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Utilising LEGO® Six Bricks® to Enhance the Pedagogy of Pre-Service Teachers in South Africa

Tarien Breytenbach, **Elma Marais*, Carolina Botha, Florence Coertzen**
Research Focus Area Community-Based Educational Research (COMBER),
North-West University, South Africa.
*Corresponding Author. Email: elma.marais@nwu.ac.za

Abstract: This study explores the potential of LEGO® Six Bricks®, a manipulative educational tool, to enhance the pedagogical skills of third-year pre-service teachers in South Africa. Employing participatory action learning and action research (PALAR), the study involved six third-year pre-service teachers from North-West University, Potchefstroom Campus. Data was generated using LEGO®-voice, reflective journalling and reflective group conversations during and after school-based teaching practice. Data analysis involved thematic content analysis and inductive analysis using ATLAS.ti 23 software These pre-service teachers not only had to reflect on their own perceptions regarding pedagogy and the role that pedagogy plays in being a teacher, but also on how a manipulative can be utilised as a teaching tool. The findings in this study revealed that LEGO® Six Bricks® positively impacted pedagogical approaches despite challenges such as insufficient support from mentor teachers and resource constraints. This study contributes to the ongoing discourse on bridging the theory-practice gap in teacher education by integrating innovative, play-based learning tools.

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Introduction

Pedagogy, the art and science of teaching, encompasses the methods and practices employed to impart knowledge and skills effectively (Shah, 2020). The educational community increasingly acknowledges that high performance in education systems depends on effective teaching practices in the classroom (Almonacid-Fierro et al., 2023, Opdenakker and Van Damme, 2006). A strong foundation in pedagogy is, therefore, essential to ensure quality education, encompassing both the content taught and the methods used to teach it (Beetham and Sharpe, 2007, Loughran, 2013).

The role of teacher training programmes and specifically school-based teaching practice experiences in pre-service teacher education is, amongst other things, to provide a bridge between theoretical learning and practical application. Pre-service teachers spend a portion of their training in classroom settings, where they can apply pedagogical theories under the supervision and support of mentor teachers (Lawson et al., 2015, NWU, 2019, Perry, 2013). This hands-on experience is crucial for developing practical teaching skills since pre-service teachers can get a foresight of what they can expect within the realities of having their own classroom (Adebola, 2022, Amankwah et al., 2017, Butler and Cuenca, 2012, del Carmen Brenes Carvajal, 2022, Musingafi et al., 2019, Ngidi and Sibaya, 2003, Sharma, 2015, Ulla, 2016). Despite the importance and value of teaching practice, many pre-service teachers consistently report a disconnect between the theoretical knowledge gained in their coursework and implementing the practical skills needed in the classroom (Phillips and

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Condy, 2023, Zeichner, 2010). It seems that many pre-service teachers may understand educational theories in an abstract sense, but struggle to apply them in the concrete and unpredictable classroom environment (Greenway et al., 2019, Salifu, 2016, Mavhunga and van der Merwe, 2020). This results in many pre-service teachers feeling unprepared and overwhelmed when faced with real-world teaching challenges during teaching practice as well as at the onset of their professional careers. This phenomenon, labelled the theory-practice gap, has been a point of critique and contention in teacher training programmes around the world for several decades (Darling-Hammond, 2006, Brandenburg and Wilson, 2013, Botha and Rens, 2019, Atkinson, 2016, del Carmen Brenes Carvajal, 2022, Luchembe, 2021). It has become evident that addressing the challenges around an omnipotent theory-practice gap requires an innovative reconceptualisation of the traditional approaches in teacher training and pedagogy. This study investigated how, through using a manipulate traditionally used as a resource for early childhood education, LEGO® Six Bricks® can be utilised to not only enhance the pedagogy of pre-service teachers, but also directly address the theory-practice gap they experience during school-based teaching practice.

LEGO® Six Bricks®, consists of six coloured bricks (see Figure 1) that is traditionally used in various classroom activities designed to enhance learning and development (Brey, 2017). This tool promotes active engagement, creativity, and collaborative learning, making it a valuable resource to implement play-based pedagogical strategies in their teaching (The LEGO Foundation, 2017).

Figure 1. LEGO® Six Bricks®

LEGO® Six Bricks® activities are designed to develop cognitive and motor skills, perception and tactile discrimination (Hutcheson et al., 2014). The versatility of LEGO® Six Bricks® allows for the design of a wide range of activities that cater to different learning objectives (Kamdar and Patel, 2019). Through activities such as building structures, sorting bricks by colour, and following patterns, students can improve their hand-eye coordination and spatial reasoning abilities.

In addition to cognitive benefits, LEGO® Six Bricks® activities also promote social and emotional development (SA Numeracy Chair Project, 2017). This resource also provides opportunities for differentiated instruction, allowing teachers to tailor activities to meet the diverse needs and abilities of their students. By adapting the complexity and focus of the activities, teachers can ensure that all students are challenged and engaged in meaningful learning experiences. It was evident that this resource could be a valuable tool for pre-service teachers to experiment with during teaching practice, but the value of using this manipulative to enhance their pedagogy and even bridge the theory-practice gap remained unexplored. In an effort to explore this, Usanov and Qayumov's (2020) cultural-historical activity theory (CHAT) was used as theoretical framework.

The CHAT model is based on the work of Vygotsky, an early psychologist, who emphasised the importance of the community in the meaning-making process. This theory is derived from the sociocultural theory (Vygotsky and Cole, 1978), which highlights the concept of distributed communication. Distributed communication refers to how all forms of

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communication entail people cooperating with their surroundings and cultural resources. Distributed communication is based on a recent convergence of the CHAT and communicative practice theories, which propose that language, cognition, and culture narratives should all be combined (Hengst, 2015). Furthermore, the CHAT model is an activity system that is constantly changing (Foot, 2014). Therefore, there are specific components in the CHAT system that are important for it to function efficiently (Brink and Petersen, 2020). These components are the subject, object, rules, tools, community, division of labour, and outcomes (Engestrom et al., 1999). These components of the CHAT system are illustrated in Figure 2.

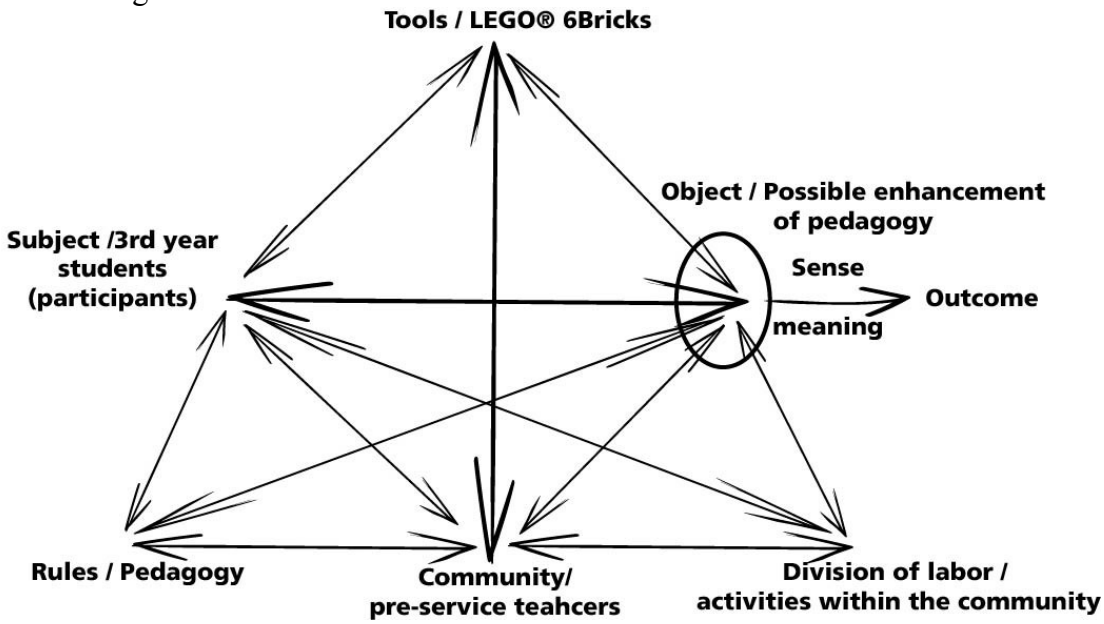

Figure 2. CHAT framework (adapted from (Engeström, 1999)

CHAT was utilised in this study as follows:

Rules – pedagogy

Rules are the tactics or teaching modes of activities, such as student-centred learning (Foot, 2014, Gretschel et al., 2015). There were specific rules the pre-service teachers needed to adhere to, such as how to use LEGO® Six Bricks® effectively in the curriculum, and basic rules for good pedagogical practice. According to Nel, Dieker and Marais (2024) LEGO® Six Bricks® could not only be used as a teaching tool, but also as a tool to plan their lessons and their approach to teaching (pedagogy). According to Melnychuk et al. (2019), perfecting pedagogical skills entails comprehending the importance and productive effectiveness of one's own pedagogical activity, regardless of the content of the disciplines taught, as well as revealing the teacher's creativity and comprehending the meaning of professional development. The rules for this study were the development of pedagogy through a play-based approach.

Community – pre-service teachers

The community is the people who have an interest in, and involvement with, the participants (in this case, pre-service teachers) (Foot, 2014). The communicative relations of the activity can be thought of as the interactions between the subject(s) or participants and the community that engages a shared object (Engeström, 1999). In other words, the community is the broader group in which the participants exist and it is said to have a significant impact on the other components of the activity system (Gretschel et al., 2015). The community of this

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study consisted of all pre-service teachers because they share an interest with the participants in this study.

Division of labour – relationship between the mentor teacher and pre-service teacher

Social organisations in the immediate context are known as the labour (Gretschel et al., 2015). The role of the division of labour is to determine which members of the community use particular tools and which use actions (Foot, 2014). It also determines who is responsible for specific actions when an activity is taking place (Kizito, 2015). Petersen et al. (2020) support Kizito (2015) by agreeing that the division of labour determines who performs specific activities and reflects power imbalances in the community. In this study, the division of labour focused on the collaborative discovery of knowledge.

Subjects – third-year students (participants)

The people who are participating in the activity system that is studied are called the subjects (Gretschel et al., 2015, Kizito, 2015). In this study, the term was adapted for the participants to correlate with the terminology used in the research methods as described under methodology. The participants – in this case, third-year Intermediate Phase pre-service teachers, also known as the participants and the researcher – are the people whose actions are the object of the study. The participants' activities are motivated by the object. The participants are also known as the transformers in the study. Action was lodged by utilising particular tools or artifacts and resulting in a specific outcome (Brink and Petersen, 2020, Petersen et al., 2020). The object was to reach the outcome of the enhancement of pedagogy.

Tool – LEGO® Six Bricks®

The tool, as another component in the activity system, can be either physical or symbolic (Foot, 2014). The tool mediates the activity between the subjects or participants and the object (Kizito, 2015, Foot, 2014, Gretschel et al., 2015). The tool that was utilised in this study was LEGO® Six Bricks®.

Object – possible enhancement of pedagogy

The purpose of the study or the solution to the problem is the object (Gretschel et al., 2015). The object can also be defined as the problem space towards which the participants direct their activity and is always the focus of the study (Kizito, 2015, Foot, 2014, Gretschel et al., 2015). The object of this study was the possible enhancement of pedagogy by utilising LEGO® Six Bricks®.

Sense of meaning and outcome

The sense of meaning focuses on the approach's outcome. The study's aim was to explore how the use of LEGO® Six Bricks® can enhance pedagogy. This entailed constructing meaning from the pre-service teachers' understanding of pedagogy and learning what to do with LEGO® Six Bricks® to adapt or enhance their pedagogy. Constructing meaning focuses not only on the tool, but also on the subjects or participants (voluntary pre-service teachers who participated in the study) and the larger community (pre-service teachers).

Research Method

The study employed participatory action learning and action research (PALAR) as a paradigm and methodology, which involves different planning, action, observation, and reflection cycles. This approach facilitates collaboration between the researcher and participants, fostering a deeper understanding of the research problem and developing practical solutions (Wood et al., 2017). PALAR promotes transformation through collaboration whilst in the process co-creating contextual and relevant knowledge and

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addressing pressing societal issues (Kearney et al., 2013, Wood et al., 2017, Neethling, 2015). The PALAR approach was also suitable as it is collaborative. The PALAR methodology aligns with the cultural-historical activity theory (CHAT), which emphasises the importance of social and cultural contexts in shaping human activity (Engeström, 1999).

Wood (2020) and Zuber-Skerritt (2018) explain that the PALAR approach is cyclical in its implementation. Since each research project has individual characteristics, the process for this study was adapted as illustrated in Figure 3.

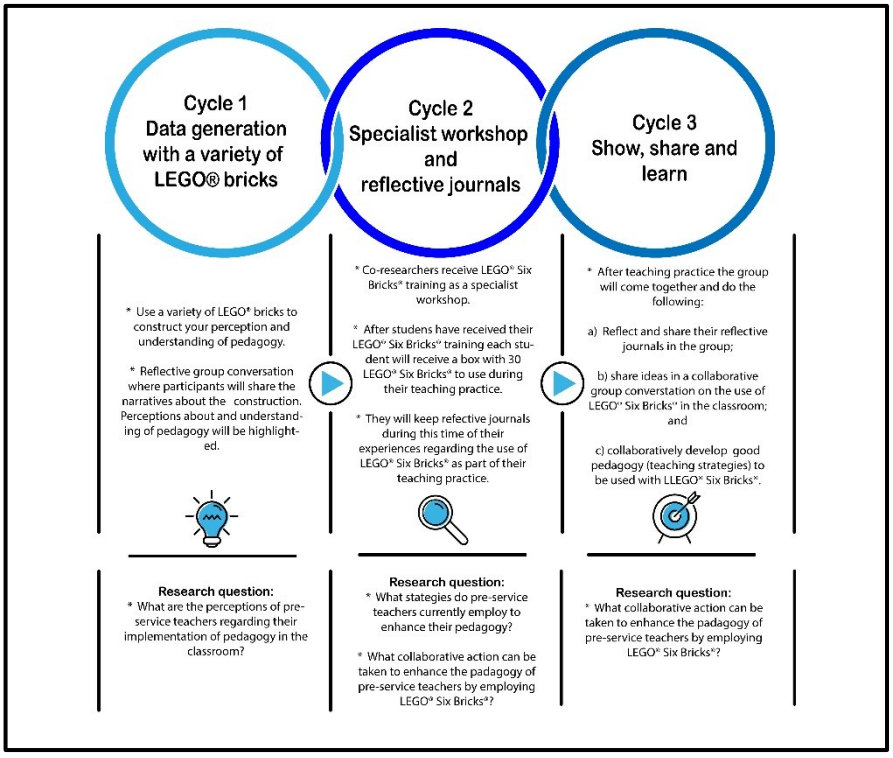

Figure 3. The PALAR process

The participants were six third-year, full-time, pre-service teachers from a prominent public university in South Africa. Ethical approval and permission were obtained from the relevant structures at the university. Data were generated through three primary methods that was implemented through three research cycles during and after school-based teaching practice blocks. LEGO®-voice is an innovative arts-based data generation strategy where participants were invited to construcd LEGO® models (Marais & Botha, 2024) to represent their perceptions and understanding of pedagogy at the onset of the study. The LEGO®-voice activities served as a starting point for critical reflection and discussion. By creating physical representations of their pedagogical beliefs and experiences, participants were able to articulate their thoughts more clearly and engage in meaningful dialogue with their peers. This method also allowed participants to express their ideas creatively and expose them to experimenting with LEGO® Six Bricks® as a teaching resource in their classrooms.

Throughout the various cycles, participants were invited to keep reflective journals during their teaching practice. Participants were encouraged to reflect on specific aspects of their teaching, such as classroom management, their own pedagogical approaches, student engagement, and the integration of LEGO® Six Bricks® activities. These reflections provided rich, detailed accounts of their experiences and contributed to the overall understanding of the study's findings.

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Lastly, various reflective group conversations before and after school-based teaching practice placements provided a supportive space for participants to discuss their experiences, share best practices, and learn from one another. This collaborative approach helped build a sense of community and mutual support among the pre-service teachers. Data generated from the various methods were analysed with involved thematic content analysis and inductive analysis using ATLAS.ti 23 software to code and organise the data. Themes and patterns were identified based on the participants' experiences and perceptions, providing a comprehensive understanding of how LEGO® Six Bricks® influenced their pedagogy and bridged the theory-practice gap they persistently experienced during previous teaching practice experiences.

The researchers employed member checking and peer debriefing to enhance the rigour and validity of the analysis. The use of multiple data sources and analytical techniques helped ensure the reliability and validity of the study's findings. By triangulating the data from reflective journals, group discussions, and LEGO®-voice activities, the researchers were able to develop a comprehensive understanding of the impact of LEGO® Six Bricks® on pre-service teachers' pedagogy.

Results and Discussion

a) Pedagogy (perceptions, influences and growth)

Pre-service teachers entered the study with varied perceptions of pedagogy, shaped by their own experiences in school and their theoretical training at the North-West University. Many participants initially viewed teaching as a straightforward transmission of knowledge, often underestimating the complexities of effective pedagogy. One participant remarked:

> *"I knew everything, but sometimes it felt like I needed to go back and also pretend like I didn't know a topic and then figure it out with them."*

These initial perceptions were influenced by the "apprenticeship of observation," a term coined by (Lortie, 1975) to describe how pre-service teachers' beliefs about teaching are shaped by their experiences as students. These preconceptions often lead to simplistic and idealised views of teaching, which can hinder student-centred pedagogical approaches. The apprenticeship of observation suggests that pre-service teachers have spent hours observing teachers during their own schooling, which shapes their beliefs and assumptions about teaching. However, these observations are often limited and do not fully capture the complexities and challenges of effective teaching. As a result, pre-service teachers may struggle to integrate new pedagogical approaches and concepts into their practice. In this study, we aimed to shake up their idea of teaching by incorporating LEGO® Six Bricks® not only to develop their own pedagogical skills, but also use LEGO® Six Bricks® in their classrooms.

b) Pre-service teachers' perceptions of pedagogy

Initially, the pre-service teachers reflected on their perceptions of pedagogy while using their LEGO® models. Another participant, Deebie[1], explained that she was hesitant with her teaching approach. She also referred to her LEGO® model, pointing out that the learner's backs are towards her, since they do not always understand what she is trying to explain. Deebie stated the following:

> *Uhm, here I am at the front of the class, and I look after the learners, but sometimes it felt to me as if the children weren't looking at me. As if they, uhm, yeah, don't pay attention in class and don't actually listen to me and don't understand what I'm saying.*

[1] To keep the identity of the participants anonyms, each participant was given a name for reporting purposes.

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In Figure 4 below, Deebie's model represents her perception of pedagogy. Another significant aspect of this model as Deebie explained, is that there is usually one learner that does understand, therefore, the one learner's face is turned towards her.

Figure 4. Participant Deebie's LEGO®-voice model

The model, therefore, indicates that the other learners do not understand what is being taught. Libbie agreed with Deebie, stating that she also does not always know whether the learners understand what she is teaching. Libbie stated that while having the content knowledge, it remained a challenge to apply and explain her knowledge. Yasmin's model, Figure 5, was explained by the following words:

> *Sometimes, I don't really know what is going on at all. So, I still have a lot to learn; so, it's (the model), not so fancy and perfect because that's how I felt.*

Figure 5. Participant Yasmin's LEGO®-voice model

When comparing Deebie, and Yasmin's models, an evident pattern was revealed. A pattern of discomfort and hesitation in teaching content. This might reflect the practical implications of the theory-practice gap, as discussed earlier. Despite the participants' content knowledge, they clearly found it challenging to ensure that the learners understood their lessons. All participants, except Ranger, raised their concerns regarding the discomfort during teaching practice. This could be because of the apprenticeship of observation since they only observed teachers in the classroom and did not have enough experience of being teachers themselves. This resulted in their hesitancy in ensuring learners understood their teaching. Therefore, it is critical to reflect on how higher education programmes support the development of pedagogy, and how the participants experience the teaching of pedagogy during the Bachelor of Education Degree.

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a) The influence of higher education on pedagogy

From the literature, it is evident that pedagogy is an essential, multifaceted part of being a teacher, and it is influenced by various aspects. The experiences of the participants' Bachelor of Education degree, plays a vital role in preparing pre-service teachers for the real-life classroom. A comment by Deebie expressed that she did not really learn about teaching in university classrooms:

> *I learn much more from practice that I learn from theory. I wish I had more practical years in my university than learning theory…I want to teach but I don't learn much from the other stuff and it feels like I've learnt a lot with the practical.*

There was consensus with Ranger, Libbie and Deebie, that lecturers do not equip them with the skills to teach, although they want to gain these skills from the lecturers as well as the university. Libbie also highlighted the fact that she learned the content, but she did not learn to transfer content in the classroom. Ranger's experience correlated with Libbie's. She stated that:

> *It doesn't feel like I have learnt anything. I feel like I wasted my parent's money, yes, like you met friends and learnt things, but physically. I learnt more on the internet than I did in college.*

This statement is also problematic for the pre-service teacher's teaching careers since it clearly indicates that they do not learn adequate teaching methods. Another disconcerting statement was made by Libbie after Ranger indicated that the Science module was "non-existent''. The Science module influenced Libbie to such an extent that she does not want to teach Science anymore. Libbie also elaborated by stating the following:

> *I feel like we need lecturers that actually teach you how to teach and that doesn't only give you the content.*

These responses indicate that the participants feel like they have not acquired the necessary pedagogical skills at the university, and that lecturers do not put in subsequent effort to enhance their pedagogy. Although the university experience and knowledge greatly impact the pre-service teachers, other aspects can also influence them.

Manipulatives: LEGO® Six Bricks®

As discussed earlier, manipulatives have a significant impact on learners since they get the opportunity to learn hands-on in the classroom. After the expert workshop, the participants were more open to the idea of using LEGO® Six Bricks® in the classroom. Their utilisation of the manipulatives in the classroom led to the following themes:

a) Cognitive development

According to Hutcheson et al. (2014), LEGO® Six Bricks® can foster cognitive development. Cognitive development is essential for learners since it is a fundamental part of interacting with the world around them. LEGO® Six Bricks® create an opportunity for learners to actively engage, explore, manipulate and construct, which in turn promotes crucial cognitive skills such as attention, memory and problem-solving.

During the reflective conversations the participants agreed that LEGO® Six Brick® had a positive influence on the learners' cognitive development. For instance, Libbie stated that:

> *They remember, a week later, we did degrees of comparison…they knew it afterwards, so, I think the blocks, I feel, really help with their cognitive development.*

Oliver also agreed with Libbie, by using his model as reference. He explained that he added heads to his figures since it seemed like his learners did not understand what he was

teaching in the beginning, but after incorporating LEGO® Six Bricks® in the lesson, he stated that:

> *They understood much better and could function much better and they weren't so shy to ask questions or to answer.*

Therefore, from these statements, in agreement with each other, the participants noticed how LEGO® Six Bricks® could be used as a manipulative in order to teach complex academic work in a more practical and simple way. Not only was it used in Oliver and Libbie's classroom, but Ranger, who presented an electrical lesson, also found a lot of value in using LEGO® Six Bricks®. This shows that LEGO® Six Bricks® does not only help with cognitive development in one discipline, but that it can be used in various disciplines in different ways.

b) Versatility

Initially, the pre-service teachers were hesitant about the applicability of LEGO® Six Bricks® in various disciplines. Over time, as they participated in the expert workshop and had more exposure in school, they realised that LEGO® Six Bricks® had boundless possibilities. They started to embrace the integration of LEGO® Six Bricks®, without limiting it to one discipline. Gabi expressed her concerns and hesitation with the group initially, but this hesitation transformed into an appreciation for the LEGO® Six Bricks® as she had a first hand, real-life experience of this manipulative in the classroom. She explained her experience as follows:

> *I used it in Social Science and Geography, and I was kind of stunned, like, how do you do that? But, like, they built little animals …There are many ways how one can like…think about how to do it.*

This encounter reinforces the notion that LEGO® Six Bricks® does have the potential to improve educational practices in various disciplines. Deebie agreed that there are endless possibilities with LEGO® Six Bricks® by stating the following:

> *You can do anything with it, and they (the children) enjoy it so much. They remember it, and for the first time, they actually talked to me…it's fun, and then they can actually chat with each other.*

LEGO® Six Bricks® allowed the integration as a manipulative in various subjects such as Mathematics, Science and Language, resulting in a more effective learning process for the learners. Therefore, LEGO® Six Bricks® are not limited to cognitive development, but also extends to social, emotional, and motor skills development among various age groups.

c) Active participation and relationship building

Active participation is fundamental for a conductive learning environment. Therefore, learners need to construct their knowledge and contribute to the learning process rather than being passive receivers of information. During the participant's teaching practice, they noted that LEGO® Six Bricks® was a catalysator for engagement, communication and a relationship building. This was highlighted by Gabi's words:

> *For the first time, they actually talked to me…they would tell me about things they have seen on TV, things they never talked about before…it is fun and then they can actually chat with each other.*

During the reflective group discussions, the other participants agreed that the learners are more engaged when using LEGO® Six Bricks®. Through engagement and active participation, meaningful relationships are built with teachers and peers, resulting in a comfortable environment for the learners, where they feel confident to ask questions. This creates a highly conducive environment for learning since content and playfulness are intertwined, resulting in a more engaging and impactful learning experience. Deebie also

experienced the LEGO® Six Bricks® in a similar way, stating that teaching was not boring anymore, leading to more engaged learners. Libbie added that engagement was facilitated by the creative freedom that LEGO® Six Bricks® offer, and simultaneously aided with the development of positive relationships between the learners and the pre-service teacher. Therefore, the whole teaching environment is impacted positively, breaking down traditional educational barriers of learning, leading to the holistic development of the learners.

d) Discipline in the classroom

LEGO® Six Bricks® does not only foster positive relationships through a play-based and hands on experience of learning, but it also has a deeper value of discipline since it creates a structured and focused environment. Since LEGO® Six Bricks® captures the learner's attention, it minimises distraction. Teachers often link active participation with a chaotic classroom environment, but the participants had the opposite experience with LEGO® Six Bricks® in the classroom. Libbie explained that:

> *I feel more like the discipline is so much better if you have something unique, I have experienced this. You have more leeway to take it away and just give them work to do. They don't want that; so if you give them something that makes them excited, like I feel the discipline with my class was much better than I thought it would be with the LEGO®*

Although Libbie initially thought that discipline would be problematic and chaotic with a play-based approach, she was surprised to see that the discipline improved. Similar to the participant's fears of an undisciplined classroom, many mentor teachers did not feel comfortable with the first exposure of LEGO® Six Bricks®, hindering the pre-service teachers to integrate this manipulative in the classroom.

External factors that influence pedagogy

As seen from the literature, mentor teachers have a significant impact on pre-service teachers (Butler and Cuenca, 2012, Mkhasibe, 2018, Moosa and Rembach, 2020, Perry, 2013, Shafqat and Muhammad, 2015). Although the majority of participants had a pleasant experience of LEGO® Six Bricks®, some had a negative experience, since some mentor teachers were sceptical about using this manipulative in the classroom. The sub-themes that emerged included a) Discipline and b) Mentor teachers.

a) Discipline

Although some participants had the opportunity to implement LEGO® Six Bricks® in the classroom and saw how discipline improved, other participants were withheld of this opportunity. Therefore, the lack of discipline had an immense negative impact on their pedagogy. Deebie stated the following:

> *Discipline is something that actually becomes so difficult for teachers literally and we don't have a lot of power concerning it.*

The participants all agreed that there was a discipline problem in schools. Although discipline was the initial concern, it seemed like active engagement reduced the discipline problem. To thoroughly evaluate the effect that LEGO® Six Bricks® have on discipline, a longer study with full classroom responsibilities is needed. It is however clear that external factors, in this study, discipline, influenced the pre-service teacher's experimentation with their pedagogical approaches.

b) Mentor teachers

Discipline was also a concern for mentor teachers. Not only did the pre-service teacher's experimentation with LEGO® Six Bricks® get hindered by the discipline of the school and

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classroom, but the mentor teachers' attitudes regarding new pedagogical approaches also influenced them. Only one participant had a mentor teacher who supported the use of LEGO® Six Bricks® in the classroom. The other, on the other hand, had negative experiences with their mentor teachers. Yasmin explained her experience as follows:

> *She wasn't even a mentor to me at all; sorry, but it's true…it was not possible to use the LEGO® and it was actually quite sad for me.*

A reality that many pre-service teachers face, is that not all mentor teachers are open to using new teaching approaches in the classroom. There are two sides of this view, one is that most teachers can relate to being concerned that they need to reteach content if the pre-service teacher fails with this approach. On the other side, this can discourage pre-service teachers causing them to resort to their apprenticeship of observation and to merely continue with what they saw teachers do during their schooling years. Apart from refusing to try new approaches in the classroom, mentor teachers were also described as being narcissistic, possessive, mean, unfair, excluding, or mentor teachers conveying a feeling of pre-service teachers being a threat in the classroom. These attitudes immensely impacted the pre-service teachers and hindered them from experimenting with finding their professional identity.

Perceived obstacles

When trying a new manipulative such as LEGO® Six Bricks®, it automatically comes with challenges. Some of these challenges include time constraints and implementing LEGO® Six Bricks® in an already full scheduled curriculum. Other concerns might be classroom management and distraction since the LEGO® Six Bricks® have an interactive and engaging nature. The participants were greatly influenced by the mentor teacher's concerns such as a) Time, b) Discipline and C) Lack of creativity.

a) Time

As mentioned, teachers are already managing a full curriculum, therefore they reason that using LEGO® Six Bricks® in the classroom will disrupt the classroom resulting in the loss of time and valuable education. Deebie stated the following:

> *It was so difficult to take it over in another teacher's class and do it…she (the teacher) said it was very cool…but as she told me, they have a very tight schedule, so I can't use it in every class. She said I should look at her planning and then I should see what day is going to work for her.*

Deebie had an opportunity to implement LEGO® Six Bricks® in the classroom, but it was limited to one time. It was the first time that learners got a chance to interact with LEGO® Six Bricks®, therefore they were very excited, and the mentor teacher felt it took a lot of time. The participants argued that it went much better when the learners got exposed to LEGO® Six Bricks® more often. As discussed, the other participants had a positive experience with LEGO® Six Bricks® and the discipline, which saved time. Therefore, if the learners are getting more exposure to LEGO® Six Bricks®, time can be managed, and it can be used effectively for teaching purposes.

b) Discipline

As seen in the theme of external influences, discipline is a big concern when teaching, not only for the participants, but also for their mentor teachers. This led to Yasmin's teacher telling her, "Don't even try". This was not merely about the discipline, but also about the learner's attitudes and preferences of only playing outside and not wanting to learn new things. This raised the question: will their teaching not be more effective when using a play-based approach?.

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Oliver also had the chance to implement LEGO® Six Bricks®, he mentioned that it was very easy since the children was used to it. He stated that it is not necessarily a LEGO® Six Bricks® discipline problem, but a normal discipline problem in schools. Libbie also thought that implementing LEGO® Six Brikcs® in the classroom would be chaotic, but she experienced the opposite as activities went well. This highlights the fact that LEGO® Six Bricks® can be integrated in a playful, yet positive way if the participants can expose the learners to LEGO® Six Bricks® more often. Most importantly, the participants realised that using LEGO® Six Bricks® is not the reason for the lack of discipline, but that it was rather part of the normal school environment.

c) Lack of creativity

The final perceived obstacle that surfaced during the reflective group conversations was a perception of LEGO® Six Bricks® being developed only for the Foundation Phase learners. The participants felt like extra creativity was needed to implement LEGO® Six Bricks® since they needed to adjust some activities for their subjects. Ranger found it challenging to implement LEGO® Six Bricks® in different subjects, she said:

> *There are only activities for some subjects. Science was difficult, for instance, as I was unsure how to adapt the activities. I could not think of ways to use it in other subjects.*

This indicates that there is a lack of creativity to change or adapt the activities. If a participant lacked creativity, the free LEGO® Six Bricks® application could've been of help since there are various activities available for the Foundation Phase learners. Although the participants were informed about the application, of all the open-source resources and while having access to a WhatsApp group, they still did not ask for help or ideas. This can be a concerning indication of a passive approach to their pedagogy. Although some of the participants lacked creativity and it hindered their implementation of LEGO® Six Bricks® in the classroom, it should be considered that it was their first time using this manipulative. Various factors contributed to their experience with LEGO® Six Bricks® in the classroom, but overall, when they had an opportunity to implement LEGO® Six Bricks®, they had a positive experience.

Summary of Key Findings

This study demonstrates that LEGO® Six Bricks® is an effective tool for enhancing the pedagogy of pre-service teachers. The research found that by utilising LEGO® Six Bricks® effectively bridges the possible theory-practice gap in pre-service teacher training at the North-West University. Using LEGO® Six Bricks® and its implementation in this context highlights the relationship between pedagogical tools, training programs and the broader educational community, not only regarding bridging the gap between theory and practice, but also approaching teaching differently. The study redefines pedagogy as more than the transmission of knowledge, but as a dynamic and emotional engagement of pre-service teachers in their pedagogy. Furthermore, the research contributes to the inclusion of play-based approaches in the adult education discourse by showing how these approaches can enhance their professional development. Despite challenges such as limited support from mentor teachers, resource constraints, and classroom management issues, participants reported significant improvements in their pedagogical practices and student engagement, and in doing so, their approach to teaching as a whole.

The findings demonstrate how LEGO® Six Bricks® enhances pre-service teachers' capacity to engage students effectively, stimulate creativity, and implement differentiated instruction. The study highlights the tool's ability to foster cognitive skills, such as memory and problem-solving. Through hands-on experiences, pre-service teachers gained confidence

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and adaptability, crucial for navigating real-world classroom complexities. However, the study also underscores challenges, including limited mentor-teacher support, classroom discipline concerns, and time constraints. These practical barriers suggest systemic changes to better integrate innovative tools like LEGO® Six Bricks® into teacher education.

The findings suggest that integrating play-based learning tools like LEGO® Six Bricks® into teacher education programs can support the development of effective pedagogical skills in their future classrooms. Teacher education institutions should consider incorporating such tools into their curricula, and providing adequate support and training for pre-service teachers. This integration can help future teachers develop the confidence and competence needed to implement innovative teaching strategies in their classrooms. The findings highlight the potential of LEGO® Six Bricks® to transform traditional teaching practices and create more engaging, dynamic, and inclusive learning environments. By providing pre-service teachers with practical strategies and tools, LEGO® Six Bricks® can help them to develop the skills and confidence needed to become effective educators.

Conclusion

The study's findings highlight the potential of LEGO® Six Bricks® as a transformative tool in teacher education. By promoting active engagement, creativity, and reflective practice, LEGO® Six Bricks® can help pre-service teachers develop the skills and confidence needed to become effective educators. As one participant aptly summarized, "LEGO® Six Bricks® has not only changed how I teach but also how I think about teaching. It's a powerful reminder that learning can be both fun and meaningful."

In conclusion, this study contributes to the ongoing discourse on enhancing teacher education by integrating innovative, play-based learning tools. By addressing the theory-practice gap and providing practical strategies for effective pedagogy, LEGO® Six Bricks® can help shape the next generation of teachers who are equipped to create dynamic and engaging learning environments for their students. The findings show the importance of providing pre-service teachers with opportunities to engage in hands-on, learning experiences that bridge the gap between theory and practice. By incorporating tools like LEGO® Six Bricks® into teacher education programs, institutions can support the development of innovative and effective teaching practices that meet the diverse needs of today's learners.

Recommendation

For pre-service teachers, the integration of LEGO® Six Bricks® presents an opportunity to create more engaging and interactive classroom environments. This tool facilitates a shift from traditional, teacher-centered methods to innovative, student-focused approaches. Its flexibility allows teachers to cater to diverse learning needs, enhancing cognitive, social, and emotional development.

Policymakers play a crucial role in institutionalising the benefits of LEGO® Six Bricks® within teacher education. Incorporating play-based learning tools into teacher training curricula can empower pre-service teachers with innovative pedagogical strategies. Structured mentoring programs should be established to ensure that experienced educators provide the necessary guidance and encouragement for adopting these new methods. Furthermore, providing resources and scheduling flexibility within curricula will enable the effective integration of such manipulatives, addressing logistical and practical concerns raised in the study.

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For researchers, the findings open avenues for further exploration. Longitudinal studies are necessary to evaluate the sustained impact of LEGO® Six Bricks® on both teaching practices and student outcomes. Additionally, researchers could explore the adaptability of this tool across different educational levels, cultural settings, and disciplines. Identifying best practices for implementation and developing strategies to overcome barriers, such as resistance from mentor teachers and limited creativity, will be essential. Such investigations can enhance the scalability and effectiveness of LEGO® Six Bricks®, contributing to a broader transformation of educational practices.

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