

Digitally assessing the visual memory of 4-5-year-old children from the selected Early Childhood Care and Education Centres in South Africa

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Abstract - This paper examines the digital assessment of young children's visual memory from the selected pre-schools in South Africa. The paper aims to collect information about how the integration of technology can benefit young children. There is a dearth of literature regarding the integration of technology in the Early Childhood Care and Education (ECCE) sector not to mention the use of tablet-based psychological assessment particularly among young children whose mother tongue is IsiXhosa. As the paper focuses on young children, prominent child development theorists, Bronfenbrenner and Piaget were chosen as lenses for this paper. Interpretive qualitative research was chosen for this paper. As the study sample, 20 children were purposely sampled from 4 selected centers with the permission of their parents to participate in the study. The children selected were based on their age, confirmation from parents, and home language. Observation and focus group discussions were used to gather data. From the qualitative data collected, themes for analysis emerged. From the observations made during the data collection phase, it was clear that not all children have used tablets. However, they were enthused when experimenting with tablets. From the data collected, when children were assessed on their visual memory they performed differently when presented with digital items. As the study focused on 4-5-year old, the findings further revealed that 5-year-old children excelled in visual memory as compared to 4-year-old ones. Therefore, the paper recommends that practitioners in pre-schools find ways of integrating digital devices into their daily programs, while the Department of Basic Education ensures that children at an early age are prepared for digital learning and the acquisition of 21st-century skills.

Keywords: 21st-century skills, Child development theory, Digital learning; Tablet-based assessment; Technology integration

I. INTRODUCTION

This paper examines the digital assessment of young children's visual memory from the 4 selected Early Childhood Development (ECD) centers in South Africa to gather more information about how when technology is integrated into early childhood education can benefit young children. Many factors influence every developing child. It is therefore important that such developments be observed in checking developmental delays that may delay the child. Should there be evidence of developmental delays, it is important that after identification, interventions are suggested earlier in a child's life to ensure that children are not deprived of developmental gains. As stated in Sabanathan, Wills, and Gladstone (2015), five significant common developmental realms serve as an indication of whether a child is developing or not, there are (i) intellectual / cognitive skills; (ii) motor skills; (iii) social and emotional skills (iv) language skills and (v) adaptive behavior skills. As this paper examines the children's visual memory when assessed digitally, from the developmental realms mentioned above, the paper's focus is on cognitive skills.

When assessing a child's cognitive skills, one needs to explore the role that psychological assessment plays in ascertaining children's level of development as standardized measures are used to gather information about children's development and develop strategies that may be employed should there be identified deficiencies with regards to the children's development (Laher & Cockcroft, 2014). Although psychological assessment plays a crucial role in a child's development, it has become a norm that some people often benefit from them more than others,

hence, the paper's focus is on the African child to ensure that such assessment practices can be applied to groups as well (Foxcroft & Davies, 2008). In any assessment conducted, the assessment tool needs to be valid and reliable as the scope of the people assessed is widened (Pitchford & Outhwaite, 2016). The children's visual memory was assessed using digitalized items. The assessment was conducted through tablet-based assessment. Little information is available about tablet-based psychological assessment and its development. Hence, this paper examined the digital assessment of young children's visual memory to gather information about the benefits of integrating technology in early childhood education. This paper is organized as follows, the conceptualization of key concepts, theoretical framework, methodology, results, discussion, and conclusion.

II. CONCEPTUALIZATION OF KEY CONCEPTS

As this paper examines the digital assessment of children's visual memory using tablets, this section will provide a brief description of the important concepts of this study. Hence, child development, cognitive development, memory, psychological assessment, and tablet-based assessment are briefly described in the section below. When human beings develop, they develop through a series of stages with continuous changes that each person goes through from conception until death and such changes differ for each person (De Witt, 2016). Child development includes the physical, cognitive, emotional, and social development of every child. When one studies child development holistic development must be examined to identify delays that may jeopardize a developing child when they get older. These developmental realms influence each other, for example, children's social surroundings may influence cognitive development. According to De Witt (2016), cognitive development is the ability of children to remember what they have learned and how to make meaning from what they have learned. Another important element of cognitive development is the children's ability to remember what they have expected and what that means to them. Hence, memory is perceived as a fundamental aspect of in child's cognitive development as it enables one to remember the observation made (Juan, Mendez-Lopez, Perez-Hernandez & Albiol-Perez, 2014). As memory influences the processing of the information that the child has been presented with, visual memory to be precise is about perceptual processing and how it is related to encoding, storing, and retrieving information that has been perceived (Magnussen, 2009). In finding out children's level of development, psychological assessment plays an important part (Laher & Cockcroft, 2014). Through psychological assessment, people's cognitive and behavioral processes and functioning can be assessed to determine if there are developmental delays that may be evident (Foxcroft, Roodt & Abrahams, 2013). When the psychological assessment is done by a registered counseling psychologist, what is important to note is that the child is at the center of the assessment, hence, for the assessment to be valid and reliable; the age and the developmental needs of the child should be considered (Foxcroft et al. 2013). Over time, psychological assessment benefitted a few privileged communities that do not represent the realities of children from other socio-economic backgrounds. In addition, the advent of technology brought about other means of assessing children to ensure the validity of assessments done and who the assessment is intended for. In this day in age, we have young children who have become technologically savvy at an early age, these children nowadays are even called digital natives because of their understanding and using technological devices (Stroud et al., 2016). Hence, this paper examines the assessment of children's visual memory using digitalized tablet items.

A tablet is a convenient device with a touchable screen as its primary input device that allows people without physical keyboards to enter text using a pop-up keyboard that appears on the screen (Christensson, 2011). Tablets are also suitable for young children because smaller touch screens enable children to manipulate them. In addition, they are cognitively easier and this is what makes them to better suitable for children to enhance their eye-hand coordination and motor skills (Neumann, 2014). Hence, Siegle (2013) believes that tablets are easily accessible to young children "because the tap and swipe gestures used to manipulate virtual objects on a tablet computer can be made very similar to the kinds of gestures that children would spontaneously use on physical objects in the real world" (p. 146). It has been reported that tablet technology also encourages the testing of memory Juan, et al. (2014) and over the years its use has been found effective in testing children's memory (Cimadevilla, Roldán, París, Arnedo & Roldán, 2014). Although there are benefits associated with using tablets for assessment, Marais, (2019) reports that in South Africa, gaps still exist in terms of developing tablet-based tests for children.

Objectives of the paper

This paper examines the digital assessment of young children's visual memory from the 4 selected Early Childhood Development (ECD) centers in South Africa to gather more information about how when technology is integrated into early childhood education can benefit young children.

The study was guided by the following research questions:

- How do children perform when assessed visual memory through tablet-based assessment?
- What observations are made based on children's test behavior when assessing their visual memory using the tablet?

III THEORETICAL FRAMEWORK

This paper adopted the ecological systems theory of Bronfenbrenner and the cognitive development of Jean Piaget. These theories were chosen for this paper because the paper encourages children to use their cognition in terms of remembering what they have seen. Moreover, the children's social surroundings, from immediate to wider contexts often influence the developing child. From an ecological systems theory (Bronfenbrenner, 1979), there is an interaction between the child and the environment, and a developing child is often affected whether directly or not directly involved. The theory has different layers that are perceived as influencing the developing child, they are; the microsystem, mesosystem, macrosystem, exosystem, and chronosystem (Bronfenbrenner, 1995). The first layer (microsystem) focuses on the child's immediate environment (home, preschool, and school), and this is where children predominantly interact and establish relationships with their immediate surroundings. This layer is more influential in terms of laying solid foundations for a developing child (Bronfenbrenner, 1977; 1979). Therefore, a conducive environment needs to be created for the developing child and prepare them for the second layer (mesosystem). With a mesosystem, the circle is now wider as other two or more settings have to connect for a developing child (Bronfenbrenner, 1989). The interaction from the layer is beyond home and such connections beyond home are also vital for the developing child, as they get exposed to new experiences. As children can develop from the connections launched from two or more layers, they may be able to reach the third layer (exosystem) successfully. This layer is about how other social structures affect the developing child. As the circle gets bigger, the developing child is even affected without being directly involved. This is because of the pressure that parents may have to endure maybe from work or families, if parents cannot handle such situations, their frustrations may be directed toward their children. This may even jeopardize the solid foundations laid already by the previous layers. The Macrosystem as the fourth layer of the ecological systems model refers to the all-encompassing institutional patterns of the culture as it is the laws, values, traditions, and universal discourses of a specific society. (Bronfenbrenner 1977; 1979). The last level in the ecological systems model is the chronosystem and the effects of time on other developmental systems matter in this layer. Time is important in one's development because transitions that take place in a developing child should be time-bound. The theory is relevant for this study because it helps understand children and their interaction with the larger community. This is because the relations that children have with their immediate and wider contexts influence how children develop holistically over time. Hence, Piaget believes that children learn as they grow and acquire new cognitive skills. In his theory, he emphasized the importance of building new knowledge from existing knowledge and this often brings about one's expanded knowledge (Piaget, 1952). For children to develop they should be engaged in their learning and this may likely influence their ability to remember and learn from each other. For one's cognitive development, memory is often perceived as important as learning and remembering are classified as core in cognitive development (De Witt, 2016). Piaget's theory has four stages and believes that children progress through all these stages. The stages are the sensorimotor stage (0 – 2 years); pre-operational stage (2 – 7 years); concrete operational stage (7 – 11 years) and formal operational stage (11 years and above). For this paper, only children who are in the pre-operational were studied as the study focused on children between the ages of four and five. This stage is between 2 to 7 years, and children use symbols in language and they mostly rely on perceptual experiences. These are both suitable because their focus is on the child's development and the impact that the environment has on the developing child as children construct knowledge through social interaction.

IV METHODOLOGY

This paper adopted an interpretive qualitative research approach to investigate the studied phenomenon. Qualitative research approach advocates for the selection of participants that are to be studied in their natural contexts, as the experiments are not promoted (Marshall & Rossman, 2016). From these natural contexts, the researcher has an opportunity of engaging participants where they are guaranteed a space where they can express themselves freely (Babbie, 2015). This enables participants to be free when interacting with the researcher and their ability to construct knowledge gets enhanced. This is in sync with the chosen paradigm of this paper, because as

people construct their knowledge; they often find an opportunity of deriving their meaning from the available information. The participants were purposively sampled (Creswell, 2014) when 20 children from 4 ECD centers were the participants. The 20 children that were purposely sampled from 4 selected centers were included in this study after permission from parents was received. Only isiXhosa-speaking children who were between the ages of 4 – 5 years old were included. Data was collected through non-participant observation and focus group discussions. The researcher observed how children engage with the tablet and how they behave when the tablet is used by another child. After the observation, the researcher engaged them in a small discussion in an attempt to find out how they experienced using the tablet. From the data collected, thematic analysis was adopted in examining the themes emanating from the collected data. Thematic analysis is perceived by Guest (2012) as the common data analysis approach that is often preferred by qualitative researchers. For quality and rigor, trustworthiness and credibility were adhered to (Lincoln & Guba, 2000). Informed consent was sought from parents and the researcher ensured parents that their children's names will remain anonymous and prevention from any harm was also ensured (Ketefian, 2015).

V RESULTS AND DISCUSSION

From the data collected, the themes to be analyzed are assessing visual memory through tablet-based assessment and children's test behavior when assessed using the tablet.

Performance on visual memory

As the study investigated the use of the tablet in assessing children's visual memory, it was important to know if children are digitally literate or illiterate. From the data collected, it was found that most children were digitally literate as they seem to understand how to manipulate the tablet with few of them who were not digitally literate. As the focus was on children between 4 – 5 years old, when it comes to digital literacy, most children who were digitally literate were within the 5-year-old group. When children assessed their visual memory, the data collected revealed that the majority of the chosen sample passed the assessment focusing on visual memory, with few children from the sampled participants failing the test. This finding implies that most children remembered what they have been exposed to during the tablet-based assessment. As children were able to remember what they have been exposed to when assessed using a tablet shows their level of cognitive development. From a cognitive theory view, memory is perceived as one of the important factors that when children master they are seen developing cognitively (Donald, Lazarus & Moolla, 2014). This is because memory may learn a solid foundation for a child's learning from the early years throughout their life. From the data, most children within the 5-year-old group passed the visual memory item as compared to the 4-year-olds who failed the item. Hence, for this study the children studied are in the pre-operational stage as the stage is for children between the ages of two to seven years. From the results of the study when it comes to the time that children spent on the tablet, it became evident that the more time children spent on the device the more they become conversant with the gadget. In addition, from the result, it is evident that both age groups performed similarly on items four and five. Although the 5-year-old age group performed better than 4-year-olds, suggests that there could be numerous reasons that contributed to this. For example, the interactions that children have with their environment can influence their development, placing the 5-year-old at an advantage over their counterparts. Bronfenbrenner (1977; 1979; 1989) therefore suggests that the development is a multidimensional and multifaceted structure as the child's development is influenced by varied structures and how such structures are connected (Bronfenbrenner, 1979). This suggests that the five layers of the ecological systems are shaped outward depending on their influence on the evolving person as they network and impact one's development (Bronfenbrenner, 1979; 1995). This is significant for this study as the emphasis is on one's cognitive development. De Witt (2016) proffers that cognitive development needs people to interrelate with their societal surroundings, as more interactions that people make are likely to yield positive cognitive milieus. From Piaget's theory, this occurs through a series of stages that a person goes through, and stages are aligned with one's age (Piaget, 1952).

Test behavior during tablet assessment

To collect data, the researcher observed the chosen research participants in an attempt to find out their behavior when assessing visual memory using the tablet. As the researcher observed the research participants several themes emerged concerning the studied phenomenon. The themes that emerged from the observation notes were; (i) attention, (ii) good rapport, (iii) motivation, and (iv) tablet interaction. These themes were found to be relevant in testing children's behavior and interaction during the testing of visual memory items using a tablet. The themes that emerged from the data are discussed below.

Attention plays an important role in psychological assessment because when people are given instructions they need to pay attention to execute what is required from them. From the observation, although children were excited to use tablets, they paid attention, as a result, they did well when their visual memory was assessed as most passed the assessment. However, some children who failed the visual memory assessment presented fidgety behavior and inattentiveness during the test. According to Juan, et al., (2014) inattentiveness poses a challenge as it may affect the test results. This is because when children are not paying attention they may not remember what they have learned. From the data collected, the 4-year-olds were less attentive than the 5-year-olds hence the 5-year-olds outperformed 4-year-olds when assessed. A good rapport was identified between the children and researcher as children interacted well with the items on the tablet as they enjoyed playing with it which seems to have increased their motivation. This is evident that cognitive development encourages people to interact with their societal surroundings. Whether people interact with their immediate or wider environment this still influences their cognitive development (Bronfenbrenner, 1989). As the good rapport was identified, most children seem motivated as they expressed their happiness when during the tablet-based assessment. This was a good sign for obtaining good results for assessing visual memory because even Foxcroft and Roodt (2008) alluded to the importance of motivation when people take tests. During the test, the researcher observed how children interacted with the tablet. During the process of visual memory assessment, children were never distracted by the animations from the tablet as most of them remain focused on the test.

VICONCLUSION

The study explored the digital assessment of young children's visual memory from the selected pre-schools in South Africa. The tablet-based assessment focused on 4 and 5-year-olds children who are speaking isiXhosa. From the selected it was evident that most children were digitally literate as they knew how to use the tablet and follow the prompts as they were assessed. However, few of them were illiterate. Those who were literate were predominantly the ones within the 5-year-old and they passed the visual memory assessment. From the observation, attention, good rapport, motivation, and tablet interaction were the common themes that emerged. From the observations, children were attentive during the visual memory assessment and this yielded positive results when children were assessed. In addition, there seem to have a good rapport between the researcher and children when visual memory was assessed. When children were interacting with the tablet during the tablet-based assessment of their visual memory, they were motivated and paying attention to the instruction given. However, there were a few children who fidget often during the test and this affected the test results. The animations and music that were playing from the background of the tablet while being assessed did not disturb them as most of them focussed and did well when assessed. Children engaged despite the music. Based on the above the paper recommends further integration of technology in early childhood years for children below 5 years.

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