Journal of Pedagogy and Curriculum

[ISSN 2957-6490]
Volume: 05 Issue: 01 | March-2026

JPC

ANALYSING THE INTEGRATION OF PLAY-BASED APPROACHES IN THE GRADE 3 MATHEMATICS SYLLABUS, NAMIBIA

Authors
Erastus Kleopas [1]; Renate Olga Shikwaya [2]
Main author's email: erasykleopas@gmail.com

(1.2) University of Namibia, Namibia.

Cite this article in APA
Kleopas, E., & Shikwaya, O. R. (2026). Analysing the integration of play-based approaches in the grade 3 mathematics syllabus, Namibia. *Journal of pedagogy and curriculum, 5*(1), 1-19. https://doi.org/10.51317/jpc.v5i1.929

OPEN ACCESS
A publication of Editon Consortium Publishing (online)

Article history
Received: 2026-01-12
Accepted: 2026-02-16
Published: 2026-03-02

Scan this QR to read the paper online

Abstract
The purpose of this study is to analyse the extent to which play-based approaches are formally integrated and pedagogically scaffolded within Namibia's Grade 3 Mathematics syllabus. Play-based pedagogy is widely recognised for supporting inclusive and learner-centred mathematics education; however, its formal integration within curriculum documents in Sub-Saharan Africa remains under-examined. This study argues that while Namibia's Grade 3 Mathematics syllabus reflects play-based principles, its articulation within the curriculum text is largely implicit and insufficiently scaffolded. The problem addressed is the limited evidence on how play-based learning is formally embedded at the curriculum level rather than enacted in classrooms. A qualitative design employing thematic document analysis was used to examine five purposively selected national and comparative curriculum and policy documents (2010-2024), chosen for their relevance to foundational mathematics reform and early grade pedagogy. The Namibian syllabus was analysed alongside curriculum frameworks from Uganda and Finland to provide contextual and policy contrasts between African and European approaches to early mathematics education. Findings indicate that while the Namibian syllabus reflects learner-centred and activity-based strategies, explicit references to "play" occur infrequently and lack structured progression and assessment guidance. In contrast, the Ugandan and Finnish frameworks demonstrate clearer conceptual framing, terminology usage, and alignment between pedagogy and assessment. The study concludes that clearer articulation, structured scaffolding, and assessment alignment are necessary to strengthen play-based integration. It recommends enhanced curriculum guidance and teacher support materials to operationalise play-based mathematics learning effectively. The study contributes to curriculum scholarship in Sub-Saharan Africa by highlighting the importance of explicit pedagogical articulation within curriculum texts to support coherent mathematics reform.

Keywords: Curriculum analysis, early grade mathematics, Namibia grade 3 syllabus, play-based pedagogy, thematic document analysis.

1.0 INTRODUCTION

Although play-based pedagogy is widely promoted in early mathematics education, limited attention has been given to how such pedagogy is formally integrated and articulated within curriculum documents, particularly in the Namibian Grade 3 Mathematics syllabus. The integration of play-based learning in early childhood education has gained significant attention due to its potential to enhance cognitive, social, and emotional development. This research focuses specifically on Grade 3 because it represents a transitional phase within the Junior Primary phase in Namibia, where learners move from predominantly play-oriented early childhood experiences toward more formalised mathematical instruction. As such, Grade 3 serves as a critical curriculum juncture at which the balance between play-based learning and formal mathematics instruction becomes especially significant. Therefore, play-based approaches are worth researching because they align with how young children learn best through active exploration, interaction, and problem-solving (Fisher et al., 2013; Weisberg et al., 2016). In mathematics, play provides meaningful contexts for developing foundational concepts such as number sense, patterns, and spatial reasoning, while also fostering creativity, collaboration, and critical thinking (Pyle & Danniels, 2017). Moreover, play supports inclusive and learner-centred pedagogy by accommodating diverse learning needs and promoting participation (UNESCO, 2020).

For conceptual clarity, this study distinguishes between structured (guided) play and unstructured (free) play. Structured play refers to teacher-guided mathematical activities intentionally designed to achieve specific learning objectives, such as games targeting counting strategies or pattern recognition. Unstructured play, by contrast, involves learner-initiated exploration with minimal direct instruction, allowing children to construct mathematical meaning through spontaneous interaction with materials and peers (Mahadew & Amin, 2025). This distinction is important for analysing whether the curriculum text provides explicit pedagogical direction or merely implies exploratory activity.

Recent research from Sub-Saharan Africa demonstrates growing empirical interest in play-based mathematics pedagogy. Studies in South Africa show that structured games and guided play can significantly strengthen early number sense and learner engagement in mathematics (Bowie & Graven, 2024). Similarly, teachers' perspectives research highlights the need for clearer curricular alignment and professional support to ensure that play is meaningfully integrated rather than treated as an add-on activity (Mahadew & Amin, 2025). A broader African scoping review further indicates that while play-based pedagogies are increasingly endorsed across policy contexts, their practical enactment is often constrained by limited resources, teacher preparation, and ambiguous curriculum guidance (Nampijja et al., 2024). These findings suggest that although play-based learning is gaining momentum in African scholarship, systematic curriculum-level analyses remain limited, particularly within the Namibian context. Investigating the explicit representation of play-based pedagogy within the Grade 3 Mathematics syllabus, therefore, contributes both to national curriculum scholarship and to broader regional debates on pedagogical integration.

Play-based pedagogy, characterised by the integration of structured and unstructured play into mathematical activities, has gained widespread support as a developmentally appropriate approach to teaching mathematics (Wood, 2014). Rooted in Vygotsky's (1978) sociocultural theory, this pedagogy emphasises active engagement, collaboration, and hands-on experiences to enhance learning. Research indicates that play-based learning facilitates the acquisition of mathematical concepts, including counting,

patterns, computation, problem-solving, geometry, measurement, and spatial reasoning, by making learning contextual and enjoyable (Van Oers, 2010; Clements & Sarama, 2011).

In Namibia, the National Curriculum for Basic Education (NCBE) advocates for learner-centred education, which aligns with the principles of play-based pedagogy (Namibia Ministry of Education, Arts and Culture, 2016). However, while policy promotes learner-centred approaches, there is limited systematic analysis of how play-based pedagogy is explicitly articulated and scaffolded within the official Grade 3 Mathematics syllabus itself. Although implementation challenges in classrooms have been documented in previous studies (e.g., Kavena, 2019), the present study is confined to curriculum document analysis. Moreover, cultural perceptions that equate play with frivolity rather than learning pose additional barriers (Hamunyela & Kanyimba, 2020). Globally, studies demonstrate the efficacy of play-based pedagogy in enhancing early mathematics education. Pyle and Danniels (2017) report that children exposed to play-based mathematics activities exhibit improved engagement, critical thinking, and numeracy skills. Similarly, Clements and Sarama (2011) emphasise the role of manipulatives and games in fostering a robust understanding of mathematical concepts. These findings highlight the potential for play-based approaches to transform mathematics instruction and align educational practices with learners' developmental needs.

The central problem addressed in this study is therefore the limited analysis of how and to what extent play-based learning is represented in the Grade 3 Mathematics curriculum text, and the level of pedagogical guidance provided to teachers through the syllabus. Despite the emphasis on play-based pedagogy in early childhood and junior primary education policies, there is limited clarity on how this pedagogical approach is explicitly integrated and articulated within the Namibian Grade 3 Mathematics syllabus. While the curriculum promotes learner-centred and activity-based learning, it remains unclear how play-based principles are embedded in curriculum content, learning objectives, suggested teaching strategies, and assessment guidelines. This lack of clarity presents a challenge for teachers who rely on the syllabus to guide instructional decisions, potentially resulting in inconsistent interpretation and enactment of play-based pedagogy in mathematics classrooms. Consequently, there is a need to systematically examine the Grade 3 Mathematics syllabus to identify the extent to which play-based pedagogy is represented, as well as the strengths and gaps in its curricular integration.

This study draws on constructivist and sociocultural theories as its analytical lens. Piaget's theory of active knowledge construction informed the examination of curriculum language for references to manipulation, exploration, and developmental progression. Vygotsky's sociocultural theory guided the analysis of how the syllabus frames scaffolding, dialogue, guided interaction, and collaborative learning. These theoretical constructs shaped the coding framework used to identify whether play-based pedagogy is explicitly articulated, implicitly embedded, or structurally scaffolded within the curriculum text.

Eventually, this study contributes original scholarship by shifting the focus from classroom enactment to curriculum-text analysis, providing one of the first systematic examinations of play-based pedagogy at the syllabus level in Namibia. By interrogating curricular language, structure, and pedagogical scaffolding, the study advances national curriculum scholarship and contributes to broader regional debates on the formal integration of play-based mathematics education in Sub-Saharan Africa.

Objective of the Study

This study aims to analyse the extent to which play-based pedagogy is explicitly integrated and pedagogically scaffolded within the Namibian Grade 3 Mathematics syllabus.

Research Questions

1. How is play-based pedagogy represented within the Grade 3 Mathematics syllabus?
2. To what extent is play-based learning explicitly articulated and systematically scaffolded across curriculum components?
3. What strengths and gaps are evident in the syllabus regarding pedagogical guidance and assessment alignment?

2.0 LITERATURE REVIEW

Play-based pedagogy has garnered significant attention in early childhood education as a developmentally appropriate approach for fostering holistic development, including foundational mathematical competencies. Research consistently highlights that play-based learning promotes engagement, creativity, and active participation—conditions that support young learners in developing robust conceptual understanding in mathematics (Petersen & McClelland, 2020). Grounded in constructivist and sociocultural theories, play is understood not merely as a recreational activity but as a dynamic pedagogical tool through which learners construct meaning, negotiate understanding, and internalise mathematical concepts (Piaget, 1952; Vygotsky, 1978). Within this framework, mathematical learning emerges through interaction, dialogue, and purposeful engagement with materials and peers.

Recent African scholarship further strengthens this theoretical foundation by providing empirical evidence from early grade mathematics classrooms. For example, Bowie and Graven (2024) demonstrate that structured mathematical games in South African early grade contexts significantly support number sense development and learner participation. Similarly, Mahadew and Amin (2025) report that while teachers recognise the pedagogical value of play, successful enactment depends heavily on explicit curricular direction and professional support. A scoping review of play-based pedagogies across African contexts confirms that although policy rhetoric increasingly endorses play, curriculum documents often lack detailed articulation of how play aligns with subject content and assessment standards (Nampijja et al., 2024). These findings suggest that curriculum-level clarity is central to ensuring that play-based pedagogy is not left to individual interpretation.

However, much of the existing African research relies on small-scale classroom-based case studies or teacher self-reports, with limited attention to systematic curriculum text analysis. Moreover, few studies critically interrogate the coherence between policy rhetoric and syllabus-level specification, leaving an under-examined gap in curriculum scholarship.

International Perspectives on Play-Based Learning

Internationally, play-based learning has been systematically embedded in early mathematics curricula in countries such as Finland and Uganda, although the depth and coherence of its integration differ across contexts. Finland and Uganda were purposively selected for comparative reference in this study because they represent contrasting curriculum contexts-Finland as a high-income system with strong policy coherence in early mathematics education, and Uganda as an African context facing resource constraints

yet actively promoting play-based pedagogy. This contrast provides a meaningful analytical lens for examining Namibia's curriculum positioning.

In Finland, play is positioned as a foundational pedagogical approach in early childhood and early primary education, explicitly linked to curriculum goals and learner development. The Finnish National core curriculum for basic education emphasises exploratory, game-based, and problem-solving activities as essential for developing mathematical thinking, conceptual understanding, and learner autonomy (Finnish National Agency for Education [FNAE], 2016). Mathematics learning in the early grades is designed to emerge through guided play, interaction, and meaningful engagement with concrete materials, supported by clear curricular guidance that assists teachers in translating play-based principles into classroom practice (Pyle et al., 2017; Walsh et al., 2019).

In contrast, Uganda's early grade curriculum promotes play-based learning primarily as a strategy to enhance learner engagement and conceptual development within resource-constrained settings. While policy documents encourage play as a pedagogical strategy, empirical studies indicate that its articulation within curriculum texts is less explicit than in high-income contexts (Kakuru et al., 2020; UNESCO, 2021). Consequently, teachers often rely on professional discretion and locally available materials to integrate play into mathematics lessons (Piper et al., 2018). This flexibility, while contextually responsive, may lead to uneven curriculum enactment where pedagogical integration is not clearly scaffolded in official documents.

Nevertheless, even in Finland, some scholars caution that strong rhetorical support for play does not automatically eliminate tensions between academic accountability pressures and play-based approaches (Walsh et al., 2019). Similarly, in Uganda, variability in implementation raises questions about the extent to which curriculum flexibility enhances innovation versus contributing to inconsistency. These nuances highlight the importance of examining not only policy endorsement but also textual specificity within curriculum documents.

These contrasting examples illustrate two models of curricular integration: one characterised by explicit policy coherence and pedagogical scaffolding, and another shaped by contextual adaptation and interpretive flexibility. This comparative lens is valuable for examining how play-based learning is conceptualised and embedded within the Namibian Grade 3 Mathematics syllabus.

Integration of Play-Based Learning in Mathematics Curricula

Curriculum design plays a critical role in embedding play-based pedagogy within educational systems. Explicit articulation of play within curriculum documents supports alignment between instructional strategies, learning objectives, and assessment practices (Nicolopoulou et al., 2010). However, research increasingly indicates that mere rhetorical endorsement of play is insufficient; curricular integration must include clear guidance on how play advances specific mathematical competencies (Hirsh-Pasek et al., 2020; Zosh et al., 2018).

Recent African research reinforces this position. Ndabezitha and Gravett (2024) emphasise that guided play must be deliberately structured and aligned with learning outcomes to ensure conceptual depth. Similarly, Selepe et al. (2024) highlight that in rural early childhood centres, limited curriculum clarity often shifts responsibility to teachers to interpret how play supports mathematics content. Where curriculum

guidance is ambiguous, play risks being treated as an enrichment activity rather than as an integrated pedagogical strategy.

At the same time, some scholars argue that overly prescriptive curriculum frameworks may constrain teacher creativity and contextual responsiveness (Hirsh-Pasek et al., 2020). This tension between curricular specificity and pedagogical flexibility suggests that effective integration requires balanced scaffolding rather than rigid prescription.

For play-based learning to be pedagogically defensible within mathematics curricula, it must align coherently with curriculum goals, learning outcomes, and assessment expectations. Play in mathematics is not incidental; it is a structured strategy for developing number sense, mathematical reasoning, problem-solving skills, and mathematical communication (Hirsh-Pasek et al., 2020). Curriculum documents should therefore clarify:

1. Why is play used?
2. How it supports specific mathematical concepts, and
3. How it progresses across grade levels.

Play-based mathematics learning may take multiple forms, including guided play, rule-based games, manipulative exploration, and contextualised problem-solving scenarios. Each requires intentional facilitation by teachers to ensure conceptual progression and alignment with syllabus objectives (Pyle & Danniels, 2017; Walsh et al., 2019). Without explicit curricular scaffolding, play may be perceived as peripheral rather than integral to mathematical knowledge construction.

Namibian Context and Play-Based Pedagogy

In Namibia, the National Curriculum for Basic Education promotes learner-centred and activity-based approaches (Ministry of Education, Arts and Culture, 2016). While these principles align philosophically with play-based pedagogy, there is limited scholarly analysis of how play is explicitly articulated within the Grade 3 Mathematics syllabus itself. Existing studies largely focus on classroom implementation challenges rather than on curriculum document analysis. Moreover, cultural perceptions that associate play with leisure rather than academic rigour may influence how teachers interpret curriculum expectations (Hamunyela & Kanyimba, 2020).

The limited curriculum-focused scholarship in Namibia mirrors broader regional patterns where play is encouraged at the policy level but insufficiently detailed in curriculum texts (Nampijja et al., 2024). This suggests a potential gap between policy intention and curricular specification, underscoring the need for systematic document analysis.

Benefits and Structural Challenges of Grade 3 Mathematics on the Play-Based Approach

Play-based learning supports critical thinking, collaboration, motivation, and learner agency-competencies aligned with contemporary educational priorities (Zosh et al., 2018). However, effective curricular integration requires professional development, material resources, and coherent policy support. African studies caution that without institutional support and curriculum clarity, implementation may become

inconsistent (Mahadew & Amin, 2025; Selepe et al., 2024). Thus, curriculum documents serve as pivotal mediators between pedagogical ideals and classroom practice.

Research Gaps and Opportunities

Despite increasing empirical evidence supporting play-based pedagogy globally and within parts of Africa, there remains limited research examining how play is formally integrated and articulated within mathematics curriculum documents in Sub-Saharan Africa. Most studies focus on classroom enactment rather than on curriculum text analysis.

This study advances knowledge by providing a systematic, curriculum-level analysis of play-based pedagogy within the Namibian Grade 3 Mathematics syllabus—an area that has received minimal scholarly attention. By interrogating the language, structure, and pedagogical scaffolding of the syllabus, the study moves beyond implementation discourse to examine how play is formally codified within official curriculum texts. In doing so, it contributes to national curriculum scholarship, strengthens regional debates on pedagogical integration, and offers evidence to inform curriculum reform, teacher education, and policy alignment in early mathematics education.

3.0 METHODOLOGY

This study employed a qualitative research design grounded in an interpretivist paradigm and utilised document analysis as the primary method of data collection and analysis. Qualitative document analysis was appropriate for examining how play-based pedagogy is conceptualised, framed, and supported within curriculum texts (Bowen, 2009). Consistent with interpretivist inquiry, the study sought to understand the meanings embedded in policy and curriculum documents rather than to measure outcomes quantitatively (Creswell & Poth, 2018). The analysis was theoretically informed by constructivist perspectives, particularly Piaget (1964) and Vygotsky (1978), which emphasise active and socially mediated learning.

Specifically, Piaget's theory of cognitive constructivism informed attention to curriculum references related to active exploration, developmental readiness, and conceptual progression, while Vygotsky's sociocultural theory guided the identification of themes such as scaffolding, guided interaction, collaboration, and mediated learning. These theoretical constructs served as initial sensitising concepts during deductive coding and shaped the interpretation of how play-based learning was framed in the syllabus.

A purposive, criterion-based sample of five institutional and policy documents published between 2010 and 2024 was selected. These included: (1) the Namibian Junior Primary Mathematics Syllabus (Grades 1–3); (2) the National Curriculum for Basic Education (Ministry of Education, Arts and Culture, 2016); 3) the Inclusive Education Policy; (4) selected curriculum frameworks from Finland and Uganda; and (5) UNESCO policy guidance on play-based learning. Documents were selected based on relevance to early grade mathematics, learner-centred pedagogy, and explicit or implicit reference to play-based approaches. The unit of analysis comprised pedagogical statements, activity descriptions, and instructional guidelines within the Grade 3 syllabus. Finland was selected due to its internationally recognised explicit integration of play-based pedagogy within formal curriculum structures. Uganda was selected as a Sub-Saharan African context with policy-level endorsement of play but comparatively varied curricular articulation. This contrast enabled examination across differing policy and socio-economic contexts.

The selection of five documents was considered sufficient to capture policy-level, curricular, and comparative perspectives relevant to Grade 3 mathematics, allowing for depth of analysis while ensuring variation across national and international contexts. Document adequacy was determined through iterative review, where thematic repetition across sources indicated conceptual saturation.

Data were analysed using thematic content analysis following Braun and Clarke's (2006) six-step framework. Coding combined deductive categories derived from theory (e.g., scaffolding, guided interaction) with inductive codes emerging from the texts. The deductive phase began with a provisional coding framework based on constructivist principles (e.g., learner agency, mediated learning, developmental progression), while the inductive phase allowed additional codes to emerge directly from the curriculum language (e.g., activity-based learning, contextualised tasks, experiential strategies). Deductive coding provided theoretical anchoring, whereas inductive coding ensured responsiveness to context-specific meanings embedded in the Namibian syllabus. Themes were refined through constant comparison across documents to identify patterns in the explicit and implicit integration of play-based pedagogy. For example, recurring codes such as "activity-based strategy," "group interaction," and "use of concrete materials" were clustered under broader themes such as implicit play alignment, while limited occurrences of the term "play" formed part of a theme relating to curricular explicitness. This dual analytic process enhanced transparency and strengthened the credibility of findings.

By employing a theoretically informed and systematically structured document analysis, this methodology directly addresses the identified research gap-namely, the limited curriculum-level examination of play-based pedagogy in Namibia-and aligns with the study's objective of determining the extent and clarity of its integration within the Grade 3 Mathematics syllabus.

4.0 FINDINGS AND DISCUSSION

Curriculum Analysis

The Grade 3 Mathematics Syllabus was analysed and reflects significant elements of play-based learning integration. It reflects an effort to integrate play-based learning and learner-centred pedagogies into early numeracy education. This integration supports the development of foundational mathematical skills through engaging, exploratory, and contextually relevant methods. The syllabus emphasises the use of concrete materials, manipulatives, games, songs, and real-life problem-solving contexts, which are core components of play-based and constructivist learning theories. Activities such as counting games, sorting, measuring using non-standard units, and role-playing in simulated marketplaces are explicitly encouraged in the teaching guidelines (Ministry of Education, Arts and Culture, 2016). These approaches not only facilitate the understanding of abstract mathematical concepts but also promote active learner engagement and cognitive development. Furthermore, the curriculum aligns with socio-constructivist theories by encouraging cooperative learning, dialogue, and discovery-based instruction. Teachers are advised to adapt learning activities to the learners' immediate environments and cultural backgrounds, making learning more relevant and meaningful (Ministry of Education, Arts and Culture, 2016). This approach supports inclusive and differentiated instruction, catering to learners with diverse needs, including those with disabilities. However, while these approaches are embedded across topics, the curriculum does not explicitly frame them within a structured play-based pedagogical model. Additional professional development and resource support may be required to ensure teachers are adequately prepared to apply these strategies effectively (Marope, 2017; Shiel et al., 2016).

Learning Through Concrete and Contextual Activities

The syllabus emphasises the use of counting rhymes, songs, and fingerplays to introduce number concepts. These activities are inherently playful and enjoyably support the development of numeracy. According to Gelman and Gallistel (1978), rhythmic and repetitive language patterns found in songs and rhymes help young learners internalise number sequences and counting principles. Learners are encouraged to manipulate objects such as stones, bottle caps, and other locally available materials to engage with numbers, shapes, and measurement, thereby aligning with hands-on, play-based learning approaches. This method is consistent with Piagetian theory, which asserts that young children learn best through active manipulation of their environment (Piaget, 1964). The use of familiar, low-cost materials also promotes equity and accessibility across socio-economic contexts (MoEAC, 2016).

Problem Solving Through Play

Simple story problems introduce learners to problem-solving through imaginative and meaningful contexts. When mathematics is embedded in playful narratives, learners are more likely to construct conceptual understanding rather than rely on memorised procedures, consistent with constructivist principles (Clements & Sarama, 2014). Guided play strengthens reasoning, flexible thinking, and connections between abstract ideas and lived experiences (Hirsh-Pasek et al., 2020). In African classrooms, structured and culturally relevant play activities have been shown to deepen engagement and enhance problem-solving competence, particularly in early mathematics settings (Ndabezitha & Gravett, 2024). Playful problem-solving, therefore, serves as a strategic pedagogical tool for developing mathematical reasoning.

Sensory Engagement and Categorisation

The curriculum promotes sensory exploration by sorting objects based on properties like colour, texture, and size. This approach supports visual, auditory, and tactile learning, playfully fostering cognitive development. According to Howard and McInnes (2013), multisensory engagement in play helps children make sense of mathematical concepts and improves their ability to classify, compare, and categorise key early mathematical skills.

Patterns and Sequencing

Play-based tasks such as creating, identifying, and extending patterns using objects or pictures help learners recognise mathematical relationships. These activities encourage creativity while developing logical thinking and sequencing skills. Research by Papic et al. (2011) shows that early exposure to pattern recognition and sequencing significantly contributes to later success in algebraic thinking and problem-solving.

Spatial Awareness and Movement

Spatial relations are introduced through activities like arranging objects, building puzzles, and describing positions (e.g., "in front of," "behind," "below"). These tasks integrate physical movement and play, helping learners interactively understand spatial orientation. Hannibal and Clements (2000) found that spatial reasoning developed through physical play supports geometry and mapping skills, which are foundational for later mathematical understanding.

Measurement in Real-Life Contexts

Measurement concepts (e.g., time, length, mass, capacity, money) are taught through comparisons and practical simulations, such as using play money for buying and selling activities. These activities connect mathematics to everyday experiences, making learning meaningful. According to Fleer (2010), embedding numeracy in socio-cultural play contexts enhances conceptual understanding and facilitates transfer of knowledge to real-life situations.

Engagement Through Storytelling and Songs

Narratives, rhymes, and songs effectively combine fun with education, making abstract concepts more accessible to young learners. Storytelling enhances memory retention and comprehension by embedding mathematical ideas in familiar and imaginative contexts. Songs and rhymes, with their repetitive and rhythmic structures, support the internalisation of number sequences and vocabulary (Sarama & Clements, 2009). These tools not only sustain learner attention but also promote language development alongside numeracy.

Active, Hands-On Learning

Tasks involving manipulating objects and sorting encourage active participation, which is critical in early childhood education. Play-based learning draws on the principle that young children learn best by doing, exploring, experimenting, and constructing knowledge through physical interaction with materials (Piaget, 1964; National Association for the Education of Young Children [NAEYC], 2020). This tactile engagement supports concept development in areas such as classification, quantity, and measurement, making learning more concrete and memorable.

Cultural and Contextual Relevance

Including activities that leverage local resources and environments ensures the curriculum remains meaningful and relatable to learners. When mathematics is taught through culturally familiar objects such as stones, seeds, or traditional games, learners are more likely to see the relevance of what they are learning to their daily lives (UNESCO, 2017). This relevance enhances motivation and supports inclusive pedagogy, especially in multilingual and socio-economically diverse contexts like Namibia.

Collaborative Learning Opportunities

Group-based tasks foster cooperation, social skills, and shared learning experiences, enhancing engagement. Collaborative play allows children to learn from one another, negotiate roles, and engage in joint problem-solving. According to Vygotsky's sociocultural theory, learning is a socially mediated process, and peer interaction plays a vital role in cognitive development (Vygotsky, 1978). Such interactions help learners develop not only mathematical understanding but also essential social competencies.

In conclusion, the Grade 3 Mathematics Syllabus integrates play-based learning effectively by embedding engaging, exploratory activities into its framework. However, play-based learning is predominantly implicit, with limited explicit naming, structuring, or pedagogical guidance within the curriculum text. Given the document-based nature of the study, conclusions are limited to curriculum design and instructional guidance rather than classroom implementation. The syllabus creates an interactive learning environment that fosters foundational numeracy skills, from sensory exploration and storytelling to hands-on tasks and real-life applications.

Overall, the findings suggest that strengthening explicit articulation, structured progression, and cultural integration would enhance the consistency and effectiveness of play-based mathematics teaching in Namibia.

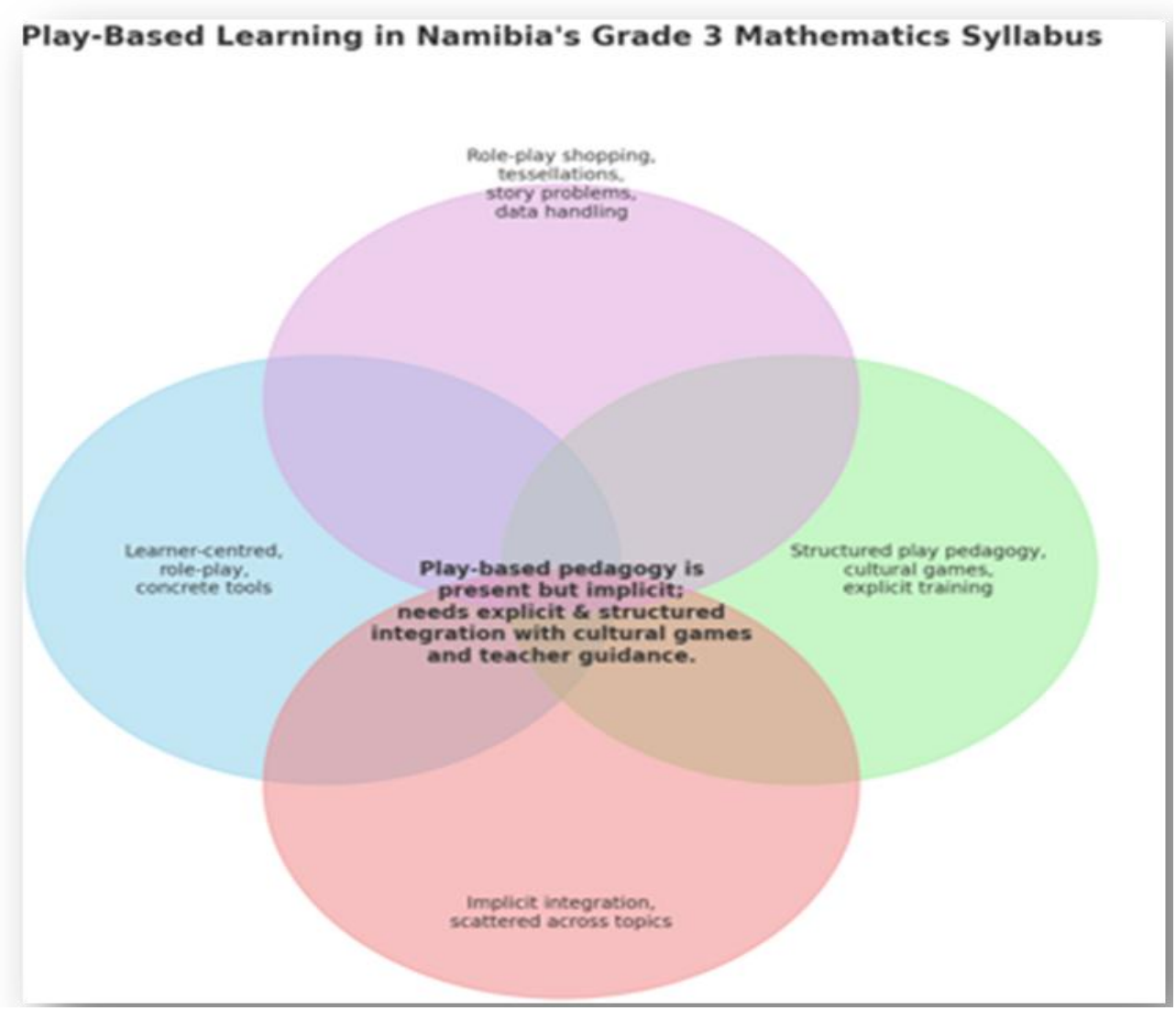

Figure 1: Play-Based Learning in Namibia's Grade 3 Mathematics Syllabus (MoEAC, 2016)

A conceptual Venn-style diagram showing how the Grade 3 Mathematics syllabus connects to play-based learning: a) blue (current support): Learner-centred, role-play, concrete tools; b) green (best integration): Structured pedagogy, cultural games, explicit training; c) red (extent): Implicit integration, scattered across topics; and d) purple (types of play): Shopping role-play, tessellations, story problems, data handling. At the centre, Play-based pedagogy is present but implicit; it needs explicit, structured integration with cultural games and teacher guidance.

Table 1: Analysis of Play-Based Learning in the Grade 3 Mathematics Syllabus

Research Question	Findings from Current Grade 3 Syllabus	Opportunities for Strengthening Play-Based Learning
1. How is play-based pedagogy represented and integrated within the Namibian Grade 3 Mathematics syllabus?	Emphasizes learner-centred education and use of concrete and local materials like stones, bottle tops, and sticks to support understanding. Encourages role-play, especially in money-related topics (e.g., shopping simulations). Promotes story-based problem solving, integrating play with real-life contexts. Supports collaborative learning through group work and discussions, which fosters playful social interaction.	Increase use of traditional and cultural games (e.g., mancala, local storytelling games). Provide clearer guidance to teachers on how to systematically integrate play across different mathematics topics. Enhance the use of contextual play, including local market simulations and culturally relevant play scenarios.
2. What strengths and gaps are evident in the syllabus regarding guidance for play-based mathematics teaching?	***Strengths:*** The curriculum already supports practical, hands-on learning, especially in areas like measurement, data handling, and geometry.It includes elements of problem-solving and exploration, which are central to play-based learning.	***Gaps:*** Lacks a formal play pedagogy framework to guide structured implementation. No designated or protected play time within the mathematics schedule (unlike models from countries like Singapore or Finland). Cultural integration could be expanded e.g., using songs, dances, traditional games, and local role-play to enhance relevance and enjoyment.

Table 1 shows that the Namibian Grade 3 Mathematics syllabus incorporates elements of play-based pedagogy through learner-centred approaches, use of concrete local materials, role-play, story-based problem solving, and group work. These features support active and collaborative learning.

Table 2: Documented Case Studies of Play-Based Approaches in Mathematics Education

Case Study	Context	Implementation	Outcomes	Citation
South Africa: Traditional Games	A rural school uses locally available materials to teach mathematics.	- Games like *mancala* for counting and grouping. - Role-play simulating shopping with play money. - Counting stones and building shapes with sticks.	- Improved engagement and numeracy skills. - Enhanced teacher confidence in play-based methods. - Learners enjoyed the lessons.	Van der Walt & Maree, 2021.
Singapore: Holistic Learning	Kindergarten integrates play in a structured mathematics program.	- Pattern building with blocks. - Board games for arithmetic. - Free play exploring symmetry and spatial relationships.	- Improved collaboration and problem-solving skills. - Deeper conceptual understanding of numbers and patterns. - Addressed diverse learner needs.	Ng, 2020.
Finland: Play-Based Preschool	Preschool embedding mathematics into daily routines and activities.	- Counting during cleanup. - Outdoor scavenger hunts for shapes and distances. - Math stations with puzzles, games, and manipulatives.	- Improved spatial reasoning and arithmetic understanding. - Positive learner attitudes toward mathematics. - Natural progression in numeracy skills.	Hujala et al., 2016.
Uganda: Cultural Integration	Program training teachers to use culturally relevant play-based approaches.	- *Tug of war* and *jump rope* for measurement and counting. - Songs and stories for addition and subtraction. - Patterns created with natural materials.	- Greater confidence in applying mathematical concepts. - Higher attendance and participation rates. - Enhanced real-world application of skills.	Opolot-Okurut & Musasizi, 2019.
Namibia: Grade 3	The Junior Primary Mathematics	- Counting through grouping concrete	- Increased opportunities for active	Ministry of Education, Arts

Mathematics syllabus	syllabus emphasises learner-centred education, contextualisation, and use of concrete materials such as stones, bottle tops, and sticks to make learning meaningful .	objects (2s, 3s, 5s, 10s) and using patterns in games. - Market simulation and role-play using Namibian currency (up to N$50). - Story problems acted out through role-play and dramatization. - Measuring capacity, mass, and length with improvised tools (strings, balances, containers). - Creating patterns, tessellations, and symmetrical figures with shapes. - Collecting and representing data through pictographs, bar graphs, and tables linked to learners' environment (e.g., favourite fruits, number of birds).	participation and hands-on exploration. - Development of critical numeracy skills such as computation, estimation, and problem-solving. - Promotion of creativity, collaboration, and inclusive participation. - Strengthening of real-life connections between mathematics and local contexts.	and Culture (2023). *Junior Primary Mathematics Syllabus Grades 1–3*. Okahandja: NIED. ISBN 978-99945-2-358-0 JP Mathematics syllabus .

The Grade 3 syllabus does not explicitly call the strategies "play-based," but the learner-centred, concrete, and contextualised activities (games, role-play, local materials) reflect play pedagogy. Grade 3 builds on earlier grades by scaffolding play into more structured numeracy: market simulations, data handling with real-life contexts, and creating shapes/patterns. This alignment shows that the curriculum embeds play as a pathway to problem-solving, inclusivity, and meaningful application.

Table 3: Comparative Analysis of Play-Based Mathematics Approaches

Country/Case	Context	Implementation	Outcomes	Comparison to Namibia (Grade 3)
South Africa: Traditional Games	Rural schools integrate cultural games with mathematics learning.	Games like *mancala* for counting, role-play with play money, and grouping stones/sticks.	Improved engagement, stronger numeracy, teacher confidence.	Namibia is similar in **use of local materials** (stones, bottle tops, sticks) and role-play with money. However, South Africa emphasises *traditional games*

				explicitly, while Namibia frames them as contextualised activities .
Singapore: Holistic Learning	Structured play embedded in early mathematics curriculum.	Pattern building, board games, free play exploring symmetry.	Collaboration, deeper conceptual understanding, addressing diverse needs.	Namibia also promotes **patterns, tessellations, and symmetry** (geometry section). However, Namibia is less explicit about *structured play time*—teachers interpret learner-centred methods flexibly.
Finland: Play-Based Preschool	Mathematics embedded in daily routines and environment.	Counting in routines, outdoor scavenger hunts, puzzle stations.	Positive attitudes, improved spatial reasoning, natural numeracy progression.	Namibia uses **story problems, environmental counting, and measurement with improvised tools** (e.g., bottle tops, balances). Both stress **contextualised mathematics**, but Finland weaves play more seamlessly into *daily routines* beyond classroom tasks.
Uganda: Cultural Integration	Teachers trained to embed culture into play-mathematics.	Tug of war for measurement, songs/stories for operations, patterns with natural materials.	Higher attendance, participation, and confidence in applying mathematics.	Namibia similarly stresses **local contextualisation** (e.g., market role-play, currency, environment-based data). Uganda explicitly ties *cultural practices* to mathematics concepts, which Namibia could strengthen further.
Namibia: Grade 3 Curriculum	Learner-centred, concrete, and contextualised mathematics learning.	Role-play with Namibian currency, story problems acted out, group projects (graphs), measuring with improvised tools, shape tessellations.	Inclusive, engaging, numeracy skill development, problem-solving, creativity.	Namibia aligns strongly with **international play-based principles**, but could improve by explicitly naming *traditional games* and ensuring play is not overshadowed by formal computation goals.

Table 3 presents a comparative analysis of play-based mathematics approaches across different countries and Namibia's Grade 3 curriculum. It shows that while all contexts integrate play into mathematics learning, the level of structure and cultural emphasis varies.

South Africa and Uganda explicitly integrate traditional and cultural games into mathematics teaching, while Singapore and Finland embed structured play into daily learning routines. Namibia aligns with these approaches through learner-centred, contextualised, and hands-on strategies such as role-play, use of local materials, and story-based problem solving. However, compared to other countries, Namibia could strengthen its approach by more explicitly incorporating traditional games and formalising structured play within the curriculum.

Discussion

Implications

The findings indicate that the Grade 3 Mathematics syllabus reflects a clear philosophical commitment to learner-centred and play-based pedagogy, consistent with socio-constructivist principles (Piaget, 1964; Vygotsky, 1978). The working assumption guiding this study—that play-based principles are present but not systematically articulated within the curriculum text—was supported. While the syllabus embeds experiential and contextualised activities across mathematical strands, references to play remain largely implicit rather than explicitly defined, sequenced, and scaffolded.

Theoretically, the findings suggest that curriculum documents can reflect constructivist orientations without fully operationalising them at the level of instructional guidance. This highlights the distinction between pedagogical philosophy and curricular specification. Practically, a clearer articulation of how specific mathematical objectives can be achieved through guided play would strengthen coherence between intention and implementation. The integration of locally available materials and culturally grounded examples is a significant strength, reinforcing contextual relevance and accessibility. However, without structured exemplars and progression guidelines, teachers may interpret play-based learning inconsistently, particularly in under-resourced contexts (Mahadew & Amin, 2025; Ndabezitha & Gravett, 2024).

Assessment alignment also has practical implications. Limited guidance on evaluating learning through play may result in an overreliance on formal written assessments, potentially narrowing instructional practice (Zosh et al., 2018; Bowie & Graven, 2024). Greater alignment between pedagogy and assessment would enhance curricular coherence. Overall, the findings suggest that strengthening explicit curricular scaffolding, teacher guidance materials, and assessment integration would support more systematic and sustainable implementation of play-based mathematics learning.

Limitations

This study is limited to qualitative document analysis and does not examine classroom enactment or learner outcomes. The analysis focused on five purposively selected policy and curriculum documents; therefore, findings cannot be generalised beyond the texts reviewed. Comparative insights from Uganda and Finland were restricted to curriculum articulation rather than empirical implementation contexts. Consequently, interpretations are confined to curriculum representation rather than practice.

5.0 CONCLUSION AND RECOMMENDATIONS

Conclusion: The study analysed how play-based learning is integrated within the Grade 3 Mathematics syllabus. References to teacher professional development and resourcing are retained only where they emerge directly from curriculum analysis rather than being introduced as standalone constructs. Integrating play-based approaches into Namibia's Grade 3 mathematics curriculum can greatly enhance learner engagement and understanding. Play-based learning creates a child-centred environment where learners explore mathematical ideas through meaningful, culturally relevant activities such as indigenous games, storytelling, and manipulatives. These strategies help bridge abstract concepts with everyday experiences, improving comprehension and numeracy skills. However, limited teacher training and insufficient resources remain key challenges. Strengthening professional development and embedding play-based strategies in teacher education are essential. Overall, making play more explicit, structured, and culturally grounded, drawing lessons from Uganda's cultural integration and Finland's routine-based play, can lead to more effective mathematics instruction and improved learning outcomes in Namibia.

Recommendations: It is recommended that the Grade 3 Mathematics curriculum be revised to include more structured examples of specific games and playful activities that align with key mathematical concepts. This will provide clearer guidance for teachers in implementing play-based strategies effectively. Additionally, sustained professional development should be provided to equip teachers with the skills to design, facilitate, and assess play-based learning activities. This includes training on how to embed mathematics instruction within playful contexts and how to observe and document learning through play. Furthermore, the curriculum should explicitly link assessment methods to play-based activities to ensure coherence between pedagogy and evaluation, thereby supporting the holistic development of foundational numeracy skills.

6.0 REFERENCES

1. Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal, 9*(2), 27–40. https://doi.org/10.3316/QRJ0902027
2. Bowie, L. H., & Graven, M. H. (2024). Using games to develop number sense in early grade maths clubs. *South African Journal of Childhood Education, 14*(1), a1493. https://doi.org/10.4102/sajce.v14i1.1493
3. Clements, D. H., & Sarama, J. (2011). Early childhood mathematics intervention. *Science, 333*(6045), 968–970. https://doi.org/10.1126/science.1204537
4. Clements, D. H., & Sarama, J. (2014). *Learning and teaching early math: The learning trajectories approach* (2nd ed.). Routledge. https://doi.org/10.4324/9780203520574
5. Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Sage.
6. Finnish National Agency for Education. (2016). *National core curriculum for basic education 2014*. Finnish National Board of Education. https://www.oph.fi/en/education-system/finnish-national-core-curricula
7. Fisher, K. R., Hirsh-Pasek, K., Golinkoff, R. M., Singer, D. G., & Berk, L. E. (2013). *Playing around in school: Implications for learning and educational policy*. Oxford University Press.
8. Fisher, K. R., Hirsh-Pasek, K., Newcombe, N., & Golinkoff, R. M. (2011). Taking shape: Supporting preschoolers' acquisition of geometric knowledge through guided play. *Child Development, 82*(1), 187–192.

9. Fleer, M. (2010). *Early learning and development: Cultural-historical concepts in play*. Cambridge University Press.

10. Gelman, R., & Gallistel, C. R. (1978). *The child's understanding of number*. Harvard University Press.

11. Hamunyela, M., & Kanyimba, A. (2020). Early childhood education and care in Namibia: Challenges and prospects. *Namibian Educational Journal, 3*(2), 45–60.

12. Hannibal, M. A. Z., & Clements, D. H. (2000). Young children's development of spatial thinking in geometric contexts. *Teaching Children Mathematics, 6*(8), 505–511.

13. Hirsh-Pasek, K., Zosh, J. M., Golinkoff, R. M., Gray, J. H., Robb, M. B., & Kaufman, J. (2020). Putting education in "educational" apps: Lessons from the science of learning. *Psychological Science in the Public Interest, 21*(1), 3–34. https://doi.org/10.1177/1529100620912895

14. Howard, J., & McInnes, K. (2013). The impact of children's perception of play on academic achievement. *Early Child Development and Care, 183*(7), 915–927. https://doi.org/10.1080/03004430.2012.755586

15. Hujala, E., Turja, L., Gaspar, M. F., Veisson, M., & Waniganayake, M. (2016). *Early childhood education and care policy in Finland*. Springer. https://doi.org/10.1007/978-94-024-0927-7

16. Kakuru, D. M., Oonyu, J. C., & Kiguli-Malwadde, E. (2020). Pedagogical practices in early childhood education in Uganda: Challenges and opportunities. *African Journal of Teacher Education, 9*(2), 1–15.

17. Kavena, L. (2019). Teacher perspectives on learner-centred education in Namibian primary schools. *Namibian Journal of Education Research, 2*(1), 56–67.

18. Mahadew, A., & Amin, N. (2025). South African teachers' perspectives on play pedagogy in early childhood care and education. *Journal of Educational Research on Children, Parents and Teacher, 6*(2), 80–95.

19. Marope, P. T. M. (2017). *Education in Africa: The urgent need for systemic change*. International Bureau of Education–UNESCO.

20. Ministry of Education, Arts and Culture. (2016). *The national curriculum for basic education*. National Institute for Educational Development. https://www.nied.edu.na/assets/documents/05Policies/NationalCurriculumGuide/National_Curriculum_Basic_Education_2016

21. Ministry of Education, Arts and Culture. (2023). *Mathematics syllabus grades 1–3: English version*. National Institute for Educational Development (NIED).

22. Nampijja, M., et al. (2024). Play-based pedagogies for early learners in the African context: A scoping review. *African Journal of Education, Science and Technology, 7*(4), 173–190. https://doi.org/10.2022/ajest.v7i4.1034

23. National Association for the Education of Young Children. (2020). *Developmentally appropriate practice in early childhood programs serving children from birth through age 8* (4th ed.). NAEYC.

24. Ndabezitha, L. B., & Gravett, S. (2024). Guided play as a pedagogical tool for the early grades. *South African Journal of Childhood Education, 14*(1), a1345. https://doi.org/10.4102/sajce.v14i1.1345

25. Ng, S. F. (2020). Play-based learning in Singapore early childhood mathematics classrooms. *Asia-Pacific Journal of Research in Early Childhood Education, 14*(3), 65–83. https://doi.org/10.17206/apjrece.2020.14.3.65

26. Nicolopoulou, A., Cortina, K. S., Ilgaz, H., & Sammons, P. (2010). Using play to promote literacy and mathematical skills in disadvantaged preschoolers. *Early Education and Development, 21*(3), 371–403.

27. Papic, M., Mulligan, J., & Mitchelmore, M. (2011). Assessing the development of patterning in early childhood. *Australasian Journal of Early Childhood, 36*(3), 24–30. https://doi.org/10.1177/183693911103600304

28. Petersen, L., & McClelland, M. (2020). Play-based learning in early childhood education. *Early Childhood Research Quarterly, 52*, 37–49. https://doi.org/10.1016/j.ecresq.2019.10.001

29. Piaget, J. (1952). *The origins of intelligence in children*. International Universities Press.

30. Piaget, J. (1964). Development and learning. *Journal of Research in Science Teaching, 2*(3), 176–186.

31. Piper, B., Destefano, J., Kinyanjui, E. M., & Ong'ele, S. (2018). Scaling up successfully. *Journal of Educational Change, 19*(3), 293–321. https://doi.org/10.1007/s10833-018-9325-4

32. Pyle, A., & Danniels, E. (2017). A continuum of play-based learning. *Early Education and Development, 28*(3), 274–289. https://doi.org/10.1080/10409289.2016.1220771

33. Pyle, A., DeLuca, C., & Danniels, E. (2017). A scoping review of research on play-based pedagogies. *Review of Education, 5*(3), 311–351. https://doi.org/10.1002/rev3.3097

34. Sarama, J., & Clements, D. H. (2009). *Early childhood mathematics education research*. Routledge.

35. Selepe, M. A., & Mphahlele, R. S. (2025). Integrating Africanised play into digital learning of mathematics in the foundation phase. *Journal of Research and Advances in Mathematics Education, 10*(2), 90–100. https://doi.org/10.23917/jramathedu.v10i2.6342

36. Selepe, M. A., Mofokeng, M. M., & Hadebe-Ndlovu, B. N. (2024). Implementing play pedagogies within rural early childhood development centres: Practitioners' views. *South African Journal of Childhood Education, 14*(1), a1387. https://doi.org/10.4102/sajce.v14i1.1387

37. Shiel, G., Cregan, Á., McGough, A., & Archer, P. (2016). *Improving early literacy and numeracy*. Educational Research Centre.

38. UNESCO. (2017). *Education for sustainable development goals: Learning objectives*. UNESCO.

39. UNESCO. (2020). *Education for sustainable development: A roadmap*. UNESCO.

40. UNESCO. (2021). *Reimagining our futures together*. UNESCO Publishing.

41. Van der Walt, M., & Maree, J. G. (2021). Enhancing numeracy skills in rural South Africa through traditional games. *South African Journal of Education, 41*(1), 1–12. https://doi.org/10.15700/saje.v41n1a1836

42. Van Oers, B. (2010). Emergent mathematical thinking in the context of play. *Educational Studies in Mathematics, 74*(1), 23–37. https://doi.org/10.1007/s10649-010-9237-x

43. Vygotsky, L. S. (1978). *Mind in society*. Harvard University Press.

44. Walsh, G., McGuinness, C., & Sproule, L. (2019). It's teaching … but not as we know it. *Early Child Development and Care, 189*(7), 1162–1173. https://doi.org/10.1080/03004430.2017.1369977

45. Weisberg, D. S., Hirsh-Pasek, K., & Golinkoff, R. M. (2016). Guided play. *Mind, Brain, and Education, 10*(3), 142–152. https://doi.org/10.1111/mbe.12124

46. Wood, E. (2014). Free choice and free play in early childhood education. *International Journal of Early Years Education, 22*(1), 4–18. https://doi.org/10.1080/09669760.2013.830562

47. Zosh, J. M., Hopkins, E. J., Jensen, H., Liu, C., Neale, D., Hirsh-Pasek, K., & Whitebread, D. (2018). *Learning through play: A review of the evidence*. LEGO Foundation.