

## The Viability of Play in Teaching Number Sense to Grade 3 Learners

Selepe Mmakgabo Angelinah<sup>1</sup>, Mphahlele Ramashego Shila<sup>2</sup>

<sup>1</sup>University of Free State, South Africa, <sup>2</sup>University of South Africa, South Africa

[selepema@ufs.ac.za](mailto:selepema@ufs.ac.za), [emphahrs@unisa.ac.za](mailto:emphahrs@unisa.ac.za)

*Abstract: Play is one of the most widely used teaching strategies in Foundation Phase. Grade 3 is the exit grade off the Foundation Phase in the South African context. This paper is an output of a Masters' dissertation that explored the use of play when teaching number sense to Grade 3 learners. The dissertation findings encouraged the researchers to explore the viability of play when teaching number sense. The theoretical underpinning of this study was based on Vygotsky's theory of social development and Gardner's theory of multiple intelligence because they both emphasize the importance of play in enhancing social interaction between learners and educators. We used semi-structured interviews, document analysis and non-participant observation to collect data from six Grade 3 teachers from three primary schools in the Capricorn South District's Lebopo Circuit of Limpopo Province in South Africa. The results of this study show that educators lack clear guidelines on how to integrate play in number sense education, from planning to presentation to assessment. Educators need guidelines on how to use play to teach number sense and to be effective. They require curriculum workshops to show them how to use low-cost materials but high quality in lesson preparation. They can play Indigenous games since they require resources that are found in nature.*

### INTRODUCTION

Number sense is a key notion in early mathematics learning in Foundation Phase (Jordan, Kaplan, Ramineni & Locuniak, 2009) The (Department of Basic Education, 2011) states that Grade 3 learners should leave FP with a secure number sense. Since number sense develops over time through opportunities to explore and play with numbers, educators can use a variety of pedagogies to teach number awareness in FP Learning through play is one of the pedagogies. When teaching learners mathematics in the FP, the Curriculum Assessment and Policy Statement (CAPS) recommends a play-based pedagogy to educators. The use of play-based pedagogy in the classroom has the potential to improve and strengthen children's learning (Zosh, Hopking, Jensen, Liu, Neale, Hirsh-Paseek, Solis & Whitebread, 2017).

In FP, play-based learning strengthens young learners' foundational knowledge, allowing them to achieve math and language proficiency in Grade 12 (UNICEF, 2018). To teach number sense to Grade 3 learners, educators should employ a play-based strategy. Play is an important aspect of FP because it helps young children develop cognitive, physical, social, and emotional skills.

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Most learning theories, such as theory of social development (Vygotsky, 1978) and theory of multiple intelligence (Gardner, 2000), promote the use of play in educating young learners.

These two philosophies both emphasize the importance of the educator in the use of play. The role of the educator as a more knowledgeable other (MKO) when using play in the teaching of number sense, is central to Vygotsky's theory. In addition, the relationship between play and social interaction is also vital. Gardner's theory of multiple intelligence advocates the use of play to help young learners improve their logical-mathematical skills in real-world situations (Rosli & Lin, 2018).

The purpose of this article was to present data from a study on the use of play in teaching number sense to Grade 3 learners. The following objectives were established:

- To understand the role of play in teaching number sense to Grade 3 learners
- To establish how play can be used to teach number sense to Grade 3 learners
- To identify types of play that can help to teach number sense to Grade 3 learners
- To recommend guidelines on the use of play when teaching number sense to Grade 3 learners

In 2015, the South African curriculum included the use of play in educating learners in FP. CAPS determined that play should be used as a teaching strategy by FP educators (Department of Basic Education, 2011). The new mathematical curriculum in Grade 3 emphasizes the importance of covering the following five core areas: (i) number, operations, and relationships; (ii) patterns, functions, and algebra; (iii) space and shape; (iv) measurement; and (v) data processing.

The core content area in Grade 3 is number sense, which is generated from numbers, operations, and relationships. In Grade 3, this curriculum area accounts for 58% of the content. If educators can effectively teach number sense in a way that learners comprehend, most learners will be able to pass mathematics. According to (Jordan et al., 2010), number sense contributes to other mathematical curriculum areas in Grade 3.

### **Theoretical Framework**

The framework for this study was built on two theories: Vygotsky's social development theory and Gardner's multiple intelligence. These two theories underpinned the major goal of this study – understanding the use of play in teaching number sense to Grade 3 learners. The theoretical framework and literature evaluation are critical since they provide the foundation for data analysis and recommendations.

The employment of Vygotsky's social development theory in this study was also inspired by (Walshaw, 2017) postulated that mathematical development, in Vygotskian understanding, is conceptualized as a process involving participation, communication, inclusiveness, instructiveness, collaboration and situatedness. (Rosli & Lin, 2018) emphasized the relationship between play and social interaction in the teaching of number sense, noting that parent's

participation can promote socialization during play. Regarding Gardner's multiple intelligences, Rosita Dewi Nur, Herman & Mariyana (2019) highlighted that logical-mathematical intelligence equips FP learners with the ability to handle numbers and calculations, patterns, and logical and scientific thinking.

The promotion of social interaction during play is a crucial aspect linking Vygotsky's social development and Gardner's multiple intelligences theories. Both theories emphasize the importance of social interaction through the MKO's role in developing logical-mathematical intelligence. In this study, the link is strengthened using play by the educator to promote social interaction and expand logical-mathematical intelligence. When an educator expands logical-mathematical intelligence while teaching number sense, learner engagement is fostered. Social interaction flourishes when learners are engaged in the activity and participate actively by asking and answering questions.

## LITERATURE REVIEW

To gain an understanding of the existing research and debates relevant to the use of play in teaching number sense to Grade 3 learners and to identify knowledge gaps, the objectives mentioned in the introductory section were used to review the related literature.

### The role of play in teaching number sense

The role of play in teaching number sense discussed in the literature is the promotion of socialization. Björklund, Magnusson & Palmér (2018) conducted a study in Sweden that concluded that educators should not focus only on pre-prepared activities but spontaneously improvise and invent new activities that employ play to promote socialization. Similar results were found by Dele-Ajayi, Strachan, Pickard, and Sanderson (2019) who explored how the Speedy Rocket game contributed to socialization in rural Ado-Ekiti, Nigeria. In addition, Omidirile, Ayob, Mampane, and Sefotho (2018) found that playing with hula hoops, bean bags, cones, different colours and sizes of shapes and blocks, and flashcards with numbers strengthens learners' group work, performance, class participation and social skills. The second role was to increase learners' logical-mathematical intelligence as per Vogt, Hauser, Stebler, Rechsteiner, and Urech (2018)'s study which stressed the use of play in the form of card and board games.

### The use of play when teaching number sense

The related literature reviewed for this study revealed that the use of play in mathematics teaching aligns with different contexts such as culture, communication, and socialization. Tsindoli, Ongeti & Chang (2018) taught number sense through an Indigenous game called Kora which improved learners' social contact. Kora is Kenya's indigenous game which played with pieces of broken pottery or stones. In this game, stones are collected in the palm then thrown into the air. The main purpose is that more than one of the stones thrown into the air must come to rest on the back of the hand.

Scholars like (Sharma, 2017) and (Dicker & Naude, 2019) demonstrated that the main role of play in teaching number sense to Grade 3 learners is socialization. In this study, the use of play as guided Gardner's idea of multiple intelligences promotes logical-mathematical intelligence. The researchers found that there is a significant relationship between the role of play in socialization and the use of play in teaching mathematics.

### **Types of play that can help to teach number sense**

A discussion of several types of play that can be used to teach number sense concluded the literature review of this study. Dicker and Naude (2019) identified four types of play: Physical play, construction, exploratory play, creative play, and wordplay

- Physical play.

According to (Wonderly, 2017) physical play involves all kinds of physical movements including locomotor and non-locomotor movements. Physical play can be played indoors or outdoors.

- Construction play

(Reikerås, 2020) describe construction play as the type of play which learners usually use building blocks such as wood and bricks.

- Exploratory play

Exploratory play is described by (Dicker & Naude, 2019) as the kind of play that allows learners to explore the possibilities of unfamiliar things by experiment with tools and toys.

- Wordplay

When learners engage in wordplay, they label items according to their appropriate number-words. In this play learners should recognize various quantities labelled with the same number word and other quantities with other number words, they develop the skill of counting (Dicker & Naude, 2019).

Dicker and Naude (2019) explained that these types of play could increase social interaction in the teaching of number sense to Grade 3 learners. All four types of plays can be played both indoors and outdoors. Bose and Seetso (2016) investigated physical play and found that there is a link between physical play and socialization. Physical play includes Indigenous activities that does not necessitate the use of expensive mathematics equipment, which is often lacking in rural schools (Bose & Seetso, 2016). They can also aid in the child development (Omidire et al., 2018).

There is a connection between the MKO's role and construction play. According to Mntunjani et al., (2018), the MKO's role is to guide construction play, which enhances socialization. When learners build with blocks, they interact and communicate with one another. There is a connection between the MKO and exploratory play. According to Sharma (2017), in exploratory play, the MKO's role is to provide a safe, secure, and challenging mathematics environment that will pique learners' interest.

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The MKO's purpose in creative play is to aid in the development of logical-mathematical intelligence by providing learners with a variety of engaging materials (Wilmot et al., 2015) and by creating an enticing atmosphere (Sharma, 2017). Even if a teacher does not have a wide range of resources, they can design a creative environment in any situation. Finally, wordplay in the classroom promotes socialization (Frye et al., 2013). These tools, which are used in this form of wordplay, can be made by the educator using flashcards and worksheets. After the learner learns the distinction between more and less, they can play creative games.

## METHOD

Researchers employed an interpretive case study design to explore Grade 3 educators' perspectives, perceptions, and observations during the use of play in teaching number sense to Grade 3 learners. Elbardan et al., (2017) and Ponelis (2015) explained that interpretive case study researchers collect data on their own and interact with participants to investigate and comprehend a phenomenon. According to Elbardan et al., (2017), when interpretive case study researchers collect data on their own, it allows them to interact more intimately with participants and dig deeper into difficulties. This entails close conversations with participants to learn more about a phenomenon rather than making assumptions. In this study, the researchers focused on educators' perspectives and perceptions when they use play in the classroom, according to an interpretive case study.

The purpose of this study, which was to understand the use of play in teaching number sense to Grade 3 learners from the perspective of Grade 3 educators, supports the use of an interpretive case study. The research was guided by the following questions.

### Research questions

To aid in the selection of acceptable research methodologies, the following study questions were established:

The central question in this study asks:

- What role does play perform in teaching number sense to Grade 3 learners?

Sub-questions

- How can play be used to teach number sense to Grade 3 learners?
- What types of play can help to teach number sense to Grade 3 learners?
- What guidelines do educators follow when integrating play in the teaching of number sense?

### Study site and sample

Three public primary schools were selected from the Capricorn South District's Lebopo Circuit, with Polokwane City as their metropolitan center. For anonymity, the schools were named Schools



1, 2 and 3 according to the sequence in which they were visited. Classrooms were labelled Classroom 1 to 6. Two educators were purposively sampled from each of the three schools based on their level of expertise in teaching mathematics in Grade 3, work experience of two or more years, and qualifications in teaching mathematics in the FP.

### Data collection methods

Educators' perspectives and experiences of using play in teaching number sense to Grade 3 students were gathered through semi-structured interviews. The researchers also used document analysis to corroborate educators' responses from the semi-structured interviews and, to triangulate the data, the researchers used non-participant observation to attempt to provide “a confluence of evidence that breeds credibility” (Eisner, 2017). The data collection tools (interview schedule, document analysis tool and observation schedule are included in this paper as Appendices A, B and C respectively). For anonymity, as recommended by Chimentão and reis (2019) participants were given pseudonyms according to their school and teaching experience. An educator with the least years of experience (3 years) was labelled Teacher 1 and was from School 3. The pseudonym was S3E1. The second teacher with four years' experience from School 2 was named S2E2. The third one was from School 1 with five years' experience and was named S1E3. The fourth educator from School 1 with 10 years' experience was named S1E4. The fifth educator with 16 years' experience was from School 2 and was named S2E5. The last educator with 36 years' experience was from School 3 and was named S3E6.

### Data analysis

Data from interviews was accessible in audio format and was transcribed before analysis by a professional transcriber. When all datasets were in text format, they were organized according to the schools. The researchers began by manually coding data, then converting it to pdf format and entering it into <sup>1</sup>Atlas.ti, where it was re-coded electronically. The codes were produced using keywords from the interview questions that corresponded to some of the research questions' keywords. For reliability, the data was co-coded by the two researchers who compared the codes for similarities and differences. Atlas.ti was used to generate categories based on the theoretical framework that underpins this research. The researcher created data analysis outputs such as tables, networks, word clouds, and word lists using the codes, categories, and derived themes. These outputs were used to portray the data following the themes that were created in response to the research questions.

### Ethical considerations

Ethical clearance was obtained from UNISA College of Education Research Ethics Committee (Ethical reference number: 2020/10/14/64019209/07/AM). During data collection, the applicable UNISA Covid-19 rules as well as other ethical considerations were upheld. Permission was also requested from the Limpopo Department of Education. Parents were also provided consent letters

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<sup>1</sup> Atlas.ti is a computer-aided qualitative data analysis software that analyses textual, graphical, and multimedia formats including rich text format documents, Word documents, most picture formats, most sound formats and most digital video formats, as well as PDF documents (Archer, Janse Van Vuuren & van Der Walt, (2017).

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to allow researchers to conduct observations in the classrooms in the presence of their children. Potential participants were given ample opportunity to read and comprehend the information sheet before signing consent to participate in the study.

## RESULTS

Results for this study are presented under four categories, namely: the use of play when teaching number sense, lesson preparations, the role of play when teaching number sense and types of play suitable for teaching number sense.

### The use of play when teaching number sense

The first interview question aimed at getting educators' views on the use of play in the teaching of number sense. Three participants said that play was an important method for teaching number sense. Play, according to S1E4, was a tool that is used to enhance learner-centredness. S1E3 clarified that play was used to increase interaction between peers as well as between the educator and the learners.

The second question asked how educators used play when teaching number sense. Educators explained that different types of games were used to educate number sense. Indoor and outdoor games were covered. S3E1 explained that the Covid-19 pandemic was one of the problems in using play to teach number sense to Grade 3 learners. S3E1 went on to say that she preferred outdoor games since she could follow the Covid-19 guidelines. She stated:

*“I use games, such as snakes and ladders, but it is now difficult because we have to adhere to Covid-19 regulations, and it needs a die and board with numbers, and it will help them in counting.”* (S3E1)

Aside from Covid-19, another issue identified in the use of play in teaching Grade 3 learners number sense was a lack of resources. Due to a lack of teaching and learning tools, educators explained that engaging in various types of play in teaching number sense was difficult. S3E6 highlighted that to create hand-made resources, instructors must be creative. She expressed her feelings by saying:

*“The schools in rural areas are disadvantaged because they do not have resources to participate in other play. Nevertheless, as creative educators, we create our games from boards. I always use outdoor games, for example, the game called “back-to-nought”, which helps learners in counting.”* (S3E6)

Observations from Classroom 1 verified the scarcity of mathematical materials. To teach number awareness, S1E4 used a card game. S1E4 echoed what S3E6 suggested during conversations about innovation. S1E4 made cards out of cardboard that the learners decorated with watercolours. During mental math, the game was used in teaching the lesson. The learners were divided into six players per team. Each team was given a card and was asked to round the number on the card to the nearest tens. For example, if the card said 3, the learners had to round 3 to the nearest tens.

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Since 3 is less than 5 then it becomes 0. ( $3=0$ ). The team's monitor ensured that all players were participating.

With the observation from Classroom 6, the researcher confirmed the ideas expressed by S3E6 during the interview sessions. To teach learners counting, S3E6 used an outdoor game called 'back-to-nought'. The game was contested by two teams, each with four players. Because S3E6 used a ball manufactured from recycled plastic bags, the issue of insufficient mathematical resources was recognised in Classroom 6. Team 1 threw a ball at each other while Team 2 players ran to the spot in each small square while counting from 1 and avoiding being beaten by the opposite team's ball. If a player miscounted, they would start counting from zero. The winner would be the first learner to count to 30 without miscounting and being beaten by the ball. If the defenders tagged an attacker with the ball, that player was out. The educator used group assessment to allocate the teams' grades according to the points won from the play. The problem of Covid-19 was realised during the game because it was tough for learners to follow the rules of social distancing. The learners enjoyed the lesson and the play, and they did not focus on the fact that they are being assessed through the play

### Lesson preparations

During the interviews, when educators responded to the fourth question which asked them if they included play in their lesson preparation, they highlighted that they did not know how to incorporate it. An educator from School 1 explained that the lesson template did not allow for the incorporation of play. Other participants agreed that play was occasionally employed in the classroom. S3E1 stated:

*“When planning, no. I just involve it when I am busy teaching, maybe if I have a difficult word, learners will not understand, I switch to the play.”*

The issue of a lack of mathematical resources was brought up again by educators, who stated that it had a detrimental impact on planning of play activities. S3E6 said that one of the reasons she did not include play in her lesson plan was a lack of resources. S1E4 attributed the effectiveness of play to the fact that she always included it in her preparation.

*“Since the lesson plan template does has provision to include play, I write it in the lesson presentation section of the lesson plan” (S1E4)*

In responding to the fifth question, the educators emphasized that they did not include play in lesson preparation, which affected the lesson presentations, and assessments. Three educators (S1E4, S1E3, and S3E6) indicated they did not always follow their lesson plans, whereas the other three educators (S2E2, S2E5, and S3E1) said they always did. When the researchers checked their responses to the first question, educators clarified that they used play as an intervention strategy rather than a teaching strategy. S1E3 verified this by saying:

*“Remember if you are teaching, then you are active with your learners and then you see that your learner is not participating, they don't understand something, you sometimes go out and include some play or something to help learners.”*



S3E1 described how incorporating play into the lesson preparations might help with time management and the development of mathematics skills for learners because of the learners' participation and concentration. She gave an example of playing diketo<sup>2</sup> where she explained that she groups the learners into groups of four and allocates 2 minutes for each player to collect as many stones from the play as possible. But if the player makes the mistake of dropping the throwing stone (gho/mokinto) before 2 minutes is over, he/she forfeits the remaining time. In this play, learners learn how to manage time while adding the number of stones to win points.

The classroom observations corroborated what the educators shared during the interviews because the researchers saw that three educators did not adhere to their lesson preparations and used play without preparation. The first two classrooms observed demonstrated the difficulty in time management because of not including play in the lesson preparation but instead using it as an intervention strategy. One example was when learners had difficulty understanding number patterns. In Schools 1 and 2, S1E4 and S2E2 were used to play as an intervention strategy to elaborate patterns. During the follow-up conversation after the classroom observations, all educators agreed that play should be included in lesson preparation to save time.

The document analysis revealed that three educators (S2E5, S3E1, and S3E6) included play in their lesson plan template without being aware that they had included it. That might have been caused by copying and pasting previous lesson plans done by other educators. S2E5's lesson plan, for example, detailed how the game was played as well as its goals and objectives.

### **The role of play when teaching number sense**

The second and eighth interview questions aimed to gather the views of educators on the role and purpose of play in the teaching number sense. The role of play in teaching number sense, according to S2E2 and S3E6, is to increase learners' participation. S3E5 added that play can also be used as a differentiated teaching technique since it allows students with mathematical learning difficulties to participate.

*"It increases participation in the lesson and motivates learners, especially weak learners or underperforming learners."* (S3E6).

*"Play makes the learners so much active and interested in the lesson, every one of them will want to participate, even those that are slow."* (S2E2).

The researchers designed a word-cloud (Figure 1) to present the words used to describe the role of play when teaching number sense.

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<sup>2</sup> Diketo is a South African indigenous game played by two or more players using stones, pebbles or marbles. The player throws a stone called "mokinto" into the air and then tries to take out as many stones as possible from the circle before they catch it again with the same hand. Then they put the stones back into the hole one stone at a time, until all ten stones are back in the hole. The player can only move a stone while the "gho"/"mokinto" is in the air and before catching it again with the same hand.



When conducting classroom observations, the researchers witnessed the following types of physical play:

- Tsheretshere – is a South African Indigenous game in which children play by throwing a flat stone which they push with one foot from one box to another while balancing on one leg. Sometimes instead of rectangular boxes, they use circles, which helps learners develop a sense of shapes. The counting system is developed every time a player plays since they must remember where they ended and where to start the next time. The concepts of mass, weight and balancing are also perfected in the process.
- Kgati – is also a South African Indigenous game played by three or more players. Two hold the skipping rope at the ends and they swing it in circular motions while one or more players skip in the middle counting. This game teaches learners how to break numbers into hundreds, tens, and units.

The document analysis revealed that some of the lesson plans showed only physical and outdoor play.

The following section discusses these results thematically in relation to the theoretical framework.

## DISCUSSION

This study explored the viability of play in teaching number sense to Grade 3 learners. The findings were discussed thematically using four themes that were formed from the theoretical framework and the categories.

### **Theme 1: Teaching number sense through play**

Teaching number sense through play improves social interaction according to (Rosli & Lin, 2018). They added that play could effectively strengthen the interaction between parents and educators. Based on the findings presented in the previous section, teaching number sense through play helps learners with varying levels of logical-mathematical intelligence, (such as identifying, reasoning, and thinking logically) as well as those who have difficulty learning mathematics. According to S2E2, play helps learners understand number sense. Considering this, the researchers conclude that teaching number sense through play benefits learners with various levels of logical-mathematical competence.

### **Theme 2: Enhancing social interaction through play**

The review of the related literature conducted on the usage of play in several regions, including Europe, Africa, and South Africa revealed a substantial link between the usage of play and social interaction. According to Dele-Ajayi et al., (2019), using games to teach mathematical concepts enhances socialization. As a result, this research asked: how can play be used to teach number sense to Grade 3 learners? It was emphasized that the role of play in the teaching of number sense is to promote social interaction (Wium & Louw, 2015). Tsindoli et al., (2018) argue that culture

(Indigenous games) can be used to teach number sense. They also recommended that educators (MKO) provide supervision in play to improve social interaction.

This study found that educators recognised their roles in using play to improve social interaction in the teaching of number sense. For example, during the classroom observations, S2E5 meticulously introduced a skipping rope game with clear rules, goals, and objectives. Play, according to educators, is learner-centred because learners can engage and share different roles while learning.

Although some of the educators did not integrate play into their lesson plans, according to data from document analysis, they used play as an intervention strategy and to enhance opportunities for social engagement, which aids in the teaching and learning of number sense.

### **Theme 3: Guidelines for integrating play in teaching number sense**

Vygotsky's concepts of the Zone of Proximal Development (ZPD) and the MKO, according to Abtahi (2017), "have been interpreted and re-interpreted in the field of mathematics education at various degrees of depth". In this study, the MKO in this study was viewed as the educator who would integrate play into the teaching of number sense to Grade 3 learners. The findings presented in the previous sections uncovered the non-inclusion of play in lesson planning and the use of play as an intervention strategy than integrating it in the lesson activities. During the interviews, the researchers gathered that there were no guidelines for educators to integrate play into their mathematics teaching and learning activities. Guidelines are imperative for the creation of a practical and ethical framework for decision-making because they instill a sense of responsibility and accountability.

### **Theme 4: Types of play enhancing Logical-Mathematical Intelligence**

Dicker and Naude (2019), Gordon and Browne (2011), Rosli and Lin (2018), and Woolfolk (2014) found that diverse types of play improve logical-mathematical intelligence, which aids in number sense learning. Educators in the selected schools employed mainly musical, wordplay and physical play to enhance learners' logical-mathematical intelligence. The most used type of play was physical. Physical play in mathematics, according to S3E6 and Omidire et al., (2018), can also be used to build gross motor skills.

Indigenous games such as singing songs, 'Tsheretshere', skipping rope, and 'back-to-nought' were recognised as types of play that might enhance logical-mathematical intelligence. Tsindoli et al., (2018) explained that Indigenous games could potentially be used to spread logical-mathematical intelligence. These types of games can help learners gain number sense by assisting them with comparing numbers, counting forward and backwards, and identifying numerical patterns.

This study found that varied types of play are important in the development of Grade 3 learners to enhance perceptual skills (integrated with Life Skills) while wordplay increases communication skills (when combined with the home language). These findings advocate the use of various types of play not only to enhance logical-mathematical intelligence but also to promote social interaction.

## CONCLUSIONS

The South African curriculum (CAPS) recommends that educators use play to teach mathematics in the FP. Since number sense is most important for learners to understand numbers and number relationships and to solve mathematical problems, it is imperative for educators to make it fun and easy by using play. This study's findings revealed that Grade 3 educators have no clear guidelines for using play in teaching number sense. The researchers recommend the guidelines that include the following:

- Linking play with the learning outcomes.
- Integrating play into learning.
- Incorporate play in the assessment activities.

The researchers recommend that curriculum workshops should be conducted which will empower Grade 3 educators on how to include play-based approaches in lesson planning. This paper further recommends that if educators do not have access to resources provided by the DBE, they can find play resources in their immediate environment or create their own using recycled material.

This study was conducted in one circuit in the Limpopo province's Capricorn South district. Only six Grade 3 female educators with three to thirty-six years' experience ranging took part in the study, which limited the scope and applicability of the findings to the rest of the province. Nonetheless, the recommendations may be applicable to the rest of the province and other similar areas. For future research, the researchers suggest a longitudinal study that will explore the role of play in the creation of independence of learning and improvement of learner performance. Independence of learning is described by Prabhu (2006) as learning that occurs in practice where learners learn independently.

## REFERENCES

- [1] Jordan, N. C., Glutting, J., & Ramineni, C. (2010). The importance of number sense to mathematics achievement in first and third grades. *Learning and Individual Differences*, 20(2), 82–88. <https://doi.org/10.1016/j.lindif.2009.07.004>
- [2] Department of Basic Education. (2011). *Curriculum Assessment Policy Statement (CAPS): Mathematics Grade R-3*.
- [3] Zosh, J. M., Hopkins, E. J., & Neale, D. (2017). *Learning through play: a review of the evidence*. <https://doi.org/10.13140/RG.2.2.16823.01447>
- [4] UNICEF. (2018). *Learning through play Strengthening learning through play in early childhood education programmes in support of 2 Learning through play Strengthening learning through play in early childhood education programmes*. [www.unicef.org/publications](http://www.unicef.org/publications)



- [5] Vygotsky, L. (1978). *Mind in society: The development of the higher psychological process*. Harvard University Press.
- [6] Gardner, H. (2000). *Intelligence reframed: Multiple intelligences for the 21st century*. Basic Books.
- [7] Rosli, R., & Lin, T. W. (2018). Children Early Mathematics Development Based on a Free Play Activity. *Creative Education*, 09(07), 1174–1185. <https://doi.org/10.4236/ce.2018.97087>
- [8] Walshaw, M. (2017). Understanding mathematical development through Vygotsky. *Research in Mathematics Education*, 19(3), 293–309. <https://doi.org/10.1080/14794802.2017.1379728>
- [9] Rosita Dewi Nur, I., Herman, T., & Mariyana, R. (2019). Logical-Mathematics Intelligence in Early Childhood. *International Journal of Social Science and Humanity*, 105–109. <https://doi.org/10.18178/ijssh.2018.V8.944>
- [10] Björklund, C., Magnusson, M., & Palmér, H. (2018). Teachers' involvement in children's mathematizing—beyond dichotomization between play and teaching. *European Early Childhood Education Research Journal*, 26(4), 469–480. <https://doi.org/10.1080/1350293X.2018.1487162>
- [11] Dele-Ajayi, O., Strachan, R., Pickard, A. J., & Sanderson, J. J. (2019). Games for Teaching Mathematics in Nigeria: What Happens to Pupils' Engagement and Traditional Classroom Dynamics? *IEEE Access*, 7, 53248–53261. <https://doi.org/10.1109/ACCESS.2019.2912359>
- [12] Omidire, M. F., Ayob, S., Mampane, R. M., & Sefotho, M. M. (2018). Using structured movement educational activities to teach mathematics and language concepts to preschoolers. *South African Journal of Childhood Education*, 8(1). <https://doi.org/10.4102/sajce.v8i1.513>
- [13] Vogt, F., Hauser, B., Stebler, R., Rechsteiner, K., & Urech, C. (2018). Learning through play—pedagogy and learning outcomes in early childhood mathematics. *European Early Childhood Education Research Journal*, 26(4), 589–603. <https://doi.org/10.1080/1350293X.2018.1487160>
- [14] Tsindoli, S., Ongeti, K., & Chang, J. K. (2018). Integration of existing indigenous knowledge within mathematics curriculum for primary schools in Kenya. *International Academic Journal of Social Sciences and Education*, 2(1), 74–87. [http://www.iajournals.org/articles/iajsse\\_v2\\_i1\\_74\\_87.pdf](http://www.iajournals.org/articles/iajsse_v2_i1_74_87.pdf)
- [15] Sharma, A. (2017). Learning and consumer socialisation in children. In A. Gbadamosi (Ed.), *Young Consumer Behaviour: A research Companion* (pp. 37–58). Routledge. <https://doi.org/10.4324/9781315213590-3>
- [16] Dicker, A.-M., & Naude, M. (2019). Teaching Mathematics in Grade R: a play-based approach. In M. Naude & C. Meier (Eds.), *Teaching Foundation Phase Mathematics* (Second, pp. 57–83). Van Schaik.

- [17] Wonderly, K. (2017, June). *The importance of physical play in child development*. Hello Motherhood.
- [18] Reikerås, E. (2020). Relations between play skills and mathematical skills in toddlers. *International Journal on Mathematics Education*, 52(4), 703–716. <https://doi.org/10.1007/s11858-020-01141-1>
- [19] Bose, K., & Seetso, G. (2016). Science and mathematics teaching through local games in preschools of Botswana. *South African Journal of Childhood Education*, 6(2), 9. <https://doi.org/10.4102/sajce.v6i2.453>
- [20] Mntunjani, L. M., Adendorff, S. A., & Siyepu, S. W. (2018). Foundation phase teachers' use of manipulatives to teach number concepts: A critical analysis. *South African Journal of Childhood Education*, 8(1). <https://doi.org/10.4102/sajce.v8i1.495>
- [21] Wilmot, D., University, R., & Schäfer, J. (2015). Visual arts and the teaching of the mathematical concepts of shape and space in Grade R classrooms. *South African Journal of Childhood Education / 2015*, 5(1), 63–84.
- [22] Frye, D., Baroody, A. J., Burchinal, M., Carver, S. M., Jordan, N. C., & McDowell, J. (2013). *Teaching math to young children: A practice guide (NCEE 2014-4005)*. <http://whatworks.ed.gov>.
- [23] Elbardan, H., Thman, A. O., & Ashwan Kholeif, R. (2017). *Enterprise Resource Planning, Corporate Governance and Internal Auditing An Institutional Perspective*. Springer Nature.
- [24] Ponelis, S. R. (2015). Using Interpretive Qualitative Case Studies for Exploratory Research in Doctoral Studies: A Case of Information Systems Research in Small and Medium Enterprises. In *International Journal of Doctoral Studies* (Vol. 10). <http://ijds.org/Volume10/IJDSv10p535-550Ponelis0624.pdf>
- [25] Eisner, E. W. (2017). *The enlightened eye: Qualitative inquiry and the enhancement of educational practice*. Macmillan.
- [26] Chimentão, L. K., & Reis, S. (2019). Para além da ética burocrática em pesquisa qualitativa envolvendo seres humanos. *Alfa: Revista de Linguística (São José Do Rio Preto)*, 63(3), 691–710. <https://doi.org/10.1590/1981-5794-1911-9>
- [27] Wium, A.-M., & Louw, B. (2015). The South African national school curriculum: Implications for collaboration between teachers and speech-language therapists working in schools. *South African Journal of Childhood Education*, 5(1), 19–41.
- [28] Abtahi, Y. (2017). The “More Knowledgeable Other”: A Necessity in the Zone of Proximal Development? *For the Learning of Mathematics*, 37(1), 35–39. <https://www.researchgate.net/publication/318780971>
- [29] Gordon, A. M., & Browne, K. W. (2011). *Beginnings & Beyond: Foundations in Early Childhood Education*. Skyline College.

- [30] Woolfolk, A. (2014). *Educational psychology*. Pearson Education.
- [31] Prabhu, V. (2006). Independence of learning. *Mathematics Teaching-Research Journal On-Line*, 1(1), 1–6
- [32] Archer, E., Janse Van Vuuren, H. H., & van der Walt, H. D. (2017). *Basic operations, tips and tricks for coding*. <https://tinyurl.com/zlymgw9>

## APPENDIX A: INTERVIEW SCHEDULE

i. What is your highest qualification?

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ii. How many years have you been a Foundation Phase teacher?

ii. Have you taught any other phase?

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iv. Till what Grade did you do Mathematics in school?

v. Did you experience difficulty in Mathematics at school?

vii. Do you experience difficulty teaching Mathematics? Elaborate.

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1. What are your views about the use of play when teaching number sense?

2. What role does play perform in the teaching of number sense?

3. How do you use play when teaching number sense?

4. Do you use play when planning your lessons?

5. Do you always follow your lesson plan? If no, explain.

6. Do your lessons always go as planned? Explain.

7. What is the purpose of using play when teaching number sense?

8. What is your opinion about teaching number sense to Grade 3 learners? Is it more important than the other concepts? Elaborate.

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## APPENDIX B: DOCUMENT ANALYSIS TOOL

### Document analysis tool

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- Did the educator use play in the planning of the lesson?
  - How did the educator use play when planning the lesson
  - What types of play did the educator use in the lesson plan?
- 
- Did the educator give the learner's task that equivalent to what she/he was teaching about?
  - Did learners score all marks to show that play helped them to understand a concept better?
  - Does the task given in the classwork book similar to workbooks?
  - How did the role of play perform in the teaching of number sense?
-



**APPENDIX C: OBSERVATION SCHEDULE**

Observation question	Yes/No	Comment
Did the educator use the planned lesson?		
Did the educator follow the lesson plan?		
Did the educator use play to teach learners?		
Did the educator use the relevant type of play for the topic?		
Where the role of play in teaching and learning number sense evidently?		
Was social interaction among learners and educators evident?		
Did learners fully participate in play?		