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Perceptions of Mathematics Teachers toward using the Internet of Things (IoT) in the Acquisition of Math Concepts and Supporting Students' Performance

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Abstract

The aim of this quantitative study was to investigate the perceptions of Mathematics teachers working in Abha city, Saudi Arabia, toward using IoT in Mathematics classes for students' acquisition and performance. The sample was selected using the simple random sampling technique, and the researcher collected data using a self-developed scale. The analysis revealed that Mathematics teachers' perception of using IoT is high and integrating IoT in the classroom can improve student participation and help them become more skilled. Also, the findings showed that most of the participants in the survey believe that IoT is a field that is well-equipped to operate effectively. The Pearson correlation coefficient showed a strong and positive relationship between teachers' perception of using IoT and students' concept acquisition and academic performance. Owing to the vast range of study implications and its ability to boost students' performance and acquisition of new Mathematical concepts, IoT must be implemented in the classroom.

Keywords: Internet of things, knowledge acquisition, students' performance.

Introduction

Knowledge acquisition in Mathematics is crucial for all students, and many struggle to meet even the most basic expectations in this area (Jakaitienė et al., 2022). Nearly 5- 10% of school-aged children consistently underperform in Mathematics. Moreover, 7% of pupils in the school-aged population are classified as having math learning difficulties. Mathematical performance is one area where students with poor Mathematics concepts stand out from their better-performing peers (Ok et al., 2020). According to Henn (2007), there are two significant aspects to Mathematics. First, it is aesthetically pleasing in its own right, like other forms of art and music. Second, Mathematics has exceptional utility, allowing us to establish order and comprehension in every facet of our lives. Because Mathematics has so many applications outside its field, it is the only and largest instructional phenomenon. According to Yavuz (2018), having people with Mathematical knowledge and the ability to apply it in the real world has never been more critical. As a result, all nations are increasingly placing a premium on Mathematics education as this subject's relevance to everyday life grows.

A solid grasp of mathematics is essential to any society hoping to thrive economically. Its significance in helping nations advance their scientific and technological capabilities cannot be overstated. A solid grounding in mathematics is required to comprehend fields as diverse as engineering, scientific knowledge, sociology, and the arts (Ngussa & Mbuti, 2017). Writing and solving math problems on paper have long been the norm in classrooms. Due to the wide variety of existing technologies, it is essential to analyze the factors influencing educators' decision to depart from the status quo and adopt advanced technologies in mathematics instruction (Pierce & Ball, 2009). According to Abe and Gbenro (2014), mathematics has a wide-ranging impact on the scientific and technological communities, with implications across disciplines and industries. Since mathematics is pervasive, it has become an essential part of the standard school curriculum. Mathematics education aims to equip students with the tools they'll need to succeed in a rapidly developing technological landscape (Mazana et al., 2019).

It is widely recognized that teachers' beliefs impact their classroom instruction. Much professional development still focuses on changing teachers' specific strategies and resources in their classroom setting (Beswick, 2006). Many educators' poor attitudes and performance in mathematics can be traced back to the approaches and strategies teachers use in the classroom. Creating rich educational experiences to increase students' curiosity and knowledge of mathematics makes integrating technology into teaching mathematics conditions necessary (Biber et al., 2022).

The industrial revolution has altered many aspects of human activity, including the instructional process. Cyber-physical processes and the Internet of things (IoT) all worked together to make this revolution. Because the Internet can be adapted to individual needs, IoT plays a crucial role in making people's lives simpler (Huda & Yulisman, 2020). There is still room for development in IoT, especially regarding the human experience. The "Internet of People" (IoP) concept is also essential. The users of IoP are encouraged to interact strongly with one another, taking into account their traits and the unique context in which they operate (Marr, 2018). The IoT and the IoP are supposed to raise a new generation that appreciates the rapid progress of education, especially in the field of information technology (Miranda et al., 2015). As a result of the implications that IoT and IoP have for education, stakeholders in the field must heed how teachers implement new forms of technology in education. Growing up in the age of the Internet of things and the industrial Internet of things typically results in a child having solid technological proficiency. If educators cannot adapt to this situation, their students will be at a significant disadvantage (Kranz et al., 2009).

There are constant technological advancements, and the Internet has helped in the field of education. Now, students have the flexibility to pursue their education either by attending or skipping classes. Through a portal, students and teachers can interact in an online classroom (Kamaruzaman et al., 2021). Students can learn in real time with their teachers or at their own pace with the help of recorded lectures and other online materials. Students can get their notes quickly and easily through an online portal (Chiou et al., 2010). Likewise, students can interact with their professors through online discussion boards. In addition, some virtual learning environments provide students with tools like interactive quizzes and step-by-step guides to grasp better the concepts presented in their courses.

The introduction of new technologies has made education more engaging for students. Technology has made it simpler to develop novel strategies for grabbing students' attention. In particular, today's youngest students enter school with a head start on the technological tools they'll use throughout (Mtchedlishvili & Serin, 2015). Technology use in the classroom can potentially increase students' interest in and enthusiasm for learning. Students can improve their performance thanks to the influence of intrinsic motivation. Using technology in schools has been shown to affect student motivation positively. Technology's ability to provide a wide range of information sources helps to keep students engaged in class. With the help of technological advancements, education can now be enjoyed (Baya'a & Daher, 2013). Comprehension is facilitated, student engagement is increased, and focus is strengthened when learning is integrated with technology. Students can pay more attention to lessons when they are presented well. Students are more likely to actively participate in the learning process when they can focus intently on what is being taught. The use of technology in the classroom has the potential to alter teaching and learning practices significantly. Technology's potential to boost students' math skills only becomes apparent when it's put to good use (Serin & Oz, 2017).

The expansion of the IoT strengthens the evolution of intelligent systems for managing information across many fields. The Internet of Things can effectively incorporate and virtually analyze data from the mathematics fields generated across multiple networks. Therefore, research into relevant IoT technology is required to realize the initiative's goals. However, there is a lack of smart learning toolkits in today's learning and teaching systems that would enable them to provide pupils with IoT-based mathematics skills and knowledge (Habib et al., 2021). The role of educators in the implementation of ICT is crucial. Therefore, educators must continue expanding their pedagogical expertise. High levels of technology acceptance among participants are crucial to the success of online learning for continuing education. In light of this, it is crucial to ascertain teachers' investment in the instructional program (Wang, 2010). According to the literature on the restrictions experienced in using technologies in schools, structural factors have a predetermined effect on this procedure (Ardiç, 2021). To assure the effective use of technology in teaching mathematics, it is necessary to determine how teachers use the Internet of things, their perceptions and beliefs toward technology, and how it affects students' knowledge acquisition and performance. Owing to the literature support, the current study was designed to investigate the perceptions of mathematics teachers toward using the Internet of things (IoT) in acquiring math concepts and supporting students' performance in Saudi Arabia.

Definition of Key Terms

Internet of things: IoT refers to scenarios where network connectivity and computing capability incorporating into the educational context in order to create innovative strategies that enhance the teaching and learning of mathematics with ease (Bajracharya, Gondi, Hua, 2021).

Knowledge acquisition: It refers to the ability of students to acquire skills and knowledge that will shape their behavior and enable them to perform mathematics activities and face its problems with a more successful approach (Lidia et al., 2016).

Students' performance: In this study, students' performance refers to the growth percentiles in mathematical conceptual understanding, computational skills, problem-solving skills, and geometric skills (Ok et al., 2020).

Literature Review

The current study revolves around mathematics teachers' perception of using IoT, concept acquisition, and students' performance. The relevant articles were searched with the keywords using study variables, and Google scholar, Education Resources Information Center (ERIC), Science Direct, and Springer journals were the central databases from where the researcher took the data. After selecting the relevant research papers, the researcher presented the review of the related literature below under the relevant headings.

Perceptions of Mathematics Teachers toward using the Internet of Things

Biber et al. (2022) studied how thriving technology can help students have fun while learning math and how teachers feel about using technology in the classroom. Researchers found that while educators generally approve of and welcome incorporating technology into classrooms, they face several challenges when implementing their theories. As such, 50 technologically-based interactive activities based on the topics of exponential and square root numbers have been planned after soliciting the opinions of 10 working mathematics educators. Ardiç (2021) studied how secondary school mathematics educators feel about incorporating technology into their classrooms. A convergent parallel research design was employed as the research strategy of preference for this mixed-methods investigation. A total of 57 teachers from 22 different Turkish high schools volunteered to participate in the research, and their participation was ascertained using the convenience sampling method. Educators' "positive" views of technology were noticed to have a beneficial effect on students' exposure to it in mathematics classrooms.

Yilmaz and Sönmez (2022) conducted this study to use visual metaphors (using ICT) to understand the perspectives of prospective mathematics teachers who began their college careers during the 2009 Covid-19 global epidemic. The research utilized the phenomenology approach. The participants in this study were 31 first-year mathematics teachers who had never attended college before. The results showed that analogies could be classified into the categories of the learning process and feelings. The participants held a negative view of distance mathematics instruction, as evidenced by their drawings and written explanations throughout the epidemic.

Furthermore, it was disclosed that the classes were ineffective because the attendees were too nervous about asking questions since they'd never met their friends or educators. According to Pierce and Ball (2009), many math classrooms can access and use technological resources. Changes in pedagogy on the part of teachers are inevitable if they are to use technology to enhance the educational process effectively. In this paper, we present the opinions of 92 secondary mathematics educators from various backgrounds. It found that while most people are open to new ways of teaching math, there are some significant perceived barriers to change. For this reason, it is beneficial if those in charge of professional development and the promotion of technology use take note of these obstacles and work to eliminate them, in addition to bolstering the factors that make the latter possible.

The purpose of the research by Uzelac et al. (2015) was to determine what factors impact students' ability to pay attention in class. Using various inexpensive smart devices, they could take several readings in a mock classroom setting. Data from 14 online courses with a total of 197 participants are used in this study. After analyzing the collected data, eight factors were found to have statistically significant different values for the "intensive" and "non-intensive" sections. Different classifiers' abilities to distinguish between "intensive" and "non-intensive" clumps of a lecture were evaluated using the data acquired. AdaBoost M1 classifier was found to have the highest accuracy rate overall.

Internet of Things and Students' performance

According to Kerrigan (2002), students can improve their polygonal and algebraic reasoning with the help of math operating systems and internet sites. Connecting what they've learned in the classroom to issues they encounter in the real world is an essential skill for students to develop. According to Hwang et al. (2007), pupils can solve a problem if they first establish it as an abstract challenge. Students' ability to think abstractly can be nurtured through visual aids in the school environment. By relying on formulas alone, without fully grasping the underlying concepts, students may struggle to solve problems in mathematics. Students can quickly solve problems if they are presented visually through technology devices. Because technology-based techniques start creating a stress-free educational environment where all pupils confidently complete their tasks, technology-based classroom training has resulted in positive academic achievement (Baya'a & Daher, 2013). Student success in solving math problems is emphasized due to technology tools. Students' motivation to improve their work is boosted by the professional-looking presentations they create with these tools. It's a fact that technology contributes significantly to mathematics education because it helps students learn more effectively (Niess, 2001).

Based on a case study, Serin and Oz (2017) conducted research to look into whether or not incorporating technology into mathematics instruction improves student performance. The results show that when educators incorporate technology into their methods of instruction, students' mathematical development is greatly facilitated. Students' motivation was boosted, and their mathematical performance was enhanced when they were exposed to engaging presentations made possible by modern technology. This demonstrates how factors such as students' access to technology, teachers' beliefs, readily available resources, and, most pertinently, educators' skills in effectively utilizing technology can significantly improve their grasp of mathematical concepts.

Students' performance and assessment systems, which can detect students' interests and feelings in real-time, are smart classroom environments. Students' attention is identified through the tracking and analysis of their eye movements, while their emotions are deduced from their speech's temporal and linguistic characteristics. If students are engaged during a lecture, the system can immediately relay that information to the instructor, significantly impacting students' achievement (Luo et al. 2009). Jawad et al. (2021) studied how math and science instruction affect creative thinking and mathematical performance. To do that, the researchers conducted an experimental study with the treatment and control groups. The study's findings revealed statistically significant differences in favor of the treatment group that pursued a STEM education on the assessments of creative thinking and mathematical performance.

Research Objectives

The objectives of the study were to:

- Explore the level of mathematics teachers' perceptions regarding the Internet of Things in mathematics.
- Examine the relationship between teachers' perceptions regarding the Internet of Things and students' mathematics performance.

- Investigate the relationship between teachers' perception of the Internet of Things with students' acquisition of mathematics concepts.

Research Hypotheses

The researcher designed the following null hypotheses to investigate the phenomenon under study.

- H_{o1}: Mathematics teachers do not perceive using the Internet of Things in mathematics.
- H_{o2}: There is no significant relationship between teachers' perception of the Internet of Things and students' mathematics performance.
- H_{o3}: There is no significant relationship between teachers' perception of the Internet of Things and students' acquisition of mathematics concepts.

Research Methodology

The researcher used a quantitative research approach following the positivistic research paradigm to explore the phenomenon under study. Following positivism, reality is taken to be objective and distinct from human experiences. Our sensory organs do not filter it, and its rules are set in stone. Positivists take a realist view of ontology. The goal of positivists is to apply scientific methods to studying human society. It is possible to make accurate predictions of natural occurrences after the cause-and-effect relationship between them has been established. Positivists extend this logic to the social realm as well. Since reality is independent of time and place, scientists studying the same phenomenon will always reach the same results. Positivists objectively view knowledge (Rehman & Alharthi, 2016). Therefore, the researcher followed the positivist worldview so that the results of the current quantitative study should be generalized to the study population.

Research Design

The current quantitative research study was carried out using a cross-sectional survey, and the study's research design was correlational. In this research design, data were collected using the questionnaire at one point, and the relationship among the study variables was explored.

Participants

The study population comprised mathematics teachers working in the elementary, middle, and high schools of Abha city, Saudi Arabia. The study sample was selected using the simple random sampling technique, and for the current correlational study, the researcher selected 72 mathematics teachers. Demographic detail of the sample is provided in the results section. All the participants were recruited after taking informed consent. A briefing was given to them, and study objectives were shared with them. After being recruited, they were given the right to withdraw from the study process at any stage if they felt inconvenienced by the study process. They were also assured of their anonymity and confidentiality. They were also assured that their personal information would not be shared with anyone at any cost, and the data obtained would be used only for the sake of the f the current study.

Instrumentation

For the current study, the researcher developed a questionnaire comprising two parts. The first part of the questionnaire is about the demographic information of the study participants, like their gender, qualification level of education, and teaching experience. The second part of the questionnaire is a scale developed on a five-point Likert scale with options ranging from strongly disagree (1) to strongly agree (5). The scale had three factors; a) items for measuring teachers' perceptions regarding IoT use in the classrooms, b) items related to teachers' perceptions of how IoT contributes to students' concepts related to mathematics, and c) it had items related to teachers' perception regarding the use of IoT for improving students' performance. It's a 24-item scale developed after a rigorous review of the related literature. After developing the questionnaire, expert opinions from the five subject experts were requested to provide feedback on the language of the scale, item relevancy towards the study objective, and how well the study variables were measured. After their feedback, scale items were revised. After expert opinion, the scale was piloted on the participants who were not part of the current study. Based on the feedback from the pilot study, scale items were again revised for the final data collection. A modified and revised scale was used for the sake of data collection. The researcher used Survey Monkey to collect data online from the study participants. After collecting data, it was extracted into an excel file and stored using a strong password. The scale's reliability was measured using Cronbach's Alpha, and the value is provided in table 1.

Table 1

Reliability of the Scale (N = 72)

Cronbach's Alpha	N of Items
.81	24

Table 1 shows the reliability value of the scale used in the current study to collect data. It shows that the Cronbach Alpha value of the scale is .81, which is highly acceptable as per the defined criteria for using the scale with a Cronbach Alpha of .70.

Results

In the current study, the researcher collected data to explore mathematics teachers' perceptions regarding IoT and its relevance to concept acquisition and students' performance. For data analysis, the researcher used Statistical Package for Social Sciences (SPSS) version 26. After collecting the data, it was screened out, the assumptions of parametric data were tested, and the data was found to fulfill the assumptions of parametric data. Therefore, parametric analysis was conducted in the current study. Descriptive statistics were used to analyze data for demographic information, while inferential statics was used to test the second and third hypotheses. Results of the analysis are provided under the relevant headings.

Demographic Information of Participants

Here in the current part of the analysis, the researcher presented the descriptive analysis of the demographic information of the study participants. The researcher used frequency and percentage analysis for the gender, level of teaching, teaching experience, and qualification of the study participants. The results are presented in table 2.

Table 2

Demographic Information of Study Participants (N = 72)

Variable	Category	Frequency	Percentage (%)
Gender	Male	34	47
	Female	38	53
Level of Teaching	Elementary school	24	33
	Middle school	24	33
	High school	24	33
Experience (years)	Less than 5 years	24	33
	5-10 years	31	43
	11-15 years	15	21
	Above 16 years	2	3
Qualification	Bachelor	64	89
	Master	7	10
	Ph.D.	1	1

Table 2 reveals that the current study sample comprised 72 mathematics teachers. It indicates the information regarding the gender of study participants. The bar graphs show that female mathematics teachers are 34 (53 %), which is greater than male mathematics teachers who are 34 (47 %). The above table also shows the number of respondents according to the teaching level. It reveals an equal number of respondents, 24 (33.33 %), for each level comprising elementary school math teachers, middle school math teachers, and high school math teachers. The table also indicates the information regarding the teaching experience of the study participants. It shows that most of the respondents, 31 (43 %), had teaching experience of 5-10 years group, followed by the candidates 24 (33 %) with experience of fewer than five years. One-fifth of the study participants, 15 (21 %), belong to the group having working experience of 11-15 years, and only 2 (3 %) respondents belong to the age group of more than 16 years. The above table also shows information regarding mathematics teachers' level of qualification. Analysis revealed that 64 (89 %) of the study participants had Bachelor's degree, followed by 7 (10 %) respondents who had a Master's degree. At the same time, only one candidate (1 %) had a Ph.D. degree.

Perception of Mathematics Teachers regarding IoT

After the demographic analysis, the researcher analyzed data for hypothesis testing. The first hypothesis was designed to measure mathematics teachers' perception of using IoT in their mathematics classes. For measuring participants' responses, the researcher measured frequency, the mean, and standard deviation for measuring their perception of the IoT, and the results are represented in table 3.

Table 3

Mathematics Teachers' Perception of Using IoT in Classrooms

S. N	Items	SD (%)	D (%)	N (%)	A (%)	SA (%)	M	SD
1	The Internet of Things (IoT) is an area in which I am well-equipped to work efficiently	1	1	0	56	42	4.35	.70
2	I can use IoT expertise in my mathematics teaching.	1	1	0	55	43	4.38	.59
3	I have updated my knowledge and experience to implement IoT into math classes.	14	14	13	31	28	3.44	1.39
4	IoT makes participation extremely challenging	0	3	14	56	28	4.08	.73
5	It's simple to incorporate IoT into math class.	0	0	15	70	15	4.56	.50
6	I can participate in all facets of the Internet of Things with great success.	0	15	14	28	43	3.99	1.10
7	I can instruct students in various mathematical disciplines using the right Internet of Things (IoT) tools.	0	0	15	68	16	4.00	.557
8	IoT tools are a better source of mathematical information for me than books.	0	0	43	28	29	3.86	.84
9	The Internet of Things (IoT) ensures effective mathematics education in the classroom.	0	15	0	29	56	4.25	1.06
10	Teaching mathematics with IoT saves time and effort.	0	1	14	43	42	4.25	.75
11	Experts' proficiency simplifies teaching math in the IoT.	0	14	1	71	14	3.85	.83
12	Using IoT in the classroom slows down the completion of arithmetic lessons.	0	1	28	15	56	4.25	.92

Table 3 indicates the results of mathematics teachers' perceptions regarding the usage of IoT in their mathematics classes. The results show that overall, teachers' perception is high for IoT usage in their mathematics classes. Most of the responses had mean values of around 4, which shows that teachers perceive scale statements highly. Analysis revealed that mathematics teachers' perception regarding the fifth item that its simple to use IoT in mathematics classes is highest on the scale (M = 4.56, SD = .50), whereas 85 % of the respondents showed their level of agreement with the statement and no one showed their level of disagreement. The first item on the scale was ranked third in the table (M = 4.35, SD = .70), whereas 98 % of respondents showed their level of agreement with the statement. The second item followed the fifth item that they can use IoT expertise in the mathematic classes (M = 4.38, SD = .59), an overwhelming majority of the respondents (98 %) showed their level of agreement with this statement, and only 2 % of the participants showed their level disagreement.

On the other hand, low scoring item in the current scale was the third one where the teachers responded for their updated knowledge of implementing IoT tools in mathematics classes (M = 3.44, SD = 1.39), whereas 59 % of the teachers believed that they updated knowledge and experience for using IoT in mathematics classes. In comparison, 28 % of the respondents showed their level of disagreement with the statement.

Result: From the above data analysis, the study participants believe they have a higher perception of IoT in mathematics classes. They showed their level of agreement that even though IoT make them feel challenged in the classroom, they are sure that teaching mathematics with IoT saves their time and potential. It also helped them to complete their lessons within the period. Very little concern was shown for the sake of updated knowledge.

Relationship between Teachers' Perception of the Use of IoT and Students' Performance

The second research objective was developed to measure the relationship between teachers' perception of the Internet of Things (IoT) and students' performance. To explore this relationship, the researcher tested the second null hypothesis using the Pearson correlation coefficient at the significance level of 0.05, and the results are provided in table 4.

Table 4

Relationship between Teachers' Perception of the Use of IoT and Students' Performance

		Teachers' perception of IoT	IoT and students' performance
Teachers' perception of IoT	Pearson Correlation	1	.663**
	Sig. (2-tailed)		.000
	N	72	72
IoT and students' performance	Pearson Correlation	.663**	1
	Sig. (2-tailed)	.000	
	N	72	72

Table 4 shows the relationship between teachers' perceptions of using IoT and students' performance. The results indicate a strong, linear and positive correlation between teachers' perception of the use of IoT and students' performance at r = .66, n = 72, p = .000, which is statistically significant at the Alpha level of .05.

Result: Analysis revealed that the data rejected the null hypothesis and found a strong correlation between students' teachers' perception of using IoT and students' performance.

Relationship Between Teachers' Perception of The Internet of Things and Students' Acquisition of Mathematics Concepts

The study's third objective was to measure the relationship between teachers' perception of using IoT and students' acquisition of mathematics concepts. The third hypothesis of the study was tested using the Pearson correlation coefficient at the significance level of 0.05.

Table 5

Relationship between Teachers' Perception of the Use of IoT and Concept Acquisition

		Total scale: Teachers' perception of IoT	**Total scale: IoT and students' concept acquisition**
Total scale: Teachers' perception of IoT	Pearson Correlation	1	.889**
	Sig. (2-tailed)		.000
	N	72	72
Total scale: IoT and students' concept acquisition	Pearson Correlation	.889**	1
	Sig. (2-tailed)	.000	
	N	72	72

Table 5 shows a strong, linear and positive correlation between teachers' perception regarding the use of IoT and their students' acquisition of mathematics concepts r = .89 n = 72, p = .000, which is statistically significant at the alpha level of .05.

Result: The analysis revealed that data did not support the third hypothesis and was rejected. The study revealed a strong correlation between teachers' perception of using IoT and students' acquisition of mathematics-related concepts.

Discussion

The current findings revealed that most of the participants in the survey believe that The Internet of Things (IoT) is a field in which I am well-equipped to operate effectively and that others like me exist. The findings of this study lend support to the findings of a previous study carried out by Biber et al. (2022). They investigated how flourishing technology can make learning mathematics more enjoyable for students and how teachers feel about incorporating technology into the classroom. It demonstrates that kids learn more and feel more comfortable using it, which is a positive outcome for everyone involved. The current research also discovered that most people who participated in the survey believed that effective mathematics instruction might be ensured in the classroom through the Internet of Things (IoT). The current study's findings support the conclusions of a study conducted by Ardic (2021), who investigated how mathematics teachers at secondary schools feel about the use of technology in their classrooms. It has been observed that teachers' "optimistic" attitudes toward technology have a beneficial effect on the students' level of engagement with it in mathematics courses.

Another significant contribution made by the current research was that the vast majority of the people who took part in the study indicated that they agree with the statement that they can educate students in various mathematical fields by using the appropriate Internet of Things (IoT) tools. They believe this improves students' performance. In addition, it supported the conclusions of the study that Jawad et al. (2021) conducted to investigate how learning mathematics and science affects creative thinking and mathematical ability. To accomplish this, the researchers conducted an experiment involving a treatment group and a control group. The study's findings showed statistically significant differences in favor of the treatment group that pursued a STEM education on creative thinking and mathematical ability assessments. These differences were seen in the results of the study.

A recent study showed that integrating IoT in the classroom can improve student participation and help them become more skilled. Serin and Oz (2017) conducted research to determine whether or not integrating technology into mathematics classrooms increases student performance. The current study's findings corroborated those researchers' conclusions. The findings demonstrate how much more easily students' mathematical progress is supported when teachers include technology in their methods of instruction. It also supported the findings of the research conducted by Niess (2001), who believes that students' success in solving mathematical problems is enhanced due to the tools provided by technology. The students' ability to generate presentations that appear of professional quality using these tools boosts their incentive to enhance the quality of their work. Because it makes learning more accessible and more efficient for students, technology unquestionably contributes substantially to mathematics education.

Using IoT tools and gadgets properly is essential for students' success. The current study investigated that most mathematics teachers believe that they can instruct students in various mathematical disciplines using the right Internet of Things (IoT) tools. The current level of perception elaborates that they are aware of the use of the IoT, which supports the findings of the research carried out by Pierce and Ball (2009). A significant number of math classrooms have access to and can make use of technology resources. If educators use technology effectively to improve the learning process, they will have to make some necessary adjustments to their teaching methodologies.

Conclusion

The current study is based on the empirical data provided by the mathematics teachers to explore their perceptions regarding the use of the IoT in the classroom and how it correlates to the students' acquisition of the concept level and their perception. Based on the findings, it is concluded that mathematics teachers' perception regarding the use of the IoT in the class is at a higher level, and the relationship between students' perception of using IoT for concept acquisition and students' performance had a strong, linear, and positive relationship.

Based on the study's findings, the researcher recommends that mathematics teachers' perceptions are higher for using IoT in mathematics classes. Therefore, it must be used in the classes to get the relevant results for students' concept acquisition for learning mathematics and improve students' performance. As the mathematics teachers believe they are trained and have sufficient knowledge, the practitioners must consider using IoT properly in mathematics classes. As the correlation between teachers' perception and the study's dependent variables are higher and strong, the policymakers should also put their ears to it and must emphasize it in mathematics teachers. The researcher also recommended that future researchers replicate study results using a qualitative design for a more in-depth study.

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