must meet increased and more sophisticated expectations (Mukuka & Alex, 2024b; Syafriafdi et al., 2019). Teachers now, more than in the past, need to be professionals who base their decisions and perceptions on a solid and current body of information, given the nature and complexity of these demands (Darling-Hammond & Bransford, 2007).

Teachers' perceptions must be taken into account in order to provide them with the necessary competencies they need to plan, direct, and modify their practical teaching activities (Mapulanga et al., 2023; Muhammad, 2019). Currently, there

is still no clear direction in the curriculum for teaching mathematics that would help teachers and students develop critical, creative, and inventive practical skills (Firdaus et al., 2015; Widana et al., 2018).

Numerous researchers conducted studies that shed light on the variables influencing teachers' attitudes, beliefs, and instructional methods in mathematics education. These studies offer insightful information about how teachers perceive practical instruction approaches in the classroom (Heffernan et al., 2019; Kaneza et al., 2023). Teachers' perceptions of practical instruction approaches in mathematics instruction can differ greatly based on a number of factors, including their educational background, experience in the classroom, philosophy of teaching, and the resources at their disposal (Heffernan et al., 2019; Sibomana et al., 2021).

Using manipulatives, real-world examples, and hands-on exercises are examples of practical instruction approaches that many teachers believe are very effective (Kyere, 2017). These authors contend that by using these strategies, learners can better grasp and relate to abstract mathematical ideas. Student participation in the learning process can be increased through practical instruction, which will increase their enthusiasm and interest in mathematics (Kaneza et al., 2023; Mbwile & Ntivuguruzwa, 2023; Millar, 2009). Teachers perceive that hands-on learning fosters the critical thinking, mathematical reasoning, and problem-solving abilities that are vital to students' mathematical growth (Abrahams, 2011).

While some teachers understand the advantages of practical instruction, they may feel limited in their ability to use these strategies because of curriculum restrictions, standardized testing, or a lack of resources (Ismail et al., 2019). Teachers who have high class sizes or limited access to materials may find it difficult or time-consuming to include practical instruction into their lesson plans. They may be concerned about striking a balance between fulfilling certain learning objectives or covering necessary topics even though they recognize the importance of hands-on activities (Loewenberg Ball & Forzani, 2009).

Some teachers could be uneasy switching from more familiar teaching techniques, or they might not have the confidence to apply practical instruction approaches in an effective manner (Abrahams & Millar, 2008; Kidman, 2012). They could think that teaching mathematical topics should be done more effectively or appropriately using more conventional techniques like lecture-based learning and rote memorization (Abrahams & Millar, 2008; Muijs & Reynolds, 2017). Regarding practical instruction methodologies, teachers' opinions may also differ based on the grade level they teach, the students' individual requirements, and their cultural background (Kidman, 2012; Mbwile & Ntivuguruzwa, 2023). For instance, primary school teachers might favor practical exercises and manipulatives to help young students grasp fundamental mathematical ideas, whereas high school teachers might give priority to more theoretical or abstract methods.

Academic achievement in Ugandan secondary schools at Uganda Certificate of Education (UCE) examinations has not been good and it is not clear whether teachers' perception towards practical instruction in teaching mathematics is partly the reason. According to the reports from Uganda National Examinations Board (UNEB), students do not perform well the numbers which need mathematical practical skills and the reports attribute this to teachers' perceptions in handling some practical topics (Uganda National Examinations Board (UNEB), 2019, 2022).

Based on the aforementioned points, it is appropriate to undertake a study and investigate the teachers' perceptions towards practical instruction approach in teaching mathematics**.** Overall, the study's significance is that practical instructional approaches would reveal the many benefits of incorporating hands-on, real-world learning experiences into education, ultimately leading to more effective teaching and more engaged, capable students.

1.1. Research questions

1. What are the teachers' perceptions towards PI approach in teaching mathematics?
2. Do teachers' perceptions towards PI affect the learners' academic achievement in mathematics?

2. Literature Review

The reviewed research on teachers' perceptions of the practical instruction approach to teaching mathematics is presented in this section.

2.1. Practical instruction, Teachers' perceptions and Academic achievement

Many researchers across the globe have discussed practical instruction approach as one that typically involves teaching mathematical concepts through real-world applications, hands-on activities, and concrete examples (Abrahams & Millar, 2008; Loewenberg Ball & Forzani, 2009). While practical instruction emphasizes real-world relevance, it may not always focus explicitly on problem-solving as the primary instructional approach (Jurdak, 2016).

According to Arseven (2015), students' involvement with mathematics is frequently increased by practical instruction approaches. Students are more likely to be actively engaged in learning mathematics when teachers positively perceive the PI approach and include it into their lessons, which can enhance their academic achievement in the subject (Festus, 2013). Students get a greater comprehension of mathematical principles by making connections between abstract concepts and tangible experiences (Boaler, 2002). They are more likely to understand challenging concepts and apply them in many circumstances when teachers value and employ these strategies effectively. Furthermore, PI is regarded by several other authors including Mukuka and Alex (2024a) as effective teaching strategy helping students retain their mathematical knowledge and abilities over time by giving them chances to apply what they have learned in meaningful contexts. Students have a higher chance of remembering and applying their mathematical knowledge to novel settings

when teachers place an emphasis on practical instruction (Baker, 2011; Kaneza et al., 2023).

Mathematical achievement according to Durksen et al. (2017) can be raised in students through practical instruction, which incorporates practical exercises, real-world applications, and interactive learning opportunities. Students are more likely to participate actively in their learning when teachers adopt these strategies with a positive attitude and successfully, which can boost their academic achievement (Baker, 2011). Students gain a greater knowledge of mathematics when they are encouraged to relate mathematical principles to real-world situations through practical training. Conceptual comprehension is likely to be prioritized over procedural fluency and rote memorization by teachers who respect and appreciate practical approaches (Kidman, 2012). Students who have a deeper comprehension of a subject are better able to use their knowledge to solve complicated challenges, which can lead to higher academic achievement (Ndihokubwayo et al., 2020; Tugirinshuti et al., 2021).

PI frequently places a strong emphasis on reasoning, critical thinking, and problem-solving techniques. Educators who consider these abilities to be crucial elements of mathematical competence are inclined to incorporate pragmatic methods into their instruction (Abrahams & Millar, 2008). Students acquire the abilities required for academic achievement in mathematics and other subjects as they work through real-world situations and apply mathematical principles in context (Wells, 2015). By incorporating a variety of viewpoints and experiences, PI makes mathematics more inclusive and relevant for all students. Teachers that are cognizant of the cultural experiences and backgrounds of their learners are more likely to employ useful strategies that connect with a wide range of students. By fostering a pleasant learning atmosphere where all students feel appreciated and involved, inclusion can have a favorable effect on academic attainment (Loewenberg Ball & Forzani, 2009).

The way that teachers evaluate students' academic progress and learning might be influenced by their perceptions about practical instruction (Ketterlin-Geller & Yovanoff, 2019). Real-world problem-solving scenarios, projects, performance assignments, and portfolios are examples of assessments that are in line with practical techniques (Ketterlin-Geller & Yovanoff, 2019). Teachers are more likely to accurately assess academic achievement when they believe that these assessment techniques are genuine and trustworthy indicators of student learning (Pegg, 2003). Teachers' perceptions on practical instruction may be modified by professional development opportunities and institutional support. Professional development programs that stress the benefits of practical techniques while also providing teachers with the knowledge and skills needed to properly implement them can have a favorable impact on teachers' views and, ultimately, the academic achievement of students (Bobis et al., 2011; Pather, 2012).

According to research conducted by Ismail et al. (2019), practical instruction approaches frequently concentrate on problem-solving activities that call for

creativity, critical thinking, and reasoning Students' problem-solving abilities strengthen when teachers appreciate and emphasize these strategies, which is crucial for success in mathematics and other science academic subjects (Mohd et al., 2011). PI strategies can increase students' self-assurance in their mathematical skills by creating a supportive learning environment and giving them chances to succeed. Students are more likely to feel confident in their mathematical ability and take on difficult tasks when teachers assist and encourage them and believe in the efficacy of these approaches (Warner & Kaur, 2017). Teachers' perceptions towards practical instruction approaches can influence students' attitudes towards mathematics. When teachers view mathematics as relevant, interesting, and accessible through practical instruction, students are more likely to develop positive attitudes towards the subject and engage in learning activities enthusiastically (Ismail et al., 2019) .

In general, there is a dynamic and intricate interaction between academic achievement in mathematics, teachers' perceptions, and practical instruction. Students are more likely to be engaged, motivated, and successful in their mathematics learning when teachers value and prioritize practical techniques. However, a number of variables, such as student characteristics, contextual impacts, instructional quality, and teacher expertise, affect how much practical education contributes to academic achievement (Osmanoglu & Dincer, 2018).

3. Methodology

3.1. Research and Sampling Technique

A cross-sectional research design was applied in this investigation. The rationale behind selecting this design was its capacity to enable the simultaneous gathering of qualitative information from a large number of respondents, thereby offering insight into how mathematics teachers view the practical instruction technique. Teachers' perceptions of the practical instructional method to teaching mathematics were significantly enlightened by the qualitative component of the data collection process. Furthermore, the qualitative data collected allowed for a more thorough investigation of the challenges these teachers had when providing practical instruction in mathematics. Through their feedback in an interview, we were able to identify specific themes being analyzed in this study.

3.2. Research Participants

The study employed multi-stage cluster sampling procedure but purposive sampling technique was used as part of it (Cohen et al., 2007; Johnson & Christensen, 2016). One district from each region (Ankole and Kigezi regions) was randomly selected giving an equal chance to all the other districts in the regions. In the selected districts, all government aided and private secondary schools with at least an enrolment of 300 students and which had existed for at least ten (10) years operational were purposively identified, listed to make a sampling frame (Fraenkel et al., 2012; Johnson & Christensen, 2016). In this sense, it was assumed such schools that had existed for long time have average standards in terms of teaching and learning compared to recently established ones. From this sampling frame, two government-aided and two private

secondary schools from each district in each region were randomly selected. This led to eight (8) secondary schools in south-western Uganda to be involved in the study: four from Kabale district and four more from the Ntungamo area. The study involved 16 respondents, all of whom were mathematics teachers. Purposively chosen to take part in in-depth interviews were two respondents with at least five years of teaching experience from each school. Two female teachers and just fourteen male teachers took part in the interviews.

3.3. Table Displaying Participants' Demographic Information

Table 1 below shows data from 16 mathematics teachers, as indicated above. The table shows their age range, teaching experience, gender, highest certification levels, and the class level that they teach. This information was critical during the interview process as it would be used to acquire pertinent data.

Table 1: Participants' information (N = 16)

Respondent ID	Age range in years	Teaching experience in years	Gender	Class level (s) being taught	Highest certification level
T_1	32-37	10	M	S.3	BSc.Ed
T_2	32-37	12	F	S.3	BSc.Ed
T_3	44-49	24	M	S.3 & S.4	DES
T_4	32-37	11	M	S.3 & S.5	BSc.Ed
T_5	38-43	16	M	S.3	DES
T_6	26-31	6	M	S.3	BSc.Ed
T_7	38-43	20	M	S.3 & S.4	DES
T_8	32-37	10	M	S.2 & S.3	BSc.Ed
T_9	38-43	15	M	S.1, S.3	BSc.Ed
T_{10}	32-37	8	M	S.3	BSc.Ed
T_{11}	38-43	14	M	S.3 & S.6	BSc.Ed
T_{12}	32-37	9	F	S.2 & S.3	BSc.Ed
T_{13}	32-37	11	M	S.2, S.3 & S.4	BSc.Ed
T_{14}	26-31	8	M	S.3	BSc.Ed
T_{15}	32-37	12	M	S.3	BSc.Ed
T_{16}	38-43	19	M	S.3 & S.6	BSc.Ed

Note: BSc = Bachelor of Science with Education, DES = Diploma Education Secondary, M = Male, F = Female

3.4. Ethical Considerations

Permission from the appropriate authority was requested and granted prior to the data collection exercise from the intended respondents who were mathematics teachers. All respondents were given well-designed consent forms to signify their willingness to engage in the study, and the Research and Innovations Directorate of the College of Education, University of Rwanda (the first author's institution) had granted ethical approval for the project.

3.5. Data Collection Procedures

A week prior to the face-to-face interview, participants were given a paper containing the consent form and a demographic questionnaire to complete. It

stated the goal of the research, the nature of their participation, how data could be used, and how participants could choose to opt out or withdraw. Nonetheless, they were promised of the strictest anonymity and asked not to withdraw. The interviewer visited each respondent at school based on the agreed-upon appointment time in order to conduct an intensive and relevant interview. Data were collected in July of 2023 and each respondent was interviewed for 20 to 30 minutes.

3.6. Analysis procedures

Responses from the interview questions (Appendix 1) conducted on 16 teachers were critically analyzed following thematic analysis guidelines of Braun and Clarke (2006). These guidelines emphasize one to follow the following steps: (i) to transcript data first, read and reread until one is familiar with it, (ii) generate initial codes, (iii) carry out the search for the themes, (iv) review the searched themes, (v) define, rename the themes and produce the qualitative report. The coding process has been extensive, broad, and comprehensive rather than generating themes based on a few striking examples. Clear and distinct themes were produced. Every pertinent excerpt for every theme has been compiled (Denscombe, 2017). Data and analysis were consistent with one another; the extracts supported the analytical assertions. There was a nice mix between the analytical story and the illustrative excerpts. Based on the data and topic, analysis presented a coherent and compelling narrative. The report adhered to the epistemological viewpoint of the analysis in terms of language and concepts used. The data's validity was guaranteed since the respondents were purposively selected from both public and private secondary schools. In addition, the teachers' findings were continually triangulated to look for new patterns. The analysis and inferences made from it were regularly verified by the second and third authors. In the analysis of the transcripts, the researchers aimed at identifying themes that describe teachers' perceptions towards practical instruction approach while conducting mathematics lessons. Overall, the findings here were used to answer the research questions.

4. Findings

The analysis aimed to investigate teachers' perceptions towards use of PI approach in teaching mathematics and whether it impacts learners' mathematical achievement. Sixteen teachers (16) who were involved in an interview were asked to respond to a number of issues including all those giving attention on how they perceive the use of PI approach and how their perceptions towards PI affect learners' mathematical achievement. Three themes were generated from the study: (a) Teachers' perceptions towards teaching mathematics and academic achievement in mathematics, (b) Teachers' perceptions towards practical teaching and (c) Assessment and feedback.

4.1. Teachers' perceptions towards teaching mathematics and academic achievement

Teachers described their perceptions while teaching mathematics lessons and were asked if their perceptions influence students' academic progress. Most teachers replied that their perceptions are influenced by how their students feel

about mathematics classes. Several teachers explained "if you are teaching students that are less interested, then really your motivation as a teacher goes very low however much you love teaching the subject." Another teacher T_1 mentioned that, "although students learn slowly in his lesson, they have a positive attitude which makes him less passionate about teaching the subject." In addition to the above, this was how teachers described their students' perceptions in the following excerpts:

T_1: My learners' perceptions to maths are "very very low."

T_2: It is average and boys are better than girls in performance. Also time constraints can make it difficult for students to understand at the same time.

T_4: My students' perceptions on the subject at our Universal Secondary Education (USE) school are completely terrible. This teacher was asked to explain what she meant by being terrible, she explained by saying that it is "not sufficient enough, it is inappropriate."

T_5: It is still under 50%.

T_7: Before the curriculum was revised, there was a negative perception towards the subject; however, as the curriculum changed to be learner-centered, there has been considerable development, and learners are enthusiastic to learn maths.

When these teachers were asked to discuss something about the learners' academic achievement and whether their perceptions towards teaching mathematics (practically if they do so) contribute to it, this is how they responded:

One of the teachers T_{11} said that: "His school is a USE and the general performance is somehow better in his community school." He continued and said "while some students have a good attitude, many have a negative attitude, which means we have to persuade them in order for them to appreciate the topic or be able to cope with it. Their performance is only average." When this teacher was asked the approach he used to teach maths, he emphasized on lecture and chalk and talk approaches and said his perception to using these approaches was good although traditional. The researchers probed this teacher on practical instruction and he said "it is costly for me since my school is not supportive in buying some equipment to conduct maths practicals for some topics otherwise I would be supporting use of practical approaches"

T_{12}: It is average performance. It is not bad, students do try.

T_6: The general performance is promising; learners are performing and progressing well especially in the classes that I handle.

T_1: It is fair, students still have a lot of bias that maths is hard; students do not have enough time to concentrate.

T_8: It is rather fair depending on the level of classes. There are few who know what mathematics is.

T_9: The general performance is over 60%. In my school they like mathematics because even in performance they perform in maths better these days than other

subjects. I teach maths using live examples and this has improved my learners' perception as well as mine.

Furthermore, these teachers were asked to define PI in mathematics education and explained how they perceived the approach in teaching. Most of the definitions hinted on PI referring to the use of teaching aids/materials in a practical form so that the learner could understand the concept in its real form or easily. Again teachers said that: it is "a way of handling mathematics using practical methodologies i.e. using different materials in real life that can help the learners understand the concept being taught." These definitions demonstrated a favorable perception regarding PI and how they believed it could boost the academic achievement of learners.

4.2. Teachers' perceptions towards practical teaching

A lot was recorded during an interview that focused on the teachers' overall opinions and perceptions of PI teaching in mathematics. They embraced practical methods and were enthusiastic about hands-on instruction. They in particular discussed as well how PI can improve the academic achievement of the learners. In general, the following extracts disposed a summary of what they perceived:

- The curriculum should encourage the teaching of maths in a practical form whereby we need to set scenarios; we give such questions in scenario form to learners and they can be able to identify the topic you are going to introduce to them. Before you as a teacher introducing a topic; first set a sample question which is in scenario form then, let the learners form groups and then discover, bring group leaders to present or discuss. At the end, introduce your topic formally.
- Yes and as a teacher I embrace the practice. It's a good one.
- As teachers of maths, teaching should be more of practical now, as teachers, we are encouraged to go to class with enough teaching materials related to the topic(s) being handled.
- True, PI is good since it makes teaching learner-centered.
- I embrace it (PI) 100% because according to me as a mathematician, I see it as one that can help our students love more maths, love more practice and eventually it will help them do a lot of practice in maths and be the best students.

Practical instruction was emphasized by many teachers ($T_1, T_2, T_3, T_6, T_7, T_8, T_9, T_{10}, T_{11}, T_{13}, T_{14}, T_{15}, T_{16}$) as a good practice. This point was mentioned by over 10 teachers. Therefore PI should be encouraged unlike before if academics of learners especially in mathematics is to be lifted.

Additionally, it was discovered during the interview that PI would be a good idea only that teachers are being limited by funds to aid the practice. When a teacher was asked more about this, he explained saying that:

> *for instance teaching bearing, one of the topics in maths needs practical movements, calculating distance or teaching transformations requires mirrors for a learner to observe. Such kind of teaching is a bit expensive though more practical and good. PI enables the use of the available resources so that students can be able to see, observe and apply maths in daily life since they are taught hands on activities.*

The teacher therefore valued teaching of mathematics using practical approaches. This discussion helped to answer partly the research questions.

After being informed by teachers that PI is all about applying real-objects to the teaching and learning of mathematical ideas, teachers were asked to discuss further how most of them perceive it and how significant it is in the teaching process. To summarize their arguments, they stated that learners extract real knowledge, real-objects complement teachers' submissions and learners do not forget easily when they are taught using real-objects. Again, it is proposed by teachers that, learners' attitude improves; teachers' burden reduces as well as just making teachers become facilitators and improving learners' understanding among the many benefits of teaching with real objects. Below were a few excerpts from identified teachers that support the above arguments:

T_3: They can help learners to extract the real knowledge for themselves but not us teachers giving them everything. In other words, these objects help the learners to think.

T_5: It is good to use them because they complement on the teacher's words. When the materials are being used in teaching mathematics, there is no a lot of suffering explaining this and that. For example when a teacher is teaching matrices and elaborates using an example of a table showing how such can be useful in medicine in labeling the drug packets, students get to understand what they are studying and they know the application of the subject in their daily life.

T_8: When students interact with these real objects, they keep remembering and improve on understanding of the topics.

T_{10}: Because real-objects motivate the learners, learners get the ideas fast before they even know what the teacher is going to introduce and they can easily remember.

T_{12}: In one way or the other, they arouse the students to first think of what they are going to do and then later get used to them. All the topics in maths are not in own language and some of the students don't know English language. Therefore, when a teacher brings in some real objects, students try to understand, imagine how some calculations can be done by approaching them using what the teacher has brought in class.

T_{15}: One reason why we go with these real objects in class room is to make sure learners see the value of studying mathematics. They look at its application in

solving daily problems for instance students can be exposed to designing a compound using different shapes of a circle, a rectangle among others.

When one of the teachers was asked to discuss how and what real objects can be used to teach trigonometry, a topic of mathematics in senior three (S.3), this was what teacher T_{15} narrated:

> *When we are introducing trigonometry in S.3, we look at the ratios of trigonometry i.e. the sine, cosine and the tangent. To teach this topic in S.3, I may also require materials to use but such materials may refer to different shapes like a triangle. I may use some boxes design a triangle for learners in different forms, even some of them can help me to design some of the triangles, for instance making a right angled triangle, an isosceles triangle and others. Eventually, these sides of the triangle using certain parameters may help to reach at the ratios as students themselves get involved. The other teaching materials would be sticks arranging them at certain angles and realize the relationship of a stick, the ratio of a stick to the other, how you can for instance make an isosceles triangle, right angled triangle and others using those sticks.*

The accompanying views and opinions from teachers demonstrated how highly they perceive mathematics teaching and learning using PI techniques. It makes learning a little more learner-centric. Based on teachers' views, we also recognize PI as a better approach in teaching mathematics.

4.3. Assessment and feedback

4.3.1. Assessment: Teachers were interviewed about the types of assessment procedures they used following lesson delivery or at the end of the teaching session. The assessment was also evaluated in terms of its practicality. This included delivering classwork individual exercises at the end of each lesson, termly exams, end-of-year exams, homework, beginning of term exams, and midterm exams, among others. Besides what is written above, others discussed the assessment methodologies as shown below in exceptional passages.

T_7: I give topical tests meaning that when we do a topic and finish it, we do a test specifically from that topic and these topical tests are to ensure that the teacher finds out whether learners have understood the chapter or topic before starting on another one. It is uncommon to make them practical due to limited resources.

T_{12}: When I am assessing my learners, I see whether they have gone ahead to do most of the research. The work I give enables them to think a head and gain additional knowledge. Every topic covered after every two weeks, I give a test, mark it, take records of the marks and keep on comparing at how they are performing on every topic.

T_{14} : We have both continuous and summative assessments. In my continuous assessment, I give different assignments at the end of every topic. The learners have to do them using mathematics approach learnt and they are usually in groups such that they borrow knowledge from each other.

Making an inquiry from a number of teachers if their assessment procedures embrace practical instruction in mathematics, the feedback was moderate.

They said it is expensive to incorporate practicality on every assessment component yet even some of their school administrators are not supportive including the Ministry of Education and Sports itself in Uganda. They told the researchers that not even the UNEB which organizes national examinations had ever supplied resources for those numbers in mathematics that require actual hands-on items (they only supply cheap ones like graph papers and other less costly ones). Teachers as individuals have seen PI favorable, but in order for it to take effect, cooperation is needed; in the absence of such cooperation, the status quo will persist.

4.3.2. Feedback: In academics, providing feedback to students is seen as crucial. Feedback is a necessary component of any assessment's accountability (Núñez-Peña et al., 2015). Some of the interview questions focused on how teachers delivered feedback, why they did it, and how it was perceived. The sixteen teachers who participated in this study all advocated for prompt feedback, marking scripts or books in time followed by making necessary revisions, and working cooperatively with their students to identify the right answers or options. This was how some teachers did it in the following extracts:

T_1 and T_5: After they have discussed their work and presented, I correct where they have not performed well.

T_4: Immediate feedback for example when a student asks a question that requires immediate feedback, I provide the answer and before I can pose the question to the entire class so that they can also contribute making it student-centered not teacher-centered.

T_8 : I normally provide feedback to my learners according to their performance so that they know where they are poor in some concepts and improve.

T_9: I normally do marking, and after marking I share with them the results. As a class, we share the different answers which they are supposed to give.

The aforementioned investigation in this study also revealed that a small percentage of teachers have unfavorable perceptions of practical instruction approaches, believing them to be superfluous or ineffectual for teaching mathematics. They could think that teaching mathematical concepts by more conventional means, including rote memorization and lecture-based training, is more effective. It was noted that some teachers are uneasy about straying from their more familiar teaching strategies or lack confidence in their abilities to apply practical instruction methodologies since they require some teaching resources which are not at their disposal.

5. Discussion

This section presents the study's interpretation of the results and any implications. According to the study's findings, teachers' perceptions are influenced by the attitudes of their students. It is also noted that teaching with practical and creative ways enhances learners' perceptions, which in turn

improves learners' academic achievement. A study conducted by Tok (2015) supports such significant points of view. Also, the respondents' descriptions and how broadly they perceive practical instructional approaches, particularly when they mention that PI is all about using different materials in real life to teach mathematics, are consistent with other scholars' views (Abrahams & Millar, 2008). The results of the study also revealed average performance of learners which is partly attributed to negative attitude (of both teachers and learners) and leaners' bias towards mathematics. The implication is that negative attitude and bias have got a direct negative impact on academic achievement as discussed by (Di Martino & Zan, 2010).

According to the results, most teachers embraced practical teaching approaches in mathematics and were more enthusiastic about it. They believed that academic achievement of learners can improve greatly with PI in existence since it makes learning learner-centered other than teacher-centered. This implies that learners understand more and so fast in various concepts. Additionally, it is cited that, and also according to other academicians for instance Kunter et al. (2008) advocate that teaching using real objects makes learners recall so easily what they have studied before and enables the teacher to just complement on what learners are viewing during studies. More studies of this nature are highly appreciated by a number of other scholars (Ismail et al., 2019). One implication of this is that, most instruction should be practical, as teachers' perceptions are expressively positive.

A responsible teacher should assess and timely provide feedback to learners for quick and proper academic accountability and professional growth (Núñez-Peña et al., 2015; Ross & Bruce, 2007). The study interviewed teachers whether they assess and provide feedback practically to their learners. Based on the evaluation methodology shared by teachers, as well as their other perceptions, it was determined that the majority of them use traditional assessment methods like homework assignments, standardized tests and exams among others. They contended that practical assessment (evaluation) is not affordable, yet they receive no support from school management or the government. Teachers stated that they certainly favor practical assessment of the topics in mathematics, but that for it to be effective, both the government and the school must cooperate; otherwise, the status quo would endure. This has an implication that such assessment that lacks practical part has contributed to the poor academic achievement of learners at Uganda Certificate of Education examinations according to yearly academic reports (Uganda National Examinations Board (UNEB), 2019, 2023). Relatedly, the research also emphasized that learners be given evaluation feedback timely. This is believed to arouse and improve the learners' attitude towards their education. This gets support from various scholars including Mahmud and Yunus (2018).

Accordingly, the implications of the study on teachers' perceptions of PI in teaching mathematics are significant. The study implies that educational policy makers should consider integrating PI approach in the maths curriculum and professional development programs for teachers of mathematics should focus on

equipping these teachers with the skills and strategies necessary to implement PI effectively. The findings of this study open avenues for further research into the factors influencing teachers' perceptions and effectiveness of PI various educational contexts. Future studies could explore the long-term impacts of PI on student learning outcomes and the specific challenges teachers face in different settings.

6. Conclusion and Recommendations

The study investigated into the way secondary school teachers perceive the PI approach to teaching mathematics. It also investigated if teachers' perceptions influence students' academic achievement in mathematics. Teachers recognized PI as one of the ideal teaching approaches with a positive perception because it includes components that can boost students' creativity and critical thinking. To attain this goal, teachers must have a positive perception toward the application of PI and be eager to encourage students to continue practicing practical skills. The study also found that, teachers' perceptions towards PI exerts an impact on learners' academic achievement and recommends that teachers be thoroughly prepared before beginning the teaching and learning process, taking into account all PI components. Given that mathematics is one of the foundational and important disciplines included in the Ugandan curriculum, the approach that is highlighted should be beneficial to both teachers and students since it guarantees that PI application does not conflict with the requirements of the current curriculum. Mathematics teachers should be aware that implementing PI is difficult because it necessitates significant sacrifices in order to create a favorable outcome. Based on the study's findings, a good consequence for teachers is that PI implementation necessitates continuous training. This will allow mathematics teachers to participate in professional development programs in the field of pedagogy, cultivating a diversity of teaching tactics, and maintaining strong self-esteem in order to establish high-quality PI practices. Teaching with PI strategies that demand the use of relevant and linked teaching aids will increase teacher motivation and attitude towards implementing PI, resulting in good student academic achievement.

The study further recommended that:

1. Extensive practice is necessary, thus teachers of mathematics should give their learners enough homework to keep them practicing.
2. The Uganda National Examinations Board should continue reviewing and advancing the mathematics curriculum to make it more practically approachable.
3. Sufficient textbooks and additional educational materials must be accessible to support teachers and students' academic pursuits.
4. School administration should avail practical resources to teachers of mathematics.

Despite its worth, this study had a few limitation(s). The study's major approach was qualitative, which may have limited the findings' generalizability despite providing in-depth insights. Due to lack of quantitative data, the results may not be representative of all mathematics teachers. Furthermore, the study used a limited sample size of 16 mathematics teachers, which may not represent the full

range of experiences and perceptions across situations and regions. The limited sample size may have an impact on the validity of the conclusions reached. These limitations imply that, while the study gives useful insights into teachers' perceptions of practical instruction, future research with a bigger and more diverse sample, as well as a mixed-methods approach, would be beneficial in validating and expanding on the findings.

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8. Conflicts of Interest

The authors declare no conflict of interest.

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Appendix 1: Semi-structured interview guide for teachers

Name of the school:
Date of interview:
Interviewee code:
Interviewee sex:
Teacher's teaching experience (in years.):
The class he/she teaches

Introductory Questions

1. In your own opinion, how can you define practical instructional teaching/learning in mathematics?
2. How is the general performance of mathematics in this school? Which gender performs better in your school?
3. Does the curriculum emphasize teaching mathematics practically? If so, how do you embrace the practice?
4. Why do you think one should use illustrative real objects while teaching most of the mathematics topics?
5. How do you rate the attitude of your learners towards the subject while teaching using PI? How does your perception towards teaching mathematics using PI affect learners' academic achievement?

Teachers' presentation and Assessment approaches

6. Why do you think you need to link the previous/prerequisite knowledge and the current lesson? How do you normally do it?
7. Explain some of the teaching approaches that you use in your mathematics lessons to develop the skills, knowledge, attitudes and values as indicated in the mathematics syllabus.
8. What are your roles as a teacher in your teaching of mathematics?
9. What are the roles of your learners? How do you ensure that your learners play their roles effectively?
10. How do you go about your self-evaluation?
11. What (practical) assessment strategies do you use to assess learners' skills, values, attitudes and understanding of mathematics concepts?
12. How do you provide feedback to your learners?

Importance of practical instruction in mathematics

13. What real objects do you normally carry in your lessons of mathematics?
14. How do you compare the motivation of your learners towards your lessons when using these objects and when you have not carried them?
15. In your opinion, which skills do you consider important for teachers of mathematics to develop in their learners as they teach using practical instruction?
16. How do you compare your perception before and after having been enlightened on practical instruction approach in teaching mathematics?
17. Are these new skills/abilities attained by students embrace this new teaching strategy?

Conclusion: Thank you very much dear teacher for participating in the interview voluntarily and you can ask a question if any.