

Pre-service Mathematics Teachers' Perspectives on the Use of Play in Teaching

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ABSTRACT

The study sought to explore pre-service mathematics teachers' perspectives on the use of play-based learning activities in teaching. The cross-sectional survey design was adopted, where 305 pre-service mathematics teachers were chosen at random to participate in the study. A closed-ended questionnaire was used to gather the data, and a Cronbach's Alpha of 0.83 indicated strong internal consistency. For data analysis, Pearson's correlation, means, and standard deviation were employed. The results showed that pre-service mathematics teachers encountered some difficulties when implementing play-based activities, but overall, held positive attitudes and showed a moderate level of readiness, confidence, and support when it came to using play-based methods to teach mathematics. To increase pre-service teachers' efficacy and confidence in integrating play-based activities into mathematics instruction, recommendations such as the provision of additional resources, pedagogical training, and alignment guidance should be enhanced.

Keywords: challenges, pre-service teachers, play-based, perception, teaching

INTRODUCTION

The quality of education is a central pillar in the advancement of any society, and mathematics education holds a paramount role in shaping individuals' cognitive abilities and problem-solving skills. Hence, the advancement of a society is intricately linked to the quality of education it provides, and within this educational landscape, mathematics education assumes a pivotal role in shaping the cognitive aptitude and problem-solving prowess of individuals (Ginsburg & Ertle, 2008). Over time, the pedagogical approach to teaching mathematics has undergone a notable transformation, shifting from conventional methods to innovative and captivating strategies that resonate with modern learners (Ma, 2010). Thus, play-based activities have emerged as an effective strategy to enhance learning outcomes and improve understanding of complex mathematical concepts (Piaget, 1962). Wood (2014) states that interactive and hands-on experiences have proven to be effective in facilitating learning across various domains, including mathematics education. These activities can include games, puzzles, manipulatives, and interactive simulations, providing a dynamic and enjoyable learning experience (Dockett & Perry, 2009; Nguni et al., 2020). While play-based pedagogy has been widely used in early childhood education, its implementation in pre-service teacher education requires further investigation. As education continues to evolve to meet the demands of modern-day learners, it is becoming increasingly important to explore the effectiveness of play-based activities in the training of pre-service mathematics teachers. By examining the integration of such activities at this stage, we not only have the potential to enhance the quality of mathematics instruction but also to gain insights into the challenges and opportunities that arise during the transition from theory to classroom practice. As these aspiring educators prepare to enter the classroom, it is critical to understand

their attitudes toward innovative pedagogical methodologies, including the integration of play-based activities. Despite the growing recognition of the potential benefits of play-based activities in math education, there is still inadequate research on the perceptions and strategies used by pre-service mathematics teachers. Therefore, this study aims to fill this gap by exploring pre-service teachers' perspectives on the use of play-based activities in teaching and learning mathematics.

Study Purpose

The purpose of this study was to explore pre-service mathematics teachers' perspectives on the use of play-based learning activities in teaching.

Research Questions

The research questions are;

1. What are the perceptions of pre-service mathematics teachers on the use of play-based activities in teaching and learning mathematics?
2. What are the pre-service mathematics teachers' perceived challenges in the use of play-based activities in teaching and learning?

Hypothesis

H_{o1} : The perception of pre-service mathematics teachers has no statistically significant relationship with their perceived challenges in the use of play-based activities.

STUDY SIGNIFICANCE

The findings of this study have the potential to contribute to the field of mathematics education, as well as teacher training programs and curriculum design, hence, understanding pre-service teachers' perspectives on using play in mathematics instruction would aid in identifying potential barriers or misconceptions that could hinder the effective integration of play-based strategies in the classroom. By addressing these perspectives, teacher-educators could better equip pre-teachers with the necessary skills and knowledge to effectively incorporate play into their teaching. It is anticipated that the study findings would further provide insights into the potential benefits of play-based strategies and help promote their widespread adoption in mathematics classrooms. Examining pre-service teachers' perspectives would provide valuable views into the existing gaps in teacher education programs. It would help identify areas where additional training and support are needed for pre-service teachers to integrate play-based strategies into their future classrooms effectively. The findings would provide a foundation for further research and innovation in the field of play-based mathematics education. It would inspire researchers and practitioners to explore various play-based approaches, develop new instructional strategies, and evaluate their impact on both teaching and learning outcomes.

THEORETICAL FRAMEWORK

The study is based on the theory of Social Constructivism, which emphasizes the importance of social interaction and collaboration in the process of learning. According to this theory, individuals actively create their knowledge and understanding by engaging in experiences, interactions, and reflections (Ormrod, 2016). This study aims to explore the perspectives of pre-service mathematics teachers on the use of play-based activities in teaching. The constructivist approach aligns with this objective, as it emphasizes the influence of individuals' prior experiences, beliefs, and interactions on their perspectives. Additionally, constructivism highlights the importance of reflection and metacognition in learning. The study aims to

achieve two objectives. The first objective is to identify pre-service teachers' perceptions of the use of play-based activities, which aligns with the constructivist theory. The second objective is to determine the challenges associated with using these activities. The examination of perceived challenges helps the researchers understand how pre-service teachers engage in metacognitive processes, which aligns with the constructivist notion of active learning through reflection. The interactions between pre-service teachers and their peers, instructors, and classroom experiences can shape their perspectives and responses to challenges. Therefore, this study incorporates social constructivism theory to provide a comprehensive theoretical framework to understand how pre-service mathematics teachers construct their perspectives and respond to challenges related to the use of play-based activities in teaching. The data collected in the study is analyzed based on the social constructivism theory, which emphasizes the role of learners' active engagement, prior experiences, social interactions, and reflection in shaping their perspectives and responses. This approach helps to provide a robust understanding of how pre-service teachers construct their perspectives and respond to challenges when using play-based activities in their teaching practices.

Research Design

This study utilized a cross-sectional design to investigate how play-based activities are used in teaching from the perspective of pre-service mathematics teachers. According to Bryman (2016), a descriptive study design presents an accurate representation of the situation being studied in its natural state, as it occurs. A descriptive study is typically used to examine a phenomenon at a specific time when resources or time for more extensive research are limited (Creswell & Plano-Clark, 2017). Descriptive design has the potential to provide information to many individuals. According to Creswell and Creswell (2017), survey research designs are the processes in quantitative research in which investigators administer a survey to a sample or the entire population to describe the attitudes, opinions, behaviors, or characteristics of the population. The descriptive survey was deemed appropriate for this study because the researchers sought to explain some aspects of the population by selecting an unbiased sample of people who were invited to complete questionnaires. The descriptive sample survey design was selected as the most suitable option for the study's purpose, research questions, and size of the target population. This design allowed the researchers to achieve the goal effectively and draw meaningful conclusions from the study.

Sample and Sampling Procedure

305 students were sampled from a targeted population of 527 students in the Department of Basic Education of the University of Education, Winneba, using the Yamane formula for sample size determination in quantitative research.

$$n = \frac{N}{1+N(e)^2}$$

where n = sample size; N = target population; and e = error margin

$$n = 527 / (1 + 527 (0.05 \times 0.05))$$

$$n = 227.4$$

The researchers used the Yamane formula to determine the minimum sample size required for the study, which turned out to be 227. However, to ensure greater accuracy and account for potential incomplete questionnaires, the researchers chose to sample 305 participants. The sample comprised of 133 males and 172 females. Per Creswell and Plano-Clark's (2017) definition, a study sample refers to a portion of the population that is chosen for the study and from whom the study gathers information. Creswell and Plano-Clark (2017) also suggest that a descriptive study requires a sample size of at least 10-20% of the target population. The sample size for this study represents 57.9% of the targeted population. Simple random sampling was employed to select the sample of Pre-service mathematics teachers from the Department of

Basic Education. Simple random sampling is a straightforward and unbiased method of selecting a subset of participants from a larger population in such a way that each member of the population has an equal chance of being included in the sample (Creswell & Plano-Clark, 2017).

Instrumentation

Data was collected using a self-designed questionnaire with closed-ended questions. A questionnaire is a research tool used in surveys that consists of carefully written questions designed to elicit self-reported responses about general and personal issues (Bryman, 2016). The questionnaire has items organized into three (3) sections (A–C). Items in Section A were utilized to collect data on the respondents' demographic information. Section B items gathered information on the perceptions of respondents in the use of play-based activities in teaching and learning mathematics, and items in Section C collected information on the perceived challenges in the use of play-based activities in teaching and learning mathematics. The questionnaire's basic structure was a five-point Likert scale. For both descriptive (means and standard deviations) and inferential (correlation) statistics, a five-point Likert scale is ideal (Creswell, 2017). In survey research, the Likert scale is frequently used to measure respondents' attitudes by asking how much they agree or disagree with a statement or question (Creswell & Creswell, 2017). The four-point Likert scale was weighted and interpreted as follows: 4 = Strongly Agree (SA); 3 = Agree; 2 = Disagree (D); 1 = Strongly Disagree (SD).

Validity and Reliability

Through pilot testing on pre-service early childhood teachers from the Department of Early Childhood Education of the University of Education, Winneba, the validity, and reliability of the research instruments were determined. Because the Students in the department take nearly identical courses and are taught by the same staff, the Department of Early Childhood Education was selected for the pilot study. As a result, the Department and the Department of Basic Education shared a great deal. The pilot test aimed to identify whether the responses were relevant to the study's goal, to ensure that the instrument was clear, and to ascertain whether the instrument would elicit the required response. Research validity is concerned with whether it is credible and true, as well as whether it is evaluating what it is supposed to or purports to evaluate. It essentially has to do with the adequacy of the data-gathering instruments as well as the study's conclusions. To that end, various research professionals reviewed the research instrument and data. In response to the reviewers' concerns, the imprecise and ambiguous questions were changed, and the challenging questions were reworded. Expert judgment, according to Creswell (2014), is one of the most reliable means of ensuring the validity of a research instrument. According to Bryman (2016), reliability is the degree to which findings hold up over time and provide an accurate picture of the entire population being studied. Reliability also refers to the ability of a research instrument to deliver consistent results when used with a similar technique. After the pilot test, the Cronbach coefficient of 0.83 was achieved to evaluate the reliability of the questionnaire. A Cronbach's Alpha coefficient of 0.70 or higher is regarded by Cohen, Manion, and Morrison (2018) as dependable and suitable for gathering the pertinent data needed to address the research objectives of a study.

DATA ANALYSIS METHOD

After the data collection process, reliable checks were performed to modify and guarantee error-free data. As a result, all incomplete and inconsistent questionnaires were suitably removed before coding and data processing. After that, the error-free data was analyzed with the Statistical Package for Solution and Service (SPSS) version 20. Furthermore, the processed data were quantitatively examined utilizing descriptive and inferential statistical methods such as percentages, frequencies, means, standard deviations, and Spearman Rank Correlation. The demographic data was analyzed using percentages and frequencies; the data obtained on the study topics was analyzed using means and standard deviations; and the hypotheses were tested using

the Spearman Rank Correlation.

Ethical Consideration

According to Creswell and Creswell (2018), it is imperative to uphold ethical standards to ensure the well-being, rights, and dignity of all involved parties. Before participating in the study, the pre-service teachers were provided with clear and comprehensive information about the purpose, procedures, potential risks, benefits, and voluntary nature of their participation. Informed consent ensures that participants are fully aware of their involvement and can make an informed decision about whether to participate (Creswell & Creswell, 2017). The researchers ensured the confidentiality and anonymity of participants, which is crucial. Bryman (2016) opines that any data collected should be treated with the utmost confidentiality, and personal identifiers should be removed from transcripts or other forms of data to protect the privacy of participants. This helps build trust and encourages candid responses. Furthermore, participation in the study was entirely voluntary, without any form of coercion or pressure. Participants had the freedom to withdraw from the study at any point without facing negative consequences. The data collected were used solely for the study, and the findings were reported accurately. Any potential for misrepresentation or misuse of the data was avoided.

RESULTS AND DISCUSSIONS

Biodata of Respondents

Figures 1, 2, and 3 show the results of pre-service mathematics teachers' demographic information such as sex, age group, and area of specialism.

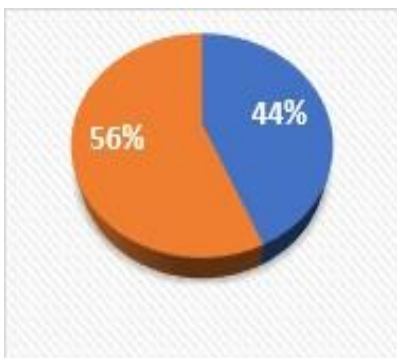


Fig.1: Sex Distribution

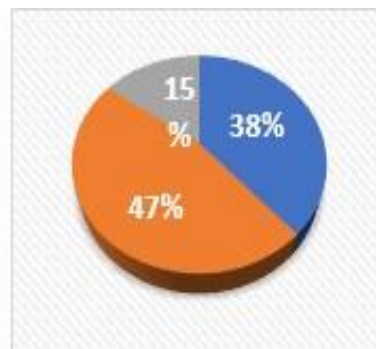


Fig. 2: Age Distribution

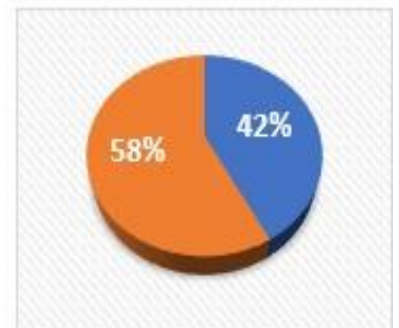


Fig. 3: Specialism

Figure 1 revealed that 133 (44%) of the pre-service mathematics teachers are males while 172 (56%) of them were females. This implies that many of the respondents who took part in the study were females.

Figure 2 shows the age distribution of pre-service mathematics teachers. The results revealed that 117 (38%) of the respondents were within the age range of 18-24 years, 142 (47%) of them were within the age range of 25-30 years while the remaining 46 (15%) of them were within the age range 31-40 years. This implies that most of the respondents were between 25-30 years.

Figure 3 revealed that 129 (42%) of the pre-service mathematics teachers were specializing in upper primary education while the remaining 176 (58%) are specializing in Junior High School. This suggests that most of the respondents who participated in the study were specializing in Junior High School.

Furthermore, Tables 1 and 2 show the responses of pre-service mathematics teachers regarding their training and prior experience with play-based activities in teaching mathematics.

Table 1: Have you received any specific training on the use of play-based activities?

Response	Frequency	Percent
Yes	184	60.3
No	121	39.7
Total	305	100.0

Source: Field Data (2023).

Table 1 shows that 184 (60.3%) of the pre-service mathematics teachers have received specific training on the use of play-based activities, while 121 (39.7%) have not had such training. This indicates that a significant portion of these future teachers have been exposed to the concept of using play-based activities in their pedagogy. The fact that over half of the respondents have received training suggests that there might be a growing recognition of the importance of play-based approaches in teaching mathematics.

Table 2: Have you had any prior experience using Play-based Activity?

Response	Frequency	Percent
Yes	84	27.5
No	221	72.5
Total	305	100.0

Source: Field Data (2023).

Table 2 reveals that only 84 (27.5%) of the pre-service mathematics teachers have prior experience using play-based activities in their teaching, while 221 (72.5%) have not utilized such methods before. This indicates a disparity between the amount of training received and the actual implementation of play-based activities in the classroom. Despite having received training, a substantial number of pre-service teachers seem to have not yet translated that knowledge into practice. One would have expected that pre-service teachers apply the play-based pedagogy during their internship program, but the case is different.

The results in this section were analyzed using mean and standard deviations. The scoring rubric and the interpretation of the results about the mean and standard deviations are presented in Table 3.

Table 3: Scoring Rubrics

Mean	Interpretation
1.00 – 1.75	Strongly Disagree
1.76 – 2.50	Disagree
2.51 – 3.25	Agree
3.26 – 4.00	Strongly Agree
Standard Deviation	
1 or greater than 1	Difference (heterogeneity)
Less than 1	Similarity (homogeneity)

Source: Adopted from Namale & Upoalkpajor, (2019)

Research Question 1: What are the perceptions of pre-service mathematics teachers on the use of play-

based activities in teaching and learning?

Research Question one seeks to explore the perceptions of pre-service mathematics teachers regarding the utilization of play-based activities in teaching and learning. This inquiry delves into the attitudes, viewpoints, and opinions of these future educators about the integration of play-based approaches as a pedagogical tool within the mathematics standards-based curriculum. Through an examination of their perceptions, this study aims to gain a deeper understanding of how pre-service teachers perceive the efficacy, benefits, and challenges associated with employing play-based activities in the mathematics classroom. Table 4 presents the results of the Pre-service mathematics teachers’ perception of the use of play-based activities.

Table 4: Pre-service mathematics teachers’ perception of the use of play-based activities

Item	Mean	SD
Incorporating play-based activities in mathematics lessons is an effective way to enhance students’ understanding of mathematical concepts.	2.9	1.1
Play-based activities are suitable for teaching a wide range of mathematical concepts and skills.	2.9	1.0
Using play-based activities can positively impact students’ attitudes towards mathematics.	2.8	1.1
Integrating play-based activities into the mathematics curriculum effectively requires careful planning and alignment.	2.8	0.8
Pre-service teachers should receive training and support in incorporating play-based activities into mathematics lessons.	2.5	0.8
I feel confident and prepared to incorporate play-based activities in my future mathematics lessons.	3.0	1.1

Source: Field Data (2023).

The mean score of 3 indicates that pre-service teachers feel moderately confident and prepared to incorporate play-based activities in their future mathematics lessons. The standard deviation of 1.1 suggests some variability in their confidence levels. Pre-service teachers perceive that play-based activities are suitable for teaching a wide range of mathematical concepts and skills, as reflected by a mean score of 2.9. The standard deviation of 1.0 suggests some variability in their perceptions. Pre-service teachers believe that incorporating play-based activities in mathematics lessons is an effective way to enhance students’ understanding of mathematical concepts, as indicated by a mean score of 2.9. The standard deviation of 1.1 suggests some variability in their perceptions. Pre-service teachers recognize that integrating play-based activities into the mathematics curriculum effectively requires careful planning and alignment, as indicated by a mean score of 2.8. The standard deviation of 0.8 suggests less variability in their perceptions. Pre-service teachers perceive that using play-based activities can positively impact students’ attitudes toward mathematics, as reflected by a mean score of 2.8. The standard deviation of 1.1 suggests some variability in their perceptions. Pre-service teachers indicate that they believe pre-service teachers should receive training and support in incorporating play-based activities into mathematics lessons, as shown by a mean score of 2.5. The standard deviation of 0.8 suggests some variability in their perceptions.

The findings highlight positive perceptions of pre-service mathematics teachers’ perceptions regarding their preparedness, confidence, resources, alignment, and support in incorporating play-based activities for teaching mathematics. The finding that pre-service mathematics teachers perceive varying levels of preparedness and confidence in utilizing play-based activities aligns with previous research (Smith et al., 2018). Many pre-service teachers may have limited exposure to play-based pedagogies during their

education, leading to uncertainty in implementing these approaches. However, contrasting studies may highlight instances where pre-service teachers felt well-prepared or expressed positive attitudes toward play-based methods (Jones et al., 2020).

Research Question 2: What are the pre-service mathematics teachers’ perceived challenges on the use of play-based activities in teaching and learning?

Research Question 2 delves into the challenges faced by pre-service mathematics teachers when integrating play-based activities into teaching and learning. This inquiry aims to uncover the perceived obstacles, difficulties, and barriers that these future educators encounter while attempting to incorporate play-based approaches within the mathematics curriculum. The results of the perceived challenges in the use of play-based activities in teaching and learning mathematics are presented in Table 5.

Table 5: Perceived challenges in the use of play-based activities in teaching and learning mathematics.

Item	Mean	Std. Dev.
It is difficult to align play-based activities with the mathematics curriculum/standards.	2.6	1.1
Managing classroom behavior during play-based activities is stressful	2.4	.8
Finding suitable play-based resources and materials for mathematics is challenging	2.4	1.1
It is difficult to assess students’ learning during play-based activities.	2.1	.9
Gaining support and acceptance from administrators and colleagues for using play-based activities is not easy	2.5	.9
It is not easy to overcome preconceived notions that play-based activities are not academically rigorous.	2.6	1.0
Obtaining adequate training and support in incorporating play-based activities is a difficult task	1.6	0.8

Source: Field Data (2023).

Pre-service teachers perceive it as difficult to align play-based activities with the mathematics curriculum/standards, as indicated by a mean score of 2.6. The standard deviation of 1.1 suggests some variability in their perceptions. Pre-service teachers find managing classroom behavior during play-based activities to be a source of stress, as reflected by a mean score of 2.4.

The standard deviation of 0.8 suggests some variability in their perceptions. Pre-service teachers perceive it as challenging to find suitable play-based resources and materials for teaching mathematics, as indicated by a mean score of 2.4. The standard deviation of 1.1 suggests some variability in their perceptions. Pre-service teachers find it difficult to assess students’ learning during play-based activities, as reflected by a mean score of 2.1. The standard deviation of 0.9 suggests some variability in their perceptions. Pre-service teachers perceive it as not easy to gain support and acceptance from administrators and colleagues for using play-based activities, as indicated by a mean score of 2.5. The standard deviation of 0.9 suggests some variability in their perceptions. Pre-service teachers perceive it as not easy to overcome preconceived notions that play-based activities are not academically rigorous, as reflected by a mean score of 2.6. The standard deviation of 1.0 suggests some variability in their perceptions. Pre-service teachers find it difficult to obtain adequate training and support in incorporating play-based activities, as indicated by a mean score of 1.6. The standard deviation of 0.8 suggests some variability in their perceptions. These findings highlight aligning with the curriculum, managing classroom behavior, finding suitable resources, assessing student learning, gaining support and acceptance, overcoming preconceived notions, and obtaining adequate training and support as challenges pre-service teachers face about play-based activities in teaching

mathematics. The identified difficulties in aligning play-based activities with the curriculum, managing classroom behavior, and assessing student learning resonate with previous research (Johnson & Johnson, 2016; Lee & Song, 2021;). These challenges underscore the need for pre-service teachers to receive comprehensive training in curriculum integration and classroom management. However, while some studies may emphasize these challenges, others might focus on different obstacles, such as time constraints or lack of support (Ginsburg et al., 2014). The findings regarding the difficulties of finding suitable resources and gaining support and acceptance from stakeholders align with prior studies (Piasta et al., 2015; Nguni & van der Westhuizen, 2020). This suggests a common concern among pre-service teachers about the availability of appropriate materials and the need for collaboration with colleagues, parents, and school administrators. On the contrary, Farquhar and Daniel (2017) highlight successful resource utilization and strong institutional support.

Ho₁: The perception of pre-service mathematics teachers has no statistically significant relationship with their perceived challenges on the use of play-based activities.

The hypothesis suggests that the perceptions held by pre-service mathematics teachers do not have a significant statistical relationship with the challenges they perceive when implementing these approaches in the mathematics classroom. Table 6 presents the results of the relationship between Perception and perceived challenges in the use of play-based activities.

Table 6: Relationship between Perception and perceived challenges in the use of play-based activities

Variable	Mean	Sd	R	R ²	P
Perception	16.95	4.32	-.918	0.843	0.000
Perceived Challenges	16.15	4.86			

** . Correlation is significant at the 0.05 level (2-tailed).

The results present the relationship between the perception of pre-service mathematics teachers and their perceived challenges in using play-based activities in teaching mathematics. The results are based on the correlation (R) between the two variables, perception, and perceived challenges, along with the coefficient of determination (R²) and the p-value. The correlation coefficient (R) is -0.918, which indicates a strong negative correlation between the perception of pre-service mathematics teachers and their perceived challenges in using play-based activities. This means that as the perception of pre-service teachers regarding play-based activities increases, their perceived challenges decrease, and vice versa. The negative sign of the correlation suggests an inverse relationship between these two variables. The coefficient of determination (R²) is 0.843, which means that approximately 84.3% of the variation in perceived challenges can be explained by the variation in perception. This high R² value suggests that there is a substantial relationship between the perception of pre-service teachers and their perceived challenges in using play-based activities. The p-value is 0.000, indicating that the correlation between perception and perceived challenges is statistically significant at the 0.05 level (2-tailed). In other words, the observed relationship between these variables is highly unlikely to have occurred by chance. Based on the findings ($p \leq 0.05$), the null hypothesis was rejected. The findings of this analysis provide strong evidence to reject the null hypothesis (Ho₁) which states that there is no statistically significant relationship between the perception of pre-service mathematics teachers and their perceived challenges in using play-based activities. Instead, the results indicate a robust and statistically significant negative relationship between the two variables.

The negative correlation suggests that as pre-service teachers' perception regarding play-based activities improves, their perceived challenges in using these approaches decrease. This finding is consistent with the idea that a positive attitude towards play-based activities may contribute to greater confidence and

competence in incorporating such methods in their teaching practices. The substantial R² value (84.3%) indicates that a large portion of the variability in perceived challenges can be explained by variations in perception. This means that pre-service teachers' perception plays a crucial role in influencing the extent to which they perceive challenges in using play-based activities in their teaching.

Main Findings

1. Pre-service mathematics teachers hold positive perceptions of pre-service mathematics teachers' perceptions regarding their preparedness, confidence, resources, alignment, and support in incorporating play-based activities for teaching mathematics. They perceive varying levels of preparedness and confidence in utilizing play-based activities that align with previous research.
2. The perceived difficulties include aligning with the curriculum, managing classroom behavior, finding suitable resources, assessing student learning, gaining support and acceptance, overcoming preconceived notions, and obtaining adequate training and support.

CONCLUSIONS

It is concluded that Pre-service mathematics teachers generally perceive a moderate level of preparedness, confidence, and support in incorporating play-based activities for teaching mathematics. This indicates that while they feel somewhat equipped and supported, there is room for improvement and further training. The challenges faced by pre-service teachers in incorporating play-based activities include difficulties in aligning with the curriculum, managing classroom behavior, finding suitable resources, assessing student learning, gaining support and acceptance, overcoming preconceived notions, and obtaining adequate training and support. These challenges can potentially hinder the effective implementation of play-based approaches in mathematics education.

RECOMMENDATIONS

1. The variability in perceptions among pre-service mathematics teachers should be addressed by providing additional resources, training, and alignment guidance that may further enhance pre-service teachers' confidence and effectiveness in utilizing play-based activities. Positive attitudes and perceptions should be promoted through teacher education programs to mitigate perceived challenges and foster a more effective and confident use of play-based activities in mathematics instruction.
2. Pre-service teachers should be provided with strategies, resources, and guidance to help them overcome challenges and enhance their effectiveness in incorporating play-based activities in teaching mathematics. Continuous support and mentorship should be available to pre-service teachers as they transition into their teaching careers. Experienced educators and mentors can provide guidance and assistance in overcoming challenges related to play-based activities in the classroom.

Conflict of Interest

The study conducted did not result in any conflicts of interest. The researchers were open and honest about any conflicts of interest or personal convictions that would compromise the objectivity of the study.

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