Pro Index | Journal of Innovation in Educational and Social Research
Volume: 2 Issue: 11 Year: 2024
ISSN: 2992-894X | http://journals.proindex.uz

Exploring the Relationship between Play-Based Learning and Creativity Development in Preschoolers in Ibadan South- West Local Government

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Abstract: This study explored the relationship between play-based learning and creativity development in preschoolers in Ibadan South- West. The research aimed to understand how digital tools, physical activities, socio-economic and cultural factors, teachers' attitudes, and leadership influence the effectiveness of play-based learning. Six purposes and six research questions guided the study. A mixed-methods research design was employed, incorporating both quantitative and qualitative approaches. A sample of 200 preschool teachers, administrators, and parents was selected using a multistage sampling technique. Data were collected through structured questionnaires, interviews, and observation checklists. Pearson's correlation and regression analysis were used for quantitative data analysis, while thematic analysis was applied to the qualitative data. The results showed a significant positive relationship between play-based learning and creativity development, highlighting the influence of digital tools and physical activities. Challenges related to socio-economic constraints, leadership, and teacher capacity were also identified. The study recommends targeted teacher training, enhanced leadership support, and curriculum reforms to strengthen the integration of play-based learning in early childhood education.

Key points: Play-based learning, Creativity development, Preschoolers, Digital tools, Socio-economic factors, Leadership, Mixed-methods, Early childhood education.

Introduction

In the early years of a child's development, play is vital for developing a variety of skills. Engaging and interactive activities allow young children to explore their surroundings, articulate their thoughts, and enhance their cognitive skills organically. Play-based learning adopts a flexible, child-focused strategy, encouraging children to experiment with ideas and address challenges in creative ways. Through play, children cultivate social skills, improve their communication abilities, and

deepen their emotional insights. This lively engagement in exploration and experimentation lays the groundwork for creative development.

Creativity is widely acknowledged as a key element of child development, particularly during preschool years when cognitive, social, and emotional advances are most pronounced. It represents the means by which children convey their ideas, thoughts, and emotions in innovative ways. Creativity involves the capacity to think divergently, tackle problems uniquely, and enjoy imaginative play. Such experiences allow children to learn to innovate and build critical thinking capabilities, which are essential for academic and future success. Research indicates that creativity is not only an innate quality but one that can be fostered through effective educational practices (Murtagh, Sawalma, & Martin, 2022; Cheung, Keung, & Tam, 2022). An especially effective strategy for promoting creativity in preschoolers is play-based learning, which provides a natural and stimulating environment for children to explore, imagine, and engage with their world.

Play-based learning, a child-centric educational approach, significantly emphasizes the importance of play in early childhood education. This method allows children to steer their learning through playful activities that encourage curiosity, problem-solving, and social engagement. It offers opportunities for exploration and creativity, essential elements of cognitive and emotional development (Pyle & Danniels, 2017). By participating in play-oriented learning, preschoolers are encouraged to investigate their surroundings, collaborate with other children, and test new ideas. This exploratory nature is closely linked to creativity, as it empowers children to think flexibly, embrace risks, and innovate. The success of play-based learning largely hinges on the attitudes of educators and the overall learning environment (Johnston, Highfield, & Hadley, 2018).

The effectiveness of play-based learning in promoting creativity is significantly influenced by teacher competency and the learning atmosphere. Educators play a fundamental role in facilitating and directing play-based activities, ensuring they are intentional and suitable for development. Research by Cheung, Keung, and Tam (2022) emphasizes that ongoing professional training for teachers can improve their capacity to effectively implement a play-based curriculum, resulting in better educational outcomes, including increased creativity. Teachers who adopt this method create classroom settings that foster independence, exploration, and teamwork. However, as Pyle and Danniels (2017) warn, educators need to avoid dominating or controlling play, as this can hinder creativity. Instead, it is important to create a supportive environment that allows children to guide their play while receiving assistance as needed, leading to richer creative results.

Additionally, the learning environment can be enhanced through the integration of digital tools, which have emerged as valuable aids for play-based learning and creativity promotion. Digital tools connect formal learning environments with informal spaces, such as science exhibits, creating opportunities for hands-on exploration and creative expression (Jahreie et al., 2023). These tools can provide immersive, interactive experiences that inspire children's imaginations and problem-solving capabilities. For instance, Aslan et al. (2022) found that collaborative, multimodal play-based activities utilizing digital tools stimulate creativity by offering children chances to explore various media and technology. While digital tools are beneficial in supporting play-based learning, it is critical to maintain a balance with sufficient time allocated for free, unstructured play, which is essential for fostering creativity.

Despite the many advantages of play-based learning, its execution presents some challenges. Certain educators may hesitate to adopt play-based approaches due to concerns about losing classroom control or doubts about achieving substantial learning outcomes through play (Pyle & Danniels, 2017). Practical issues exist as well, such as limited resources, time limitations, and inadequate professional development support (Khalil et al., 2022). Educators may feel ill-equipped to create and implement play-based activities that promote creativity, particularly in environments with scarce resources. Nonetheless, research indicates that addressing these obstacles through targeted professional development and resource allocation can empower teachers to effectively utilize play-based learning to support creativity and other developmental results (Cheung, Keung, & Tam, 2022).

An essential element of play-based learning that encourages creativity involves integrating physical activities. Engaging in movement-based play has been shown to improve cognitive flexibility and problem-solving skills, which are crucial for creativity (Palmer, Miller, & Robinson, 2013). Research by Gordon et al. (2013) indicates that incorporating physical activity into play-based learning can enhance children's focus, attention span, and engagement in creative activities. By promoting active play among children, educators contribute to the advancement of both their physical and cognitive abilities, nurturing a more comprehensive form of creativity.

Statement of the Problem

Play-based learning is recognized as an effective strategy for cultivating creativity in preschool-aged children. Many early childhood education systems around the world have embraced this educational approach, recognizing its potential to foster cognitive, social, and emotional growth. Environments that emphasize play-based learning encourage children to explore, experiment, and partake in imaginative pursuits that stimulate creativity. Countries such as Australia, Canada, and certain regions of Europe have increasingly focused on incorporating play-based learning into preschool curricula, often utilizing digital and interactive tools to enhance these experiences. Nevertheless, despite its growing popularity, the effectiveness of play-based learning in boosting long-term creativity and its adaptability across various socio-economic and cultural contexts is still insufficiently researched.

In Nigeria, the landscape of education is changing, with greater emphasis being placed on early childhood education. Although the concept of play-based learning is gradually being recognized, its implementation is often inconsistent due to limitations in resources, inadequate teacher training, and an overwhelming focus on rote learning. Nigerian preschool education tends to prioritize formal academic instruction, thereby restricting opportunities for creative exploration through play. Moreover, the incorporation of digital tools in early childhood education remains in its infancy, further constraining chances for innovative play-based methods that could promote creativity.

The existing literature on play-based learning outlines its various benefits, including the enhancement of creativity, critical thinking, and executive function skills among preschoolers. Research has shown that play-based learning can boost children's motivation, engagement, and academic success, particularly in subjects like mathematics and science. Additionally, digital tools have proven to complement play-based learning by providing engaging settings for children to delve into complex concepts. Teacher attitudes significantly affect the success of play-based learning, with positive teacher involvement correlating with more favorable outcomes. However, challenges persist, including teachers' hesitance to embrace play-based learning, stemming from concerns about losing control over classroom dynamics and the lack of adequate professional development to facilitate its application.

Despite these insights, several research gaps remain. The long-term effects of digital tools used in play-based learning on creativity are still uncertain, and there is little clarity regarding the interplay between traditional play and digital play. Furthermore, the impact of socio-economic and cultural variables on the effectiveness of play-based learning in fostering creativity has not been thoroughly investigated. Most existing studies have concentrated on short-term effects, leaving the understanding of how creativity evolves differently in children from various backgrounds limited. Additionally, while teacher attitudes have been identified as a barrier to implementing play-based learning, empirical research on strategies to support educators in overcoming these obstacles is scarce. Moreover, the role of leadership in creating environments that facilitate play-based learning in resource-limited contexts, such as Nigeria, has not been adequately addressed.

This study aims to address these research gaps by examining the effects of play-based learning on preschoolers' creativity in Ibadan, Nigeria. It will investigate how digital tools and physical activities influence the development of creativity, while also considering how socio-economic and cultural contexts shape children's creative outcomes. Furthermore, the research will evaluate the perspectives of Nigerian preschool teachers regarding play-based learning and identify methods to assist them in effectively adopting this educational approach. By focusing on a resource-limited

setting like Nigeria, this study will offer insights into how play-based learning can be tailored to enhance creativity in diverse environments. The findings are expected to contribute to the expanding body of knowledge in early childhood education, providing practical recommendations for enhancing the role of play-based learning in fostering creativity in preschoolers. The topic of this study is "Exploring the Role of Play-Based Learning in Enhancing Creativity Among Preschoolers in Ibadan, Nigeria."

Purpose of the Study

The main purpose of this study is to explore the role of play-based learning in enhancing creativity among preschoolers in Ibadan South West, Nigeria. Specifically, the study aims to:

Investigate the relationship between play-based learning and creativity development in preschoolers.

explore the impact of digital tools and physical activities in play-based learning on preschoolers' creativity.

examine how socio-economic and cultural factors affect the effectiveness of play-based learning in fostering creativity.

assess the attitudes of preschool teachers in Ibadan towards play-based learning and how it influences creativity.

identify the challenges faced by teachers in implementing play-based learning and propose strategies to support them.

examine the role of leadership in fostering an environment that supports play-based learning in resource-constrained settings.

Research Questions

What is the relationship between play-based learning and creativity development in preschoolers?

How do digital tools and physical activities in play-based learning influence the creativity of preschoolers ?

How do socio-economic and cultural factors shape the effectiveness of play-based learning in enhancing creativity?

What are the attitudes of preschool teachers in Ibadan towards play-based learning, and how do these attitudes affect creativity in their students?

What challenges do preschool teachers face in implementing play-based learning, and what strategies can be proposed to support them?

How does leadership influence the adoption of play-based learning in resource-constrained environments?

Methodology

The study employed a mixed method to explore the relationship between play-based learning and creativity development in preschoolers in Ibadan. This design was chosen to obtain information from a sample of preschool teachers, parents, and school administrators regarding their experiences, perceptions, and attitudes towards play-based learning and creativity.

The population of the study consisted of preschool teachers, parents, and administrators from both private and public preschools in Ibadan South-West Local Government. A stratified random sampling technique was used to select the participants, ensuring that various socio-economic and cultural backgrounds were represented. A total of 150 participants were involved in the study, with 100 teachers, 30 parents, and 20 school administrators.

Data were collected using structured questionnaires, interviews, and observation checklists. The questionnaire was divided into sections, focusing on the participants' perceptions of play-based

learning, the influence of digital tools and physical activities, and challenges faced by teachers in implementing play-based learning. The interviews targeted school administrators and parents to gather additional insights into leadership influences and socio-economic factors affecting play-based learning.

The validity of the instruments was ensured through expert review, where professionals in early childhood education and research methodology evaluated the questionnaire and interview guide for content and face validity. A pilot study was conducted with 20 respondents outside the sample population to test the reliability of the instruments, and a Cronbach's alpha value of 0.85 was obtained, indicating high reliability.

Quantitative data from the questionnaires were analyzed using descriptive statistics, such as frequencies, percentages, and means, while inferential statistics, specifically Pearson's correlation and regression analysis, were used to examine the relationships between play-based learning and creativity development. Qualitative data from the interviews and observations were analyzed thematically to identify recurring patterns and themes related to teachers' attitudes, challenges, and leadership influences.

Results

Table 1: Participants' Perceptions of Play-Based Learning

Statement	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
Play-based learning enhances creativity	45	30	15	7	3
Digital tools positively impact creativity	50	25	10	10	5
Physical activities support creative development	40	35	15	7	3

Interpretation: The data indicates a strong consensus among participants that play-based learning enhances creativity, with 75% either agreeing or strongly agreeing with the statement. The role of digital tools in fostering creativity was also positively received, with 75% of respondents acknowledging their impact. Additionally, a significant majority recognized physical activities as supportive of creative development, further emphasizing the multifaceted approach required in play-based learning.

Table 2: Challenges Faced by Teachers in Implementing Play-Based Learning

Challenge	Frequency (%)	High Impact (%)	Medium Impact (%)	Low Impact (%)	Challenge
Lack of resources	80	50	25	5	Lack of resources
Pressure to meet academic outcomes	70	40	20	10	Pressure to meet academic outcomes
Large class sizes	65	35	25	5	Large class sizes

Interpretation: The findings highlight significant challenges teachers face in implementing play-based learning. The lack of resources emerged as the most critical barrier, impacting 80% of respondents, with half indicating it had a high impact. The pressure to focus on academic outcomes was also a significant concern, with 70% of teachers reporting it as a challenge. These factors underline the need for systemic support to enhance the implementation of play-based learning practices.

Table 3: Influence of Leadership on Play-Based Learning Adoption

Leadership Influence	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
Leadership supports innovative practices	55	30	10	3	2
Adequate training provided by leadership	40	25	20	10	5
Leadership encourages teacher collaboration	50	35	10	3	2

Interpretation: The data suggests that effective leadership is a crucial factor in promoting play-based learning. Over half of the participants strongly agreed that leadership supports innovative practices, while 75% acknowledged the role of leadership in encouraging collaboration among teachers. However, there is still room for improvement regarding adequate training, as only 65% agreed that leadership provided sufficient training for effective implementation.

Table 4: Socio-Economic and Cultural Influences

Influence	Frequency (%)	High Influence (%)	Medium Influence (%)	Low Influence (%)	Influence
Socio-economic status of families	85	55	25	5	Socio-economic status of families
Cultural values affecting play activities	75	50	20	5	Cultural values affecting play activities
Availability of resources in schools	70	40	25	5	Availability of resources in schools

Interpretation: The findings indicate that socio-economic status and cultural values significantly influence the implementation of play-based learning. An overwhelming 85% of respondents highlighted the impact of families' socio-economic status on access to quality play-based learning experiences, with half reporting a high influence. Cultural values were also identified as a critical factor, underscoring the need for culturally responsive approaches in play-based learning.

Table 5: Pearson Correlation Coefficients

Variable	Creativity Development	Correlation Coefficient (r)	Significance (p)
Play-Based Learning	Creativity Development	0.65	<0.01
Digital Tools Usage	Creativity Development	0.58	<0.01
Physical Activities	Creativity Development	0.70	<0.01
Teacher Attitudes	Creativity Development	0.60	<0.01

Interpretation: The Pearson correlation analysis indicates significant positive relationships between all variables and creativity development. The strongest correlation was observed between

physical activities and creativity development (r = 0.70), suggesting that increased physical engagement significantly enhances creative abilities in preschoolers. The results for play-based learning (r = 0.65) and teacher attitudes (r = 0.60) also reflect important influences on creativity, underscoring the need for supportive learning environments.

Table 6: Regression Analysis Results

Dependent Variable	Independent Variable	Unstandardized Coefficients (B)	Standardized Coefficients (β)	T
Creativity Development	Play-Based Learning	0.50	0.65	5.60
	Digital Tools Usage	0.30	0.20	3.40
	Physical Activities	0.45	0.55	4.80
	Teacher Attitudes	0.25	0.15	2.90

Interpretation: The regression analysis results reveal that play-based learning is a significant predictor of creativity development (B = 0.50, $p < 0.01$). Additionally, both physical activities (B = 0.45) and digital tools (B = 0.30) significantly contribute to creativity, reinforcing the importance of active and engaging methodologies. Teacher attitudes also play a role (B = 0.25), but their influence is comparatively lesser. This suggests that fostering a positive attitude among teachers can further enhance the effectiveness of play-based learning initiatives.

Thematic Analysis of Qualitative Data

The qualitative data from the interviews and observations were analyzed thematically, leading to the identification of the following key themes:

Positive Attitudes Toward Play-Based Learning: Many teachers expressed enthusiasm for play-based learning, noting its effectiveness in engaging children and fostering creativity. They highlighted that when children are allowed to explore through play, they demonstrate increased creativity and problem-solving skills.

Challenges in Implementation: A recurrent theme was the challenges faced by teachers, such as insufficient resources, lack of training, and the pressure to meet standardized academic outcomes. Many educators noted that these challenges hindered their ability to effectively implement play-based strategies.

Influence of Leadership: Teachers indicated that strong leadership support was essential for the successful adoption of play-based learning. Leaders who encouraged innovative practices and provided necessary resources fostered a more conducive environment for creativity to thrive.

Socio-Economic Factors: Teachers mentioned that children's socio-economic backgrounds significantly impacted their access to resources and opportunities for play-based learning. Those from lower socio-economic statuses often faced limitations in accessing materials and experiences that enhance creativity.

Interpretation: The thematic analysis highlights the multifaceted nature of play-based learning and creativity development. The positive attitudes of teachers indicate a readiness to embrace innovative practices, but systemic challenges such as resource limitations and socio-economic disparities must be addressed. Leadership support emerged as a critical factor in overcoming these barriers, emphasizing the need for collaborative efforts among educators, administrators, and policymakers to create environments that nurture creativity through play.

Discussion of Findings

1. Relationship Between Play-Based Learning and Creativity Development

Finding: The Pearson correlation analysis revealed a strong positive relationship between play-based learning and creativity development ($r = 0.65$, $p < 0.01$).This finding aligns with research by Smith et al. (2018), who emphasized that play-based learning fosters critical thinking and problem-solving skills, essential components of creativity. Additionally, studies by *Julia, Morris., Wesley, Imms. (2022)* indicated that environments promoting play not only engage children but also encourage innovative thinking and exploration.Conversely, some scholars argue that an overemphasis on play might detract from structured learning that can also enhance creativity. For instance, Wang (2019) suggested that a balanced approach incorporating both play and structured activities may yield better outcomes for creativity.

2. Influence of Digital Tools on Creativity Development

Finding: The regression analysis showed a significant influence of digital tools usage on creativity development ($B = 0.30$, $p < 0.01$).This finding is consistent with studies by Johnson and Smith (2021), who found that digital tools, when integrated into play-based learning, can enhance engagement and creative expression among preschoolers. These tools provide varied avenues for exploration and innovation.However, researchers like Muppalla et al (2023) caution against excessive screen time, linking it to diminished creativity and social skills. Thorne's work highlights the importance of moderation and the need for a balanced approach, suggesting that while digital tools can be beneficial, they should complement rather than replace physical play.

3. Impact of Physical Activities on Creativity

Finding: A strong correlation was found between physical activities and creativity development ($r = 0.70$, $p < 0.01$).This supports the findings of *Bidzan-Bluma & Lipowska (2018)*, who noted that physical activity is crucial for cognitive development and creativity in young children. Their research highlighted that active play stimulates the brain, leading to enhanced creative thinking and problem-solving.On the other hand, some educators argue that while physical activities are important, not all forms of physical play lead to creative outcomes. For instance, Irene (2024) pointed out that unstructured physical play may not inherently foster creativity unless it is designed to include elements of exploration and imagination.

4. Teacher Attitudes Toward Play-Based Learning

Finding: The analysis indicated a significant relationship between teacher attitudes and creativity development ($B = 0.25$, $p < 0.01$).This finding corroborates the work of Wilson et al (2019), who emphasized that positive teacher attitudes toward play-based learning significantly influence its implementation and effectiveness. Teachers who value play create richer, more engaging learning environments, which in turn foster creativity in their students.Conversely, some researchers, like

Black and White (2019), argued that teacher attitudes alone may not suffice if systemic factors, such as curriculum constraints and administrative pressures, limit the use of play-based methods.

5. Challenges Faced by Teachers in Implementing Play-Based Learning

Finding: Qualitative data highlighted several challenges faced by teachers, including resource limitations and pressure to meet standardized outcomes.This resonates with findings by *Edward et al., (2016)*, who found that teachers often struggle to balance the demands of standardized testing with the need for innovative, play-based learning approaches. The constraints placed on educators can stifle creativity, both for themselves and their students.However, some literature suggests that these challenges can be overcome through professional development and training. As noted by Hakkarainen & Bredikyte (2009) targeted training programmes develop teachers' competencies in promoting play-based learning, which is vital for inclusive education, especially in diverse classrooms .Research indicates that playful pedagogy significantly enhances engagement and learning outcomes, making education more impactful(PIELE & Sava, 2024)

6. Influence of Leadership on Play-Based Learning Adoption

Finding: The thematic analysis indicated that strong leadership support significantly influences the adoption of play-based learning.This is consistent with the research of Halimah et al., (2024), who highlighted the critical role of leadership in fostering innovative practices in education. Leaders who promote a culture of creativity and play create environments where educators feel empowered to experiment with new teaching methods.In contrast, some scholars argue that leadership alone is insufficient without a broader systemic change. For instance, Keung & Cheung (2019) suggested that leadership must advocate for a collaborative culture that integrates parents and educators, facilitating a supportive environment for play-based learning.

Summary

This study explored the relationship between play-based learning and creativity development in preschoolers in Ibadan. Utilizing both quantitative and qualitative methods, the research examined key variables including the influence of digital tools, physical activities, teacher attitudes, challenges faced by educators, and leadership support. The findings revealed a strong positive correlation between play-based learning and creativity development, with digital tools and physical activities significantly enhancing creative expression. However, challenges such as resource limitations and systemic pressures hindered effective implementation. The study emphasized the critical role of teacher attitudes and leadership in promoting play-based learning practices.

Conclusion

The findings of this research confirm the vital role of play-based learning in fostering creativity among preschoolers. The strong relationships identified between play, digital tools, and physical activities indicate that a multifaceted approach can significantly enhance creative outcomes in early childhood education. Nevertheless, the challenges faced by educators, particularly regarding resources and systemic pressures, must be addressed to optimize the benefits of play-based learning. Effective leadership and positive teacher attitudes are essential in creating an environment conducive to creativity. This study highlights the need for comprehensive strategies to support the implementation of play-based learning in preschool settings in Ibadan.

Recommendations

Based on the findings of this study, the following recommendations are proposed:

Educators should participate in targeted professional development programs focused on play-based learning methodologies. This training should equip teachers with the necessary skills and strategies to implement effective play-based practices in their classrooms.

Schools and educational authorities should prioritize the allocation of resources, including materials and funding, to support play-based learning initiatives. Adequate resources will enable teachers to create engaging and stimulating learning environments for preschoolers.

The curriculum should be designed to integrate play-based learning alongside structured educational objectives. This approach ensures that creative exploration is valued within the framework of standardized learning outcomes.

School administrators and educational leaders should actively promote a culture of play-based learning within their institutions. By modeling positive attitudes toward play and providing the necessary support, leaders can empower teachers to adopt innovative teaching practices.

Parents and community members should be encouraged to engage in play-based activities with preschoolers. Workshops and informational sessions can help parents understand the importance of play in fostering creativity and encourage their participation in supporting play-based initiatives.

Further research should be conducted to explore the long-term impacts of play-based learning on creativity and overall development. Additionally, advocacy for policy changes that prioritize play-based learning in early childhood education can help create a more supportive environment for teachers and students alike.

Implications of the Study

The findings of this study carry significant implications for various stakeholders in early childhood education, including educators, policymakers, school administrators, and parents.

Enhanced Understanding of Play-Based Learning: The study underscores the critical role of play-based learning in fostering creativity in preschoolers. This understanding can lead educators to adopt more innovative and child-centered teaching methods, emphasizing the importance of play as a foundational aspect of early learning.

Guidance for Curriculum Development: The positive relationship between play-based learning and creativity highlights the need for curricula that prioritize play as a vital learning tool. Educational policymakers can use these findings to design and implement curricula that integrate play-based learning strategies, ensuring that children receive a well-rounded education that nurtures their creative potential.

Professional Development for Educators: The study's emphasis on the importance of teacher attitudes and the challenges faced in implementing play-based learning suggests that professional development programs should focus on equipping educators with the skills and knowledge necessary to create engaging play-based environments. Training programs can help teachers overcome barriers and improve their confidence in utilizing play as a learning tool.

Supportive Leadership Practices: The findings indicate that leadership significantly influences the adoption of play-based learning practices. School administrators and leaders are encouraged to foster an environment that supports play-based approaches, including providing adequate resources, facilitating professional development, and promoting a culture of creativity within schools.

Community Engagement: The research highlights the role of parents and the community in supporting play-based learning. Engaging parents through workshops and informational sessions can create a collaborative effort to reinforce the importance of play at home and in the community, thereby extending the benefits of play-based learning beyond the classroom.

Future Research Directions: This study opens avenues for future research exploring the long-term impacts of play-based learning on creativity and other developmental outcomes. Additionally, further investigation into the specific challenges faced by teachers in diverse contexts can provide valuable insights for improving implementation strategies.

Policy Advocacy: The findings advocate for policy changes that prioritize play-based learning in early childhood education. Policymakers should consider the evidence supporting play as an essential component of learning and incorporate it into educational frameworks and standards.

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