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Designing Learning Centres That Facilitate Knowledge Construction on Science Process Skills in Early Childhood Classrooms

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Abstract

Science education is perceived to have the potential to develop 21st century competencies. In Zimbabwe, the teaching of science in early childhood by using learning centres is considered as a way of empowering young learners with scientific knowledge and skills to become productive citizens in future. To strengthen the initiative, resources are being channelled and policies crafted to support the teaching of STEM (science, technology, engineering and mathematics). Despite considerable efforts to introduce STEM in early childhood development (ECD), research concerning the benefits of developing science skills using learning centres is sparse. This study adopted an interpretive paradigm and multiple case study design for three schools and three purposively selected ECD teachers. Data was solicited through semi-structured interviews, document analysis and classroom observations. The variable nature of learning centres in ECD classrooms is an indication of shortcomings in policy on teaching using learning centres. At learning centres, learners construct scientific knowledge, ideas and skills through interaction with peers and developmentally appropriate materials. Teachers should be creative and innovative and create learning centres that enable learners to explore the world and construct scientific knowledge through active participation and sharing ideas. A policy to guide the teachers on constructing appropriate learning centres for effective teaching of science skills should be drafted.

Keywords: *Early Childhood Development, Learning Centres, Science Process Skills, ECD Teachers, Teaching and Learning, ECD Classrooms, ECD Learners.*

Introduction

Science learning is critical during the early childhood years and has long-term associations with school readiness and continued academic achievement (Piasta, Pelatti & Miller, 2014; Mugweni, 2016). Several studies suggest that science learning during preschool years helps learners establish a solid foundation of basic scientific skills that facilitates mastery of new, developing skills and fine-tunes already existing ones (O'Connor, Fragkiadaki, Fleer & Rai, 2021). In Zimbabwe, the teaching of science in the early years aims to develop learners who can, eventually, compete in international markets and demonstrate expertise in research and innovation (Piasta et al., 2014; Mugweni, 2016; Samkange, 2016). To strengthen the initiative, the country is channelling resources and crafting policies that support the teaching of STEM (science, technology, engineering and mathematics) and STEAM (science, technology, arts, engineering and mathematics) from as early as the early childhood period (Zimbabwe, 2015a). Early science learning experiences are assumed to be critical for both school readiness and as foundations for future learning (Dejonckheere, Wit, Keere & Vervat, 2016). Although information concerning early childhood science learning is increasing, research concerning the benefits of developing science skills using learning centres is sparse (Mugweni, 2016). In trying to meet the demands of the new curriculum framework, early childhood development (ECD) teachers employ various methodologies to develop science skills in learners. This article explores how learning centres can be designed to facilitate knowledge construction on science process skills (SPS) in early childhood classrooms. These process skills include observing, describing, comparing, questioning, predicting, experimenting, reflecting and cooperating (Dejonckheere et al., 2016).

Various terms are used to refer to learning centres, including interest centres, learning stations, activity areas, free-choice areas, booths and enrichment centres (Pattillo & Vaughan, 1992). Indoor or outdoor learning centres are designed by a teacher, and there are no guidelines or specifications regarding the number and type of learning centres that can be used to promote the teaching of SPS in ECD classrooms (Kroeker, 2017; Britto & Nieto, 2018). For ECD, learning centres are the best science learning

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environments, because they are developmentally appropriate for learning and developing skills (Dejonckheere et al., 2016). In addition, a developmentally appropriate curriculum should reflect active science learning organised around learning centres (NAEYC, 2009). Learning centres should cover mathematics, art, music, dramatic play, science, and discovery, and sensory science and discovery, manipulative and block, language, music and art. This study explored how teachers can design learning centres to facilitate knowledge construction of SPS by learners.

Primary Research Question

How can teachers design learning centres to facilitate knowledge construction of SPS in ECD classrooms?

Conceptual Framework

The study explored the concept of learning centres as one of the conceptual frameworks common in the literature review. Mantsose (2020) posits that learning centres are arranged play spaces in early childhood classrooms support all areas of growth and development of children. These centres are visibly constructed in ECD classrooms, in order to actively engage children in their own language, and to promote emotional, cognitive, social, and physical development (Darling-Hammond, Flook, Cook-Harvey, Barron & Osher, 2020). The centres are designed to develop different developmental milestones in children in which SPS are not an exception (Chikwiri & Musiyiwa, 2017; Clyton & Kufakunesu, 2017). Examples of learning centres are mathematics, art, music, dramatic play, science, and discovery, manipulative and block and sensory. In these learning centres, learners are encouraged to build their skills, pursue their interests, and learn to make meaningful choices (Dejonckheere et al., 2016; Mugweni, 2016). However, far too little attention has been paid to the effectiveness of these learning centres in developing SPS.

Literature Review

Research conducted with young children argues that children are born naturally inquisitive and full of questions about the world around them (Tsakeni, Vandeyar & Potgieter, 2019). Therefore, early childhood educators are urged to take advantage of this innate curiosity and channel children's enthusiasm towards scientific discovery. In addition, early engagement in science stimulates the development of understanding of scientific concepts and knowledge through active participation in science activities (Darling-Hammond et al., 2020). Studies on the teaching of STEM recommend the early teaching of SPS in ECD classrooms (Clyton & Kufakunesu, 2017).

Contemporary educational discourse has found that teachers can employ various methods to teach science in ECD classrooms (Chikwiri & Musiyiwa, 2017; Darling-Hammond et al., 2020). Different methods, techniques and approaches have been developed to help young children acquire SPS in the best way. These methods are collectively known as child-centred approaches (Andiema, 2016), and they help learners to make sense of their world and environment and actively construct their own knowledge (Aktulun & Kiziltepe, 2018; Tsakeni et al., 2019). Despite commendable efforts to teach science skills using child-centred approaches, there is scant literature on the teaching SPS using learning centres.

The learning centres found in early childhood classrooms vary in terms of their numbers, equipment, and materials available. Some of the learning centres involve science and discovery, mathematics and block, manipulative play, a classroom library, cooking, manipulative nd block, cooking, dramatic play, music and movement, and sensory activities.

The Science and Discovery Centre

Literature on early childhood education supports the idea that young learners are born curious and enthusiastic to learn about the world around them (Aktulun & Kiziltepe, 2018). Therefore, a science and discovery centre should provide opportunities for learners to learn through concrete experiences with real objects. Learners are intrinsically motivated to learn new things every day at well-equipped centres with real objects (Darling-Hammond et al., 2020). A variety of learning materials at a centre also exposes learners to

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opportunities for social interaction with their peers. In other words, well-equipped science and discovery learning centres promote cooperative learning by encouraging learners to communicate their observations and share information during lessons (Metin, 2017). In addition to engaging in cooperative learning, learners observe using their senses to perceive similarities, differences and changes among objects and materials. They classify, organise, sort and describe the learning materials provided at the centre. It is argued that, as children interact and collaborate at these different learning centres, they produce, create, and consume socially constructed knowledge (Darling-Hammond et al., 2020). It is the role of the ECD teacher to create and design learning centres that promote the construction of scientific knowledge and ideas by learners.

Mathematics and Block Centre

A learning centre affords learners the opportunity for oral language development, as they verbalise their actions and discuss problems and solutions (Aktulun & Kiziltepe, 2018). As they play at the centre, intellectual development is facilitated through sorting, classifying, measuring, evaluating and solving scientific problems. Through engagement in different learning activities at the centre, concepts such as size, space and time develop. At the centre, learners represent what they know from past experiences through construction, talking and planning. Past experiences allow them to engage in meaningful conversations as they construct projects using learning materials at the centre. These areas allow children, either individually or in small groups, to play and explore different learning materials under the guidance and supervision of their teachers (Darling-Hammond et al., 2020).

Manipulative Play Learning Centre

The teaching of SPS in early childhood should not be an obstacle; instead, it should be about early exposure to reasoning, predicting, hypothesising, problem-solving and critical thinking, rather than memorising facts. A manipulative play learning centre nurtures these skills in young children, and kindles their interest in STEM study and careers later on in life (Dejonckheere et al., 2016). Activities at the learning centre are child-directed, not teacher-directed; the teacher is free to interact with children in a one-on-one or small-group situation. This allows the teacher to observe children's skills and problem areas more closely. During this interaction, learners come up with new ideas, and build on their past experiences.

Participation at the centre stimulates development, as children become involved in detailed planning, sharing and cooperating. Darling-Hammond et al. (2020) suggest that learners can work with others or individually at the centre to construct their own creations, such as bridges and towers. The learning centre is described by Niteck and Chung (2015) as a safe place in the classroom, carefully constructed to allow learners work cooperatively and communicate with peers. The extended conversation at the centre, furthermore, develops learners' language while simultaneously freeing the teacher to attend to the distinct needs of each learner, individually or in smaller groups. In addition, learning centres are used as powerful instructional routines that provide teachers with opportunities to focus their attention on small groups of learning while children work and learn at their own pace while they experiment with their prior knowledge (Aktulun & Kiziltepe, 2018).

Despite data on the importance of the manipulative play area for developing SPS existing, research on how teachers can design the centre to facilitate the construction of knowledge by learners is still limited. A well-equipped centre contains maths manipulative blocks of different sizes and colours, puzzles, beads, interlocking materials, cards with patterns and seeds of different sizes (Kroeker, 2017).

The Classroom Library Centre

The book centre or the classroom library is an important area in the ECD classroom and is furnished with brightly illustrated books (Niteck & Chung, 2015; Ozturk & Kiziltepe, 2018). The books are displayed on low shelves for learners to access, select and explore as they are introduced to reading in their own classroom library (Ozturk & Kiziltepe, 2018). Mantsose (2020) agrees that the library space in the classroom exposes young children to different age-appropriate reading materials, which are important in science

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teaching and learning in the preschool. A well-designed classroom library should aim to develop learners' cognitive, social and literacy skills. The centre gives learners the opportunity to interact with a variety of books, which stimulates their thinking and imagination skills and enhances language development (Kroeker, 2017; Ozturk & Kiziltepe, 2018). The centre should be designed in such a way that it gives learners the opportunity to face positive challenges, solve their own problems, discover and investigate concepts and gain self-esteem as they explore different reading materials (Darling-Hammond et al., 2020).

Cooking Centre

Researchers report on the importance of a cooking centre in an ECD classroom (Britto & Nieto, 2018). Science-oriented activities, including cooking, are relevant for early childhood education, because they enhance active participation, exploration, discovery, and teamwork by learners (Darling-Hammond et al., 2020). During cooking activities, learners can measure ingredients, follow a recipe and learn concepts such as blending, mixing, rising and timing (Kroeker, 2017). Literature supports the idea that cooking centres provide children with opportunities for working with others, being involved in practical activities, making choices and becoming fully engaged in learning (Niteck & Chung, 2015; Metin, 2017; Britto &Nieto, 2018). Zosh et al. (2017) posit that the centre should be designed to facilitate learner creativity, problem-solving and thinking, and give learners the opportunity to use the knowledge they have and apply it by sequencing, counting, measuring, and following direction. For example, when learners mix flour, sugar and butter during cooking to make cookies at the cooking centre, they learn that mixing and baking will change substances into something new and different. From these arguments, it is clear that it is vital to ensure the existence of a cooking centre in ECD classrooms in Zimbabwe, and to investigate how teachers use the centre to teach SPS.

The Sensory Centre

The primary goal of the sensory centre is to encourage young learners to investigate natural and man-made phenomena within their world as they engage in sensory experiences with minimal teacher instruction (Kroeker, 2017). Children should be encouraged to make accurate and careful observations when they sniff, feel, pinch and probably taste a variety of materials at the sensory centre. Learners develop an understanding of scientific processes when they observe, sort, explore, compare, classify, predict, evaluate outcomes, and label and describe objects. Aktulun and Kiziltepe (2018) suggest that, for the science environment to be effective in developing these processes, it should be properly prepared and the materials arranged and designed for maximum benefit. Scientific processes encourage learners to learn and construct knowledge through cooperation, sharing ideas, and experiences.

Research Methodology

The major thrust of the study was to explore how teachers designed learning centres to enhance knowledge construction for SPS of early childhood learners. The study adopted an interpretive paradigm and multiple case study design involving three schools in the Harare Metropolitan Province, from which three ECD teachers were purposively selected. In adopting an interpretive philosophical claim, the aim was to comprehend teachers' practices, values, assumptions and experiences in designing learning centres in ECD classrooms (Johnson & Christensen, 2014). The novel phenomenon of designing learning centres can be better understood in the social context (ECD classrooms in which they are constructed and reproduced by ECD teachers when they are teaching SPS (Creswell & Poth, 2018).

Study Participants

Three teachers (one from each school) were purposively sampled due to their relevance to the study (Ponelis, 2015). The study purposively selected participants who possessed knowledge, expertise and experience of the phenomenon under study (Johnson & Christensen, 2014). The participants each had more than five years of teaching experience in ECD classrooms. Experienced participants usually communicate thoughts in an appropriate scholarly language (Mukherji & Albon, 2015).

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To provide anonymity to participants, pseudonyms were assigned. Ms Rudo taught at Fox School, Mrs Chipo at Leopard School and Ms Fadzai at Lion School. Participation was voluntary and participants were aware that they could withdraw consent at any time.

Research Methods and Data Collection

Data were gathered through semi-structured interviews, document analysis and classroom observations during science lessons over a period of four months. Participants were observed teaching science lessons and each lesson was video-recorded.

The semi-structured interviews were useful to provide insight into how the existence of learning centres in ECD classrooms supported knowledge construction of SPS. The researcher gained an in-depth understanding of the insights, behaviours, approaches, and practices of participants (Yin, 2017). In this study, semi-structured interviews helped to achieve a holistic understanding of teachers' views on designing and constructing learning centres in their classrooms, and to explore interesting areas for further investigation (Mukherji & Albon, 2015).

A total of 15 lessons were observed, that is, five lessons per participant. The purpose of the observations was to gain open-ended and first-hand information (Mukherji & Albon, 2015) on the use of learning centres to construct knowledge related to SPS. Each lesson observation lasted 20 minutes, which was the standard time for an ECD lesson in Zimbabwe, as scheduled on the timetable. During the observations, lessons were video-recorded and, at the same time, descriptive notes (of the actual lesson) were taken. The notes were expanded into field notes directly after each lesson, by adding personal thoughts, ideas, and perceptions (Mukherji & Albon, 2015; Sharan et al., 2019).

The documents that were analysed are ECD syllabi, particularly the maths/science syllabus, plan books and schemes of work; they were all of an acceptable quality and relevant to the use of learning centres for teaching SPS in ECD classrooms (Bowen, 2009). The rationale for using document analysis was to acquire background information on the role of learning centres in ECD classrooms, as well as general data on their use in teaching science as a subject (Tight, 2017). In this study, document analysis was a way to ensure that the study was critical and comprehensive, because it pointed to questions that needed to be asked and to situations that needed to be observed (Bowen, 2009).

Thematic and content analysis were used as methods to analyse and interpret data. The process involved reading the collected data several times, making notes of common ideas and coding them throughout the text (Bartlett & Vavrus, 2016). According to Ridder (2016), the analysis involves classifying and labelling the primary patterns in the data in order to determine substantial information. Finally, the codes were grouped together into similar clusters to create a meaningful theme. Recurring patterns or themes that emerged from the data that was generated were used and were, in turn, placed under the predetermined themes that respond to the research questions.

Research Findings

The data were categorised under different themes, namely learning centres support the teaching of SPS, the teachers' role as a facilitator in developing SPS, learning centres support knowledge construction, and ways to enable knowledge construction at learning centres.

Learning Centres Support the Teaching Of SPS

In all the three classrooms visited there were different, clearly labelled learning centres in ECD classrooms. The learning centres were for mathematics and science, physical education, indigenous languages, heritage studies, mass displays and visual and performing arts, and ICT. These learning centres represented the different learning areas taught at ECD level as reflected in the syllabus and the teachers' schemes. The study found out that there were different learning centres in each of the three classrooms visited. In Ms Rudo's classroom, the learning centres were filled with a variety of teaching and learning materials, such as, balls,

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counters, soil, puzzles, different shapes, models of animals and their shelters (nests), potted plants and flowers, empty boxes, water, computer toys, radios and TVs that no longer worked, calculators and bones. Ms Rudo, Mrs Chipo and Ms Fadzai shared their knowledge on how learning centres developed SPS as follows:

- *Ms Rudo: I prepare the learning centres so that learners learn, interact, discuss together, do activities like measuring, grouping objects and carry out simple experiments.*

- *Mrs Chipo: I stuffed my centres with open ended materials, as you can see, soil, pieces of cloth, or water. The materials allow learners to perform various activities, for example, a piece of cloth can be a mat, used to carry a baby or a blanket.*

- *Ms Fadzai: These activities that learners perform at learning centres are part of the content I teach and practical activities of the lessons.*

Data in the excerpts reveal that learning centres in ECD classrooms were equipped with different learning materials. During lesson observations it was learned that learners visited these centres for activities and to develop skills such as communication, observation, measuring, inferring, classifying, predicting and experimenting. Learners were observed working together, discussing, asking questions and participating in different conversations. The syllabus specifies that learners should be introduced these activities during science lessons.

The Teacher's Role as A Facilitator in Developing SPS

Teachers play a significant role in developing SPS by designing learning centres that facilitate the teaching of SPS. Ms Fadzai said, *My role as a facilitator of learning is to design and create learning centres.* She added that a teacher should be creative and innovative to create meaningful learning centres that are relevant to the teaching and learning of SPS. The study observed that the learning centres in all classrooms were labelled. On the importance of labelling learning centres, Mrs Chipo had this to say:

- *Mrs Chipo: As a facilitator, l design and label the learning centres so that learners can easily identify them. Though ECD children are still illiterate, labelling centres is also a way of unconsciously introducing the learners to print.*

- *Mrs Chipo: I prepare the environment for learners to carry [out] experiments and discoveries. For successful experiments, I have to plan and guide, monitor learners during activities.*

The teachers reported on other roles they fulfilled, such as facilitation, planning activities, resource mobilisation and monitoring and guiding learners during activities. As part of facilitation, teachers directed all learning activities, to pave the way for independent learning. More importantly, the roles were stated in teachers' schemes, in the methods and activities column.

Learning Centres Supporting Knowledge Construction

Learning centres were constructed by teachers to enable learners to construct knowledge of SPS. Participants shared their views on how learners constructed knowledge of SPS at different centres. Mrs Chipo said:

- *Mrs Chipo: Learners need well prepared learning centres with materials from their environment. Sometimes l ask leaners to bring them from home. Parents were assisting in producing the materials. Learning materials from home are within learners' knowledge.*

Ms Fadzai reported that learners actively participated when they interacted with age-appropriate materials. Ms Rudo, however, commented on the learners' characteristics and said the following:

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- *Ms Rudo: Learners always have a lot of questions to ask about things around them. This makes them to be mobile and unable to concentrate for long periods of time so I give them short difficult tasks to solve in groups. They love to play with different learning materials as they perform the tasks.*

From the above excerpts, it is clear that, for successful construction of knowledge, learners need a prepared environment equipped with developmentally appropriate and locally available teaching and learning materials. Class observations revealed that providing locally available materials increased active participation and concentration by learners during activities at the learning centres. Learners were familiar with learning materials that had come from their homes; it was within learners' knowledge and experiences. The materials were relevant to learners' own lives and communities, and supported learners in exploring their own backgrounds. Exposure to relevant and age-appropriate materials during measuring and observation activities enabled learners to create new competencies and ideas.

Play was identified as an important component of knowledge construction at learning centres. Learners constructed knowledge through guided or planned play at well-prepared learning centres. The syllabus emphasises that learners learn new ideas and develop new skills through play in a prepared learning environment. SPS develops naturally in learners through interaction with peers at the learning centres. Data from the teachers' schemes of work revealed that learners constructed knowledge through cooperative learning, groupwork and collaboration.

By provision of challenging work at the learning centres, learners were provoked to develop imagination, critical thinking and problem-solving skills, which are crucial skills in science learning. Learners were observed participating in groupwork during experiments, explorations and discussions. They asked each other questions, engaged in arguments and communicated results.

Young learners were described as energetic, curious, playful and eager to learn. Participants capitalised on these characteristics by planning short, interesting and motivating activities, thereby paving the way for the construction of knowledge in the centres. The researcher found that, due to children's short concentration span, short and interesting activities increased the chances of active participation and sharing of ideas among learners.

Ways To Enable Knowledge Construction at Learning Centres

Knowledge construction by learners can be encouraged in different ways by ECD teachers. Mrs Chipo explained:

Mrs Chipo: I have arranged and organised my learning centres so that quiet areas are far away from noisy areas and related learning centres are close to each other. This idea allow learners to participate in activities which requires maximum concentration without distractions and reduce movements from one centre to the other.

Ms Fadzai has this to say:

Ms Fadzai: I regularly change materials in learning centres from time to time in order so that learners always see new tings and love to learn. By playing with new things every time at the centres, learner learn new information.

In addition, Ms Rudo said,

Ms Rudo: I arrange learning centres in such a manner that there is adequate space for each learner to manipulate objects freely. Between learning centres, there should be enough space for movement and free play.

Data from the excerpts above confirm that optimal concentration of learners is key to knowledge construction at the centres. Furthermore, teachers need to motivate and maintain learners' interest, boost their confidence and cultivate self-esteem in learners through regularly changing the materials at the centre around. Regular interactions with new learning aids triggered the development of new ideas, stimulated

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their imagination and lead them to acquire new skills. The accessibility of learning materials supports independent learning and free play.

Discussion of Findings

The main objective of the study was to explore how the design of learning centres by ECD teachers can facilitate knowledge construction in relation to SPS.

Learning Centres in ECD Classrooms

There were different learning centres in ECD classrooms. According to the mathematics and science syllabus, the learning areas should relate to subjects that are taught in ECD classes, and separate spaces in classrooms should represent different learning areas (Zimbabwe, 2015b; Metin, 2017). The variation in the number of learning centres in each classroom that was observed could be because the policy does not provide specific guidance on the construction of learning centres in Zimbabwean ECD classrooms (Muzawazi, 2019). Ideally, a variety of learning centres in preschool environments should expose learners to different stimulants and learning opportunities (Aktulun & Kiziltepe, 2018).

Participants agreed that learning centres were a prerequisite in any ECD context, and the availability of adequate learning materials at the centres activated learners to develop essential science skills, such problem-solving, communication, classifying, and observing. This view is echoed by Aktulun and Kiziltepe (2018), who posit that learning centres are the perfect place to promote all areas of growth, namely the psychomotor, cognitive and affective domains of child development. The study observed that learners learnt about new scientific concepts, improved their concentration, acquired new language, skills and experiences, and even more importantly, constructed knowledge through dialogue and collaboration. Metin (2017) confirms that learners acquire new knowledge and skills through interaction with peers and familiar objects in prepared environments.

Participants said that the major roles of the teacher were to create, design and furnish learning centres with age-appropriate learning materials relevant for teaching SPS. Kitta and Kapinga (2015) state that the main goal of every early childhood (ECD) teacher is to provide the best science learning environment for the learners, so that they can play, explore and discover. The study found that creating learning centres involved preparing the environment and organising opportunities for learners to investigate, self-discover and solve problems. In addition, the data reveal that a knowledgeable teacher facilitates, guides and monitors the learners' activities. Arubayi (2015) and Ozturk & Kiziltepe (2018) agree, and view the teacher as a resource provider, leader, instructional specialist, classroom supporter and curriculum specialist.

The mathematics and science syllabus that is used by teachers for scheming and planning states that teachers should be knowledgeable, resourceful and creative, in order to present a variety of materials and, therefore, varied learning experiences at the centres. During activities at learning centres, teachers were observed maintaining order and discipline, as well as guiding and monitoring learners' activities. Schreiber and Valle (2013) concur that the facilitator plays an integral role in students' acquisition of knowledge. Learners remain focused and achieve their goals when the teacher is present (Darling-Hammond et al., 2020).

The participants shared different approaches that they applied when designing learning centres in ECD classrooms. These included ensuring the proximity of learning centres and the safety of learners, and leaving space between centres. Findings suggest that related learning areas should be close together, as it reduces learner movement during the lesson and increases learners' interaction due to a wide choice of materials. A safe and secure learning environment is largely conceptualised as a way to protect children from physical harm (Mwona, Nyakwara & Murungi, 2018). To ensure the safety of learners at learning centres, it is a teacher's responsibility to provide a safe physical environment for children to learn in (Metin, 2017; Ozturk, 2018). Findings also suggest that, if learners are safe, their self-confidence to perform experiments and explorations is boosted.

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Data gathered suggest that learners constructed knowledge on SPS in different ways in the learning centres, including through play, social interaction, groupwork, and questions and answers. Participants commented that play episodes at the learning centres encouraged learners to use their senses to explore the world. In addition, organised play with relevant and age-appropriate home-grown play materials at learning centres were beneficial to young learners, and bridged the gap between home and school. Beaty (2014) and Bodrova and Leong (2015) concur, and add that organised, guided and structured play in a social constructivist classroom enhances children's social, physical, emotional and intellectual skills.

The findings suggest that play enables learners to explore the world around them through sharing ideas, knowledge and learning materials, as they observe, carry out experiments and communicate with peers at the learning centres. Therefore, play should be guided and monitored, so that the lesson objectives are achieved. Through play, learners engage in social interaction, conversations and discussions, pose questions and provide answers (Andiema, 2016). These engagements enable them to learn new ideas, share and construct knowledge and develop social skills. This finding is in line with the suggestion by Vygotsky (1978) that meaningful interaction in social and cognitive activities with others, or more knowledgeable others, is a driving force behind individual development and learning.

Learners' characteristics of being curious, energetic, active, mobile and inquisitive helped them to work successfully in groups or in pairs. Groupwork also promoted maximum participation of learners and construction of new knowledge and ideas through sharing and working together. Teamwork during the learning process made challenging tasks easier and improved participation by learners. Similarly, Nitecki and Chung (2015) posit that curiosity and questioning about the surroundings is inherent to children from birth to 6 years, and their natural desire to play can be exploited to encourage learning. Colgrove (2012) and Tipps and Kennedy (2014) concur that social interactions assist in reducing egocentrism and maximising knowledge construction.

Conclusion

Learning centres represent subject areas, as prescribed by the curriculum framework (2015–2022). However, variation of these centres in ECD classrooms in this study was the result of shortcomings in the policy, which did not guide teachers on the creation and construction of these centres. Equipping the learning centres with locally available, developmentally appropriate open-ended materials exposed learners to open-ended activities, including communicating, measuring, classifying and experimenting. These activities call for careful planning and thorough preparation, so that learners can work in groups or pairs and acquire and construct new skills and ideas through conversations and discussions and sharing information. The teachers' critical roles of creating, designing, constructing and labelling learning centres took centre stage in developing learners' SPS. During lessons, the teachers' role shifted to facilitating, monitoring and guiding learners' activities. Learning centres demand that teachers are innovative and resourceful, so that leaners can explore their surrounding through play as they interact with different learning materials. Innovation includes rotating learning materials, so as to continue motivating and maintaining the learners' interest.

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