



East African Journal of Arts and Social Sciences

eajass.eanso.org

Volume 8, Issue 3, 2025

Print ISSN: 2707-4277 | Online ISSN: 2707-4285

Title DOI: <https://doi.org/10.37284/2707-4285>



EAST AFRICAN
NATURE &
SCIENCE
ORGANIZATION

Original Article

Direct or Indirect Instruction on Environmental Print in Enhancing Letter Name Knowledge in Tanzanian Public Pre-Primary Classes: Which Works Better?

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Article DOI: <https://doi.org/10.37284/eajass.8.3.3385>

Date Published: ABSTRACT

24 July 2025

Keywords:

Letter Name,
Letter Name
Knowledge,
Direct
Instruction,
Indirect
Instruction,
Environmental
print.

The current study investigated the effects of direct and indirect instruction on environmental print to enhance Letter Name Knowledge (LNK). The research's foundations were sociocultural (direct) and constructivist (indirect) theories. The study was an eight-week intervention. It took place in the Shinyanga District Council, Tanzania, using a positivist, quantitative approach with a randomised experiment design and no control group. The study included two experimental groups—direct and indirect instruction—across six randomly selected schools from three wards. The participants were public pre-primary children, 293 (162 indirect, 131 indirect) and six teachers (three from each instructional type). The pre-primary teachers were responsible for enhancing LNK during the environmental print intervention, and their work was evaluated using the Fidelity Implementation checklist. The findings indicated insignificant differences in direct and indirect instruction on environmental print on enhancing LNK in both pretest and posttest. Data were collected through intervention tests and observations. Independent samples t-test, Welch t-test, and Kendall's Coefficient of Concordance (W) were used in analysing data. The finding is substantiated by constructivism and sociocultural theory, which suggest that both instructional strategies work better. This perspective supports the idea that both instructions contribute to ensuring that all children, regardless of their background, receive equitable access to quality early literacy education. Improvement in LNK is crucial, as it fosters early reading skills in children, ultimately contributing to equitable quality education, which supports sustainable development goals (4). Recommendation to the Ministry of Education, Science and Technology to develop and provide professional development workshops for pre-primary educators focused on effective strategies for teaching environmental print to enhance letter name knowledge (LNK). Further research needs to be done on pre-primary teachers' views on the challenges and benefits of environmental print strategies. Also, research is needed on the impact of environmental print instruction on children with diverse learning needs and backgrounds.

APA CITATION

Kabate, M. J. (2025). Direct or Indirect Instruction on Environmental Print in Enhancing Letter Name Knowledge in Tanzanian Public Pre-Primary Classes: Which Works Better?. *East African Journal of Arts and Social Sciences*, 8(3), 1-19. <https://doi.org/10.37284/eajass.8.3.3385>

CHICAGO CITATION

Kabate, Martha Jacob. 2025. "Direct or Indirect Instruction on Environmental Print in Enhancing Letter Name Knowledge in Tanzanian Public Pre-Primary Classes: Which Works Better?." *East African Journal of Arts and Social Sciences* 8 (3), 1-19. <https://doi.org/10.37284/eajass.8.3.3385>.

HARVARD CITATION

Kabate, M. J. (2025), "Direct or Indirect Instruction on Environmental Print in Enhancing Letter Name Knowledge in Tanzanian Public Pre-Primary Classes: Which Works Better?", *East African Journal of Arts and Social Sciences*, 8(3), pp. 1-19. doi: 10.37284/eajass.8.3.3385.

IEEE CITATION

M. J., Kabate "Direct or Indirect Instruction on Environmental Print in Enhancing Letter Name Knowledge in Tanzanian Public Pre-Primary Classes: Which Works Better?", *EAJASS*, vol. 8, no. 3, pp. 1-19, Jul. 2025.

MLA CITATION

Kabate, Martha Jacob. "Direct or Indirect Instruction on Environmental Print in Enhancing Letter Name Knowledge in Tanzanian Public Pre-Primary Classes: Which Works Better?." *East African Journal of Arts and Social Sciences*, Vol. 8, no. 3, Jul. 2025, pp. 1-19, doi:10.37284/eajass.8.3.3385

INTRODUCTION

The foundational stage of literacy development in early childhood education is crucial for fostering later academic success. Sustainable preschool education provides a child with a solid foundation for primary schooling (Osakwe, 2009; Borg, 2022). One critical component of this foundation is letter name knowledge, which refers to children's ability to recognise and name letters. Letter name knowledge is a key predictor of later reading abilities and has consistently been shown to be positively related to and a strong predictor of reading success across different orthographies (Caravolas et al., 2013; Kim, 2007; Larsen et al., 2024; Shanahan & Lonigan, 2010). Letter name knowledge also plays a pivotal role in the development of phonological awareness skills, particularly phonemic awareness and letter-sound knowledge—both essential for reading development (Foulin, 2005; Share, 2004; Adams, 1994).

Moreover, research highlights that early exposure to print and systematic instruction can significantly enhance letter name knowledge, which in turn supports reading development (Ehri et al., 2001). Hamilton (2013) showed that children who are oriented to print at the earliest age are predicted to

read words in the future. The author went further on how the availability of printed materials in the home influences a child's success in learning to read. Further, Kafumu (2014) asserts that there is a need to assess the teaching approaches employed by teachers in order to know whether they are appropriately used for improving learners' competence. According to Roskos et al. (2003), effective early literacy instruction offers preschoolers suitable environments, materials, and support to nurture early reading and writing skills into conventional literacy. Given the information, the present study is very significant in terms of reading ability in children.

In the context of early childhood education in Tanzania, pre-primary classrooms face unique challenges, including limited resources and varied instructional practices. These challenges can impact educational equity and inclusivity, making it crucial to explore effective instructional methods that cater to diverse learning needs. Environmental print—such as signs, labels, and posters found in the surrounding environment—offers a potential tool for enhancing literacy skills among young learners (Whitehurst & Lonigan, 1998). Environmental print provides contextual and meaningful exposure to print, which can support children's letter name

recognition and production through both direct and indirect instructional methods (Rosenblatt, 1978; Treiman, 2019). This approach can be particularly beneficial in promoting inclusivity by providing diverse and accessible learning experiences for all students, including those from under-resourced settings.

Direct instruction involves explicit teaching strategies where letter names are taught systematically, often through structured activities and focused lessons (National Reading Panel, 2000). In contrast, indirect instruction relies on incidental learning that occurs through everyday interactions with environmental print, where children encounter and learn about letters in natural contexts (Rosenblatt, 1978). Both methods have been shown to be effective in various educational settings, but their comparative effectiveness in the Tanzanian context remains underexplored (Goswami, 2015). Investigating these instructional methods in a setting characterised by diverse student backgrounds can offer insights into how equitable and inclusive practices can be implemented.

Tanzanian public pre-primary classes serve a diverse population of young learners, making them an ideal setting to investigate instructional approaches that support equity and inclusion. The availability and use of environmental print in Tanzanian classrooms may differ from other contexts, potentially influencing the effectiveness of direct versus indirect instruction (Miller & Reddy, 2019). Understanding how instructional methods impact letter name knowledge in this specific setting could provide valuable insights for educators and policymakers aiming to enhance early literacy outcomes and promote equity and inclusion in education. This study seeks to address the gap in the existing literature by comparing the effect of direct and indirect instruction on environmental print in enhancing letter name knowledge among children in Tanzanian public pre-primary classes, which is little done.

LITERATURE REVIEW

Empirical Literature Review

The empirical literature on the effect of direct versus indirect instruction using environmental print to enhance letter name knowledge reveals varied findings. Studies such as those by Sénéchal and LeFevre (2002) demonstrate that direct instruction, which involves explicit teaching of letter names and their associations with environmental print, significantly improves early literacy skills in children. Justice et al. (2006) support prior information, which highlights that children exposed to structured, explicit teaching methods show greater gains in letter recognition and phonological awareness compared to those receiving more incidental exposure. Sénéchal and LeFevre (2002), Justice et al. (2008), and McGinty et al. (2012) showed that explicit print instruction contributed to children's learning. Still, its benefits decreased as the quality of the classroom and children's attentional skills increased.

Conversely, indirect instruction, which integrates letter learning into broader exploratory activities, has also been shown to foster letter name knowledge, though often at a slower rate (Graham & Hebert, 2011). For instance, the work of Whitehurst and Lonigan (2001) suggests that while indirect methods can enhance children's engagement and contextual understanding of print, they may not be as effective in rapidly advancing letter name knowledge. In the context of Tanzanian pre-primary education, these findings suggest a need to assess the balance between direct and indirect approaches to optimise literacy instruction and cater to local educational needs. Specific studies in Tanzanian pre-primary education might be scarce, and research on early literacy interventions in similar contexts is limited.

Theoretical Framework

The Sociocultural theory of Vygotsky (1978) and the constructivist theory of Jean Piaget (1896–1988) guided the study. The sociocultural theory asserts

that learning is culturally dependent (direct instruction). The sociocultural theory focuses on three main areas: social interaction, the more knowledgeable partner (for example, the adult in teacher-child interactions), and the zone of proximal development (ZPD) (Evans et al., 2009). The theory asserts that learning is a mostly social process that occurs through interactions with people who possess more knowledge or skill than the learner. The Zone of Proximal Development (ZPD) was a key construct in Lev Vygotsky's theory of learning and development. The ZPD is the distance between what a person can do with and without help. Vygotsky, 1978). It is defined as the difference between the actual level of development as determined by independent problem-solving and the higher level of potential development as determined through problem-solving under guidance or in collaboration with More Knowledgeable Others (MKO). Constructivism proposes that new information is created by building on existing knowledge and experiences (Bransford et al., 2000). Constructivism emphasises the importance of learners actively engaging with new information and building upon their existing knowledge through indirect instruction. Through this process, learners can develop critical thinking skills and problem-solving abilities. Both theories show how learning takes place for a child by being guided by an expert or by independent learning.

Present Study

The present was a quasi-randomised control trial experiment without a control group. The study

assessed the direct and indirect instructional strategies for enhancing alphabet letter writing with the support of environmental print for pre-primary classes in the Shinyanga district. The present study was guided by a null hypothesis (*Ho*): *There are no significant differences between direct and indirect instructional strategies in the development of alphabet letter name knowledge with the support of environmental print by pre-primary teachers.*

METHODS

Participants

The participants of this study were pre-primary children aged five and above and their respective teachers. According to Zubairi and Rose (2018), age five is the most critical development stage in a child's life, and the brain is 90% developed and is the foundation stage for success in school. The pre-primary children were male; 132 (45.1%) were male; among them, 74 (56.1%) were under direct instruction and 58 (43.9%) were under indirect instruction. Of the females, 161 (54.9%), 88 (54.7%) were under direct instruction, and 73 (45.3%) were under indirect instruction. Therefore, the total number of children involved in direct instruction was 162 (55.3%), and indirect instruction was 131 (44.7%). The majority, N = 174 (59.4%), of the studied children were aged six years; others were five years of age, N = 110 (37.5%), and a few were seven years of age (9.1%). In the study, N = 162 (55.3%) children were under direct instruction, and N = 131 (44.7%). Six teachers were involved in the study.

Table 1: The Sampled Primary Schools, Number of Pre-primary Classes and Instructional Strategy

| Instructional Strategies | Primary schools | Number (N) of children in pre-primary classes attached to primary schools. | % |
|--------------------------|-----------------|--|-------------|
| Direct Instruction | School A | 57 | 35.2% |
| | School B | 43 | 26.5% |
| | School C | 62 | 38.3% |
| Total Number | | 162 | 100% |
| Indirect Instruction | School D | 42 | 32.1% |
| | School E | 57 | 43.5% |
| | School F | 32 | 24.4% |
| Total Number | | 131 | 100% |

Source: Field Data (2021)

From Table 1, $n = 162$ children were under direct instruction, while $n = 131$ were involved in indirect instruction ($N = 293$). $N = 293$ children, plus their six teachers from each primary school who teach

pre-primary classes, were involved in the study, making 299 total participants involved in the intervention study.

Table 2: Number of Children for Pre-primary Classes Involved in the Intervention Study Based on Instruction and Gender

| Instructions Over Conditions | Pre-Test | | | Post-Test | | |
|-----------------------------------|------------|------------|------------|------------|------------|------------|
| | Male (n) | Female(n) | Total (n) | Male(n) | Female(n) | Total(n) |
| Experimental Indirect Instruction | 58 | 73 | 131 | 57 | 71 | 128 |
| Experimental Direct Instruction | 74 | 88 | 162 | 74 | 86 | 160 |
| TOTAL | 132 | 161 | 293 | 131 | 157 | 288 |

Source: *Research (2021).*

Table 2 shows the number of children involved in the study based on instructional strategies used by gender. One hundred thirty-two males and 161 females were involved in the pretest, making a total of 293. The number of children involved in the posttest was 288; among them, 131 were male and 157 were female.

Procedure

The present study was conducted in the Shinyanga district council, Shinyanga Region. According to UWEZO (2017), between 2011 and 2015, the Shinyanga region was reported to be among the seven regions showing low performance (32%) in Kiswahili. District-wise, Shinyanga Rural (44%) has been doing poorly in literacy (Kiswahili, English, and numeracy) among children aged three up to 9 years, according to the EQUIP Tanzania baseline assessment in 2014. It was reported that the Shinyanga region is among the five regions where 77% of the children come from homes where Kiswahili is not the primary language (language minority) spoken at home. This might be the reason why the region and the district, in particular, are doing poorly in literacy in Kiswahili.

Pre-primary learners were drawn from six primary schools. The six schools are among the 136 primary schools in three divisions and 26 wards. Each division was represented in the research by a ward that was selected by random sampling (3). Again,

random sampling was used to select two primary schools from each sampled ward (3) for treatment with direct and indirect instruction. Therefore, the survey involved six sampled schools (3 for direct instruction and 3 for indirect instruction). Each sampled primary school contributed one pre-primary class for the current investigation. Six (6) pre-primary education teachers from sampled schools participated in the research.

Data was obtained by conducting intervention tests (pretest and posttest) and observations for pre-primary children. Observation methods included an observation checklist and fidelity implementation. In addition, the researcher conducted a training session for pre-primary education teachers, consisting of six teachers and three researchers (two research assistants and one primary researcher), resulting in nine individuals involved across the selected nine schools.

Intervention

The intervention was school-based, providing it to learners during regular school hours. The intervention aimed to evaluate direct and indirect instructional strategies with environmental print support. Before the intervention, the researcher conducted in-service training for pre-primary teachers and six research assistants for two days, September 27 and 28, to impact teachers' beliefs and classroom practices. According to Fukkink and

Lont (2007), such in-service training enhances early childhood educators' attitudes, knowledge, and abilities. The purpose of the training was to help pre-primary teachers gain knowledge and skills in using environmental print to enhance emergent literacy skills in children. Also, pre-primary teachers should use instructional strategies and emphasise the importance of instructions in enhancing emergent literacy skills in children. At the end of the training, teachers were expected to describe the characteristics of a child for better teaching and learning of emergent literacy skills, identify and explain the environmental print on enhancing Letter Name Knowledge, identify and explain the emergent literacy skills involved in the intervention; explain the alphabet letters involved in the intervention and the reasons for their inclusion; identify and explain the instructional strategies (direct and indirect) used in the intervention study and to recognise and explain the sociocultural learning theory and constructivism and their application to enhancing emerging literacy skills through environmental print. The strategies used included facilitation, discussion, and questions and answers, which were used interchangeably. The methods used were trying to gain and give experiences from each other to reach the intended objectives of the intervention.

Pre and post-intervention test: The Mason and Stewart (1990) uppercase (B, D, S, T, O, A, H, K, M, and C) and lowercase letters (b, d, s, t, o, a, h, k, m, and c) were assessed to children in both pretest and posttest. A pretest intervention was administered from September 29 to October 1 2021; three full days were devoted to pre-intervention testing. Mason and Stewart (1990) recommend ten (10) letters (B, D, S, T, O, A, H, K, M, and C) for assessing letter name knowledge were used. The authors suggested the alphabet letters because they contain a mixture of simple and complex letters based on the development of emerging literacy skills. Turnbull et al. (2010) state that acquiring alphabet letters should be done simultaneously: uppercase and lowercase letters. For intervention

implementation and in the present study's pretest and posttest, uppercase letters were introduced first, followed by a lowercase letter. The simultaneous process for teaching alphabet letters contradicts the Tanzanian Pre-primary Curriculum, 2016 (UTR, 2016). Uppercase letters serve as a bootstrap for learning lowercase letters and make children sixteen times more likely to know the corresponding lowercase letter (Turnbull et al., 2010). The post-intervention test was conducted for six days, from December 1 to December 8, 2021 (the 4th and 5th were weekends), in contrast to the pretest, which lasted only three days. There were more days in the posttest because children had more knowledge of emergent literacy skills than in the pretest time. The first five days were used to assess environmental printing and letter name knowledge, and the sixth day was used to assess letter writing. The post-intervention test aimed to determine whether learners' emergent skills improved after an environmental print intervention. The alphabet letters used are the ones recommended earlier, as stated. The measurements included in the posttest were the same as those in the pretest. In addition, the strategies used in the assessment are the same as in the pretest.

Intervention implementation: Kiswahili alphabet letters (24), including uppercase and their respective lowercase (Aa, Bb, Cc, Dd, Ee, Ff, Gg, Ii, Jj, Kk, Ll, Mm, Oo, Pp, Rr, Ss, Tt, Uu, Vv, Ww, Yy, Zz) were included in the intervention study. The alphabet letters were made on manila cards containing alphabet letters (Uppercase and lowercase) embedded with pictures matched with the alphabet of the day, which were both contextual and non-contextual. Despite the differences in instructional strategies, children were introduced to environmental print, which contains alphabet letters (24 alphabet letters) embedded with colours and pictures. Colours and pictures are visual contextual cues in the development of logographic skills (Neumann et al., 2011). Logographic skills help a child develop emergent literacy skills; letter-writing skills are included. However, before the

intervention took off, the six teachers were trained for one day. The training was all about teaching alphabet letter knowledge using environmental print learning tools through direct and indirect instruction, orienting teachers on the strategies and purposes of the study. The training also aimed to identify the schools that are using direct and indirect instructional strategies. The Kiswahili (24) alphabet letters, uppercase and their respective lowercase. In addition to that, children were given a pretest before the intervention began.

The alphabet letters were in Century Gothic, size 120 (Neumann et al., 2014). During the treatment, each day in a week, one alphabet letter (LETTER A DAY) (Piasta & Wagner, 2010; Jones et al., 2012) was posted outside at the child learning corner as used by (Piasta & Wagner, 2010; Jones et al., 2012) and in the classroom to create a print-rich environment as stated by (Gerde et al., 2016) for nine weeks from 4/10/2021–29/11/2021 (refer table 3). Research demonstrates that young children in a classroom with more print have higher writing abilities than children in classrooms with less print (Gerde et al., 2016). A print-rich environment is essential to a child's emergent letter-writing (Elliott and Olliff, 2008). At the end of each week, a time was set aside for reviewing what had been learned throughout the week; in this, the children were given traced alphabet letters for writing activities. The intervention implementation was scheduled as follows;

Week One (4th -8th October 2021): this week, alphabet letters A, B and C were enhanced while the review was done on the 7th and 8th of October 2021.

Week Two (11th -15th October 2021): Alphabet letters D, E and F were enhanced. October 15 was

allocated for review work. According to the calendar, only one day was used for review work since October 14, which was Mwalimu Nyerere Day.

Week Three (18th -22nd October 2021). G, H and J alphabet letters were enhanced. 21st and 22nd of October 2021 were for review work.

Week Four (25th -27th October 2021): This week, the 28th and 29th of October were allocated standard four National Examination; therefore, only two alphabet letters were included: J and K. The review work was done on October 27 2021.

Week Five (1st -5th November 2021): L, M and N were enhanced this week. 4th and 5th of November 2021 were for review work.

Week Six (8th -12th November 2021): O, P and R alphabet letters were enhanced this week. 11th and 12th were for review work.

Week Seven (15th -19 November 2021): The alphabet letters S, T and U were enhanced. 18th and 19th were for review work.

Week Eight (22nd -26th November 2021): V, W and Y were enhanced, and 25th and 26th were for review work.

Week Nine (November 29): this week, only the Z alphabet letter was enhanced, and November 30 was for review work.

Furthermore, pictures corresponding to alphabet letters in the environmental print were highly familiar to a child, i.e., objects found in their environment, depicted in Table 1.

Table 3: Uppercase and Lowercase Letters, Names of the Picture or Objects Matched in the Environmental Print and Alphabet Letter Names

| The symbolic expression of the Alphabet letters | | Names of matched pictures in English | Names of matched pictures in Kiswahili | Name of the alphabet in Kiswahili |
|---|-----------|--------------------------------------|--|-----------------------------------|
| Uppercase | Lowercase | | | |
| A | A | Honey | ‘Asali’ | A |
| B | B | A duck | ‘Bata’ | be |
| C | C | An orange | ‘Chungwa’ | che |
| D | D | A circle | ‘Duara’ | de |
| E | E | A mango | ‘Embe’ | E |
| F | F | A broom | Fagio | ef |
| G | G | A dress | Gauni | ge |
| H | H | A tent | ‘Hema’ ‘Hindi’ | he |
| I | I | Sing | imba | I |
| J | J | A hoe | Jembe | je |
| K | K | A hen | Kuku | ka |
| L | L | Sleep | ‘Lala’ | le |
| M | M | grasses | ‘majani’ | em |
| N | N | Wash | ‘Osha’ | O |
| O | O | Pawpaw | ‘papai’ | Pe |
| P | P | Jump | ‘Ruka’ | Re |
| R | R | A fish | ‘Samaki’ | Se |
| S | S | watermelon | Tikiti maji | Te |
| T | T | A flower | ‘Ua | U |
| U | You | Shoes | ‘viatu’ | Ve |
| V | V | children | ‘watoto’ | we |
| Y | Y | An egg | ‘Yai’ | Ye |
| Z | Z | Stick zither | Zeze | Ze |

Source: *Researcher (2021)*

In experimental schools, trained teachers used environmental print for indirect or direct instruction from week one through week nine. All six experimental schools worked with all three emergent literacy skills, including environmental print knowledge, alphabet letter names, and alphabet letter writing. The environmental print was posted every morning in the class and at the children's corner of learning. Uppercase letters started to be instructed, followed by their corresponding lowercase letters (Jones et al., 2013; Piasta & Wagner, 2010; Piasta et al., 2022). The reasons behind that include: children show a preference for uppercase letters (Treiman & Kessler, 2004); uppercase letters appear in the initial letters of names (Haryono et al., 2018)); uppercase letters serve as bootstraps in learning lowercase; and

lowercase letters are more challenging to write than uppercase letters (Lonigan, 2003).

On each working day, the trained pre-primary teachers had to spend 15–30 minutes (Neumann, 2012) leading and assisting children in acquiring emergent literacy skills with the support of environmental print. The use of 15-30 minutes was clarified by a researcher to trained teachers; the first 15 minutes were to be used in the morning before the start of lessons, and the second 15 minutes were to be covered when children were in play during break time. Roskos and Christie (2003) see a play in early literacy learning as it supports children's understanding of the connections between oral and written language. The authors emphasise that children can learn a lot about print when it is integrated into play areas (Roskos and Christie

2003). Furthermore, the acquisition of letter name skills was enhanced during the morning and during break time.

Instructional and Multisensory strategies: In the intervention process, multisensory strategies were used, including visual (point), auditory (say), tactile (trace) (Neumann, 2018), and environmental referencing (children showing attention to environmental prints) Neumann et al. (2013). Studies like Neuman et al. (2000) and Evans & Saint-Aubin (2010) show that the pointing strategy is an important strategy that makes children follow what is taught and engage with print. The masking strategy (Vera, 2010) was also used to help children focus on one single letter in their alphabet knowledge. Masking is a strategy that "highlights a word or letter that is to be talked about" (Holdaway, 1979). A masking strategy was also used in the pretest and posttest. "Show and tell was also used; the strategies are in both verbal and nonverbal referencing (Sofka & Justice, 2010). Exposure to environmental print, both independently and adult-guided, has been shown to increase emergent literacy skills (West, 2017). As stated earlier, the present study enhanced emergent literacy skills through direct and indirect instruction with the support of environmental print.

Direct instruction (explicit approach): A teacher starts a short review of the previous letter learned the other day while enhancing emergent literacy skills. A trained teacher sets a purpose or goal using clear language at the beginning of the lesson so children understand the skill. Through demonstration and modelling with active practice, the trained teacher provided the name of the day's letter and guided the children to make the relationship between the uppercase and lowercase letters based on their names.

In the journey of children's learning, a teacher commented about printing, posed requests about print, and pointed to the print when talking about the story. Together, the trained teacher answered the children's questions about the print and expanded

upon what the children said. Also, a trained teacher followed the children's interests while reading the environmental print while playing. Teachers' examples regarding children learning through print and modelling when enhancing emergent literacy skills enable children to understand and visualise expectations. Using multisensory strategies in this instructional strategy increases children's motivation to learn and engagement in learning (Neumann et al., 2012).

Indirect instruction (implicit/embedded approach): It has low scaffolding, centred on child-initiated comments and interest. The teacher allowed the learning to continue without interruptions. The teacher created a learning environment where children learn print directionality (left to right) and differentiate print from pictures—learned to read and write mainly by reading and writing using environmental print. Children reading aloud or silently. Peers developed emergent literacy skills in this instruction, and children themselves were encouraged to take significant responsibility for their learning. There was minimal use of multisensory strategies as far as the indirect strategy is concerned.

Review under Direct Instruction Strategy (Distributed Review): Children in this strategy had more time to work with their teachers. In the present study, children were reminded of what they were taught about going through a print and identifying what was in it. Children were given more exercises on recognition and production of names of alphabet letters by assimilating the uppercase and lowercase alphabet letters. Children were given a piece of paper with the learned letters for matching purposes for letter naming acquisition (alphabet letter name recognition). The matching activity also enhanced environmental print knowledge. The alphabet letters to be matched were Gothic Century 72 font size, as emphasised by Neumann and Neumann (2009). Children were presented with each uppercase letter, and the lowercase letters were learned in a week on individual cards in random

order and asked to say (letter name production) the name asked. Children were asked, “What is the name of the letter?” (Neumann and Neumann 2014).

Review under Indirect Instructional Strategy or

Massed Review: In indirect instruction, there is minimal interaction between a teacher and children. Children are guided to go through the environmental print, and after that, they make reviews on their own or with the help of their peers.

Observation

The researcher used the observation method in the intervention to gain knowledge of the context in which events occurred. It enabled the researcher to see and comprehend information that neither the participants nor the teacher who participated in the experiment knew. The observation checklist was made from literature with a 1-weak, 2-moderate, and 3 (substantial) rating scales if the child does not show literacy behaviour based on the assessed emergent literacy skills. Two, if the learner shows literacy behaviours of emergent literacy skills with mistakes, and three, if a child clearly shows literacy behaviour based on the assessed emergent literacy skills. The observation used a 13-item intervention fidelity checklist with a Cronbach's alpha of 0.967 (Excellent) and a 10-item observation checklist with a Cronbach's alpha of 0.612 (Good). According to Wim, Katrien, Patrick, and Patrick (2008), as cited in Said (2018), Cronbach's alpha between 0.60 and 0.80 is acceptable.

Fidelity of Implementation Checklist

The fidelity of any intervention study is critical to its validity, which is directly connected to the statistical power of outcome analyses. Failure to achieve fidelity limits the conclusions that may be taken from any outcome evaluation (Dumas et al., 2001). During efficacy and effectiveness research, the fidelity of implementation is described as determining how well an intervention is executed concerning the original program design (Hill et al., 2007). A focused approach to assessing program fidelity. (*Prevention Science*, 8, 25-34). The

consistency with which an intervention is implemented influences its success (Dusenbury et al., 2003; Dane & Schneider, 1998; Elliott & Mihalic, 2004).

Validity and Reliability

Experts in language and early literacy specialists validated the pre- and post-intervention assessments for validity. As stated by Justice & Pullen (2003), careful training of interventionists and monitoring fidelity in implementation were done. For reliability, the research assistants involved in the intervention study were given the appropriate training to conduct the intervention test. During observation, the recording methods' dependability and correctness were examined closely.

Data Processing, Analysis and Interpretation

A multi-method (tests and observation) was used to assess the variables in the study. Independent sample t-test, Welch t-test, paired t-test, and Kendall (W) were used. The null hypothesis was tested at a significance level of 0.05 and a confidence level of 95%; *there are no significant differences in using direct and indirect instructional strategies in developing letter name knowledge with the support of environmental print by pre-primary teachers*. When two experimental conditions have distinct participants, an independent sample t-test is utilised (Field, 2005). Children in the present study received direct or indirect education to improve their knowledge of alphabet letter names. The assumptions of the independent sample t-test include independence, normality, and homogeneity of variance (Skaik, 2015; Field, 2005). Welch t-test: is the parametric test for comparing means between two independent groups without assuming equal population variances (Ahad & Syed-Yahaya, 2014). The Welch t-test is an adaptation of an independent-test intended for two samples having possibly unequal variances. This statistic is robust for testing to mean equality when the homogeneity assumption is invalid. Kendall's Coefficient of Concordance (W) is a measure that applies ranks to

establish an agreement among raters evaluating a given set of objects (Gearhart et al., 2013). The current study used Kendall's Coefficient of Concordance (W) to compute data from observation and Fidelity implementation checklists. The two checklists were observed differently by the researcher and the assistant researchers.

Likert Scale and Interpretation of Information from Observation Instruments

The observation instruments involved an observation checklist with a three-point Likert scale and fidelity of implementation with a four-point Likert scale. For the fidelity implementation checklist, the researcher used a Likert four-point scale mean scores interpretation (Nee & Yunus, 2020) on "*An Effective Method to Improve Writing Skills among Year 3 Pupils*": 4.00-3.00 (Strongly Agree), 2.99-2.00 (Agree), 1.99-1.00 (Disagree), and 1.00-0.99 (Strongly Disagree).

Measurement and Assumptions

The dependent variables were measured using ten upper alphabet letters (B, D, S, T, O, A, H, K, M, C) recommended by Mason and Stewart (1990). The researcher added the lowercase letters (b, d, s, t, o, a, h, k, m, c) of the recommended uppercase letters.

Letter Name Knowledge had 40 items from four subcategories. The range score was 0-80. Each subcategory had ten (10) items with a range score of 0-20. In this variable, children were assessed on recognising uppercase (10 items) and lowercase letters (10 items) and producing uppercase (10 items) and lowercase (10 items).

Assumptions for the Independent Sample t-test

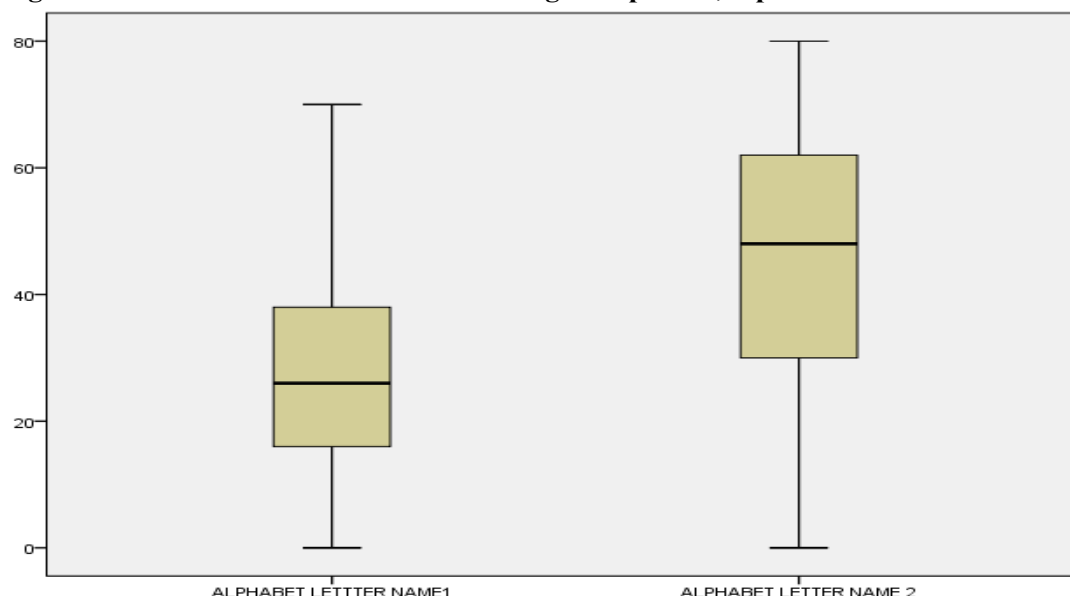
Before performing the independent sample t-test, the following assumptions were computed;

Independence: The direct and indirect instruction strategies are mutually exclusive and independent.

Normality: The study computed skewness and kurtosis of the outcome variables for the pretest and posttest; alphabet letter name skewness -.566, kurtosis -.717; Griffin and Steinrecher (2013) and Collier (2020) recommended acceptable values for skewness as being -3 to +3 and kurtosis from -10 to +10. Therefore, skewness and kurtosis of the outcome variables of both measurements are well within range; we can assume normality.

Outliers: Aggarwal (2016) defines an outlier as an observation that deviates significantly from other observations. No outliers were identified.

Figure 1: Outliers of Letter Name Knowledge: 1 =pretest;2=posttest.



Homogeneity of Variances: Levene's test for equality of variances was used to compute this assumption. Letter name knowledge shows $F(1,291) = 6.367$, $P = .012$, equal variances are not assumed for the pretest. The assumption of homogeneity of variances is violated for the variable alphabet letter name. Equal variances are predicted $F(1,286) = 2.634$, $p = .106$ for alphabet letter names on the posttest. According to Delacre et al. (2017), if variances are not equal across groups and sample sizes vary across independent groups, the independent sample t-test can be highly biased and lead to invalid statistical conclusions. The Welch t-test is an adaptation of the independent sample t-test; it has nearly the same power as the independent sample pretest (Ahad & Yahaya, 2014). According to Ahad and Yahaya (2014), the Welch t-test is a parametric test for comparing the means of two independent groups without assuming equal variances when the assumption of homogeneity is violated. Therefore, the Welch t-test was conducted on the pretest for alphabet letter names and the posttest for alphabet letter writing skills.

FINDINGS OF THE STUDY

To achieve the goal, means and standard deviations were computed before and after the intervention—computation of means and standard deviations compares performance in observing the effectiveness of the instructional strategies. This variable assesses the degree to which the child can recognise and produce names of alphabet letters in uppercase and lowercase against direct and indirect instructional strategies in pre- and posttest. In recognition of alphabet letters uppercase, for pretest scores, direct instructional strategy ($M = 7.79$,

$SD = 5.26$), indirect instruction strategy ($M = 7.04$, $SD = 4.44$), for posttest scores, direct instructional strategy ($M = 12.33$, $SD = 6.36$), indirect instruction strategy ($M = 11.54$, $SD = 6.97$). In recognising the lowercase letters for the pretest scores, direct instructional strategy ($M = 8.17$, $SD = 5.58$), indirect instructional strategy ($M = 7.10$, $SD = 4.46$), for posttest scores, direct instructional strategy ($M = 13.23$, $SD = 5.54$), indirect instructional strategy ($M = 12.27$, $SD = 7.39$). On the other hand, alphabet uppercase letter name production, for pretest scores, direct instructional strategy ($M = 5.21$, $SD = 4.31$), indirect instruction strategy ($M = 4.37$, $SD = 3.42$), for posttest scores, direct instructional strategy ($M = 9.58$, $SD = 5.45$), indirect instruction strategy ($M = 8.20$, $SD = 5.41$). In recognising the lowercase letters for the pretest scores, direct instructional strategy ($M = 5.63$, $SD = 4.29$), indirect instructional strategy ($M = 4.85$, $SD = 3.69$), for posttest scores, direct instructional strategy ($M = 9.58$, $SD = 5.23$), indirect instructional strategy ($M = 8.55$, $SD = 5.46$).

The findings show that almost all categories of alphabet letter names scored higher in the posttest than in the pretest for direct and indirect instruction. However, direct instruction had a much more significant impact on enhancing alphabet letter names than indirect instruction with the support of environmental print. Recognition of alphabet uppercase and lowercase letters had higher mean scores in the pretest and posttest than the production of alphabet uppercase and lowercase letter names across instructional strategies and time. Both direct and indirect instruction enhance letter recognition with the aid of environmental print. Direct instruction has more of an impact on the recognition of lowercase letters than indirect instruction.

Table 4: Descriptive statistics; Number of Children, Mean, Standard Deviation, and Standard Error of Emergent Literacy Skills Across Time and Instructional Strategies

| Dependent Variables | Instructional Strategies | Pretest | | | | Posttest | | | |
|----------------------|--------------------------|---------|-------|-------|-----------|----------|-------|-------|----------|
| | | N | M | SD | Std error | N | M | SD | SD error |
| Alphabet letter Name | Direct instruction | 162 | 26.06 | 17.46 | 1.37 | 160 | 43.63 | 21.47 | 1.780 |
| | Indirect instruction | 131 | 24.09 | 14.48 | 1.26 | 128 | 40.07 | 23.83 | 2.10 |

Source: Field Data (2021).

Table 4 indicates mean scores of environmental print knowledge, alphabet letter name, and alphabet letter writing skills across direct and indirect instruction. Among the three assessed emergent literacy skills, alphabet writing had low mean scores compared to alphabet letter names and environmental print knowledge across instructional strategies. It suggests that environmental print is not a significant resource for improving alphabet letter writing through direct and indirect instructions. The table shows that direct instruction impacted environmental print knowledge and alphabet letter writing due to the increase in mean scores from the pretest to the posttest.

In the independent sample t-test, two statistical tests are assessed, “Levene’s test for equality of variances and test statistics for equality of means. There are two hypotheses for Levene’s test: either we accept the population variances of groups one and two as equal or reject the hypothesis that the population variances of groups one and two are unequal. Levene’s test of equality of variances guides further interpretation of whether to go through the first or the second line in the t-test for equality of means. According to Leung (2011), Welch’s t-test is a modification of the independent sample t-test for the assumption of unequal variances, which allows heterogeneous variances under $p < 0.05$ to be tested with ANOVA.

Table 5: Independent Sample t-test for Variables met Homogeneity of Variances

| Dependent variables | | | Levene's Test for equality of variances | | t-test for equality of means | | | |
|------------------------|----------------------------------|--|---|------|------------------------------|---------|----------------|---------------|
| | | | F | Sig | t | Df | Sig (2-tailed) | M differences |
| Alphabet letter name 2 | Equal variances assumed | | 2.634 | .106 | 1.342 | 286 | .181 | 3.590 |
| | | | | | | | | 3.590 |
| | Equal variances are not assumed. | | | | 1.327 | 258.462 | .186 | |

Note: 1= pretest, 2=posttest

Source: Researcher (2021).

Table 5 shows the results of the independent sample t-test analysis, revealing the p-value of Levene's test of equality of variances of the outcome variables, which is non-significant. The independent sample t-test was interpreted using the null hypothesis that all variables had equal variances. The first line of the table was taken into consideration. Therefore, in examining the development of each emergent literacy skill across direct and indirect instruction, an independent sample t-test was used. The results for each dependent variable against the independent variable include: The findings for alphabet letter names were as follows: direct instruction ($M=43.68$, $SD=21.47$), indirect instruction ($M=40.07$, $SD=23.83$), $t(286) = 1.342$, $p=.181$ posttest, the pretest results for alphabet letter names were presented through Welch's t-test. Welch's t-test

findings showed non-statistical significance differences in the development of alphabet letter names for pretest across instructional strategies, direct instruction ($M=26.06$, $SD=17.46$), indirect instruction ($M=24.09$, $SD=14.48$), $t(290.803) = 1.056$, $p=.292$, the null hypothesis was accepted. The findings imply that direct or indirect instructions with the support of environmental print knowledge influence the development of alphabet letter name knowledge.

Furthermore, Tables 6 and 7 present findings from observations. Fidelity implementation checklists refer to Table 6, which presents the association of raters with the statements of the fidelity implementation checklist. Eight out of thirteen statements of raters had higher mean scores

($M=4.00$, $SD=.00$) with a higher rank of 8.78. Kendall's coefficient concordance was .789, implying 78% agreement among raters. Further, Kendall's W. 931, implying 93%, also shows the significance of the observation .0000; the P value is

< than 0.05 significant level. Regarding the implementation of the intervention, the fidelity implementation checklist shows that the trained teachers were positive with the program and did what the researcher and the program intended.

Table 6: Descriptive Statistics: Mean and Standard Deviations for Fidelity Implementation Checklist

| | Observed statements | Number cases | Mean | Standard deviation | Mean Rank |
|--|--|--------------|------|--------------------|-----------|
| Quality of Instruction | | | | | |
| 1 | A trained teacher uses clear and concise, age-appropriate language | 102 | 3.84 | .36 | 7.16 |
| 2 | A trained teacher provides clear expectations for children | 102 | 3.13 | .48 | 3.54 |
| 3 | A trained teacher provides clear instructions | 102 | 4.00 | .00 | 8.78 |
| 4 | A trained teacher ensures children understand instructions | 102 | 3.10 | .44 | 3.30 |
| 5 | A trained teacher demonstrates and guides activities | 102 | 4.00 | .00 | 8.78 |
| 6 | A trained teacher maintains children's attention, engagement, and interest | 102 | 4.00 | .00 | 8.78 |
| 7 | A trained teacher provides praise and encouragement | 102 | 4.00 | .00 | 8.78 |
| 8 | A trained teacher interacts positively with children | 102 | 3.05 | .39 | 2.99 |
| 9 | A trained teacher displays a positive and enthusiastic approach | 102 | 3.07 | .43 | 3.17 |
| 10 | A trained teacher displays a warm and approachable manner. | 102 | 4.00 | .00 | 8.78 |
| Instructor's adherence to the program | | | | | |
| 11 | A trained teacher's language is in general accordance with the program script. | 102 | 4.00 | .00 | 8.78 |
| 12 | All materials and resources are available and easily accessible | 102 | 4.00 | .00 | 8.78 |
| 13 | All components of the program session are completed | 102 | 4.00 | .00 | 8.78 |
| | Kendall's w | .787 | | | |
| | Chi-square | 963.602 | | | |
| | Df | 12 | | | |
| | Asymp. Sign. | .000 | | | |

Scale: 1=Never, 2=sometimes, 3=mostly, 4=always

Source: Researcher (2021)

Table 7: Descriptive Statistics: Mean and Standard Deviations for Observation Checklist

| Observed statement | Number cases | Mean | Standard deviation | Mean Rank |
|---|--------------|--------|--------------------|-----------|
| Children playing around in the environment print | 102 | 2.9510 | .21698 | 5.97 |
| Children walking around the environmental print | 102 | 2.9314 | .25407 | 5.90 |
| Children pointing to letters embedded in the environmental print | 102 | 2.9314 | .25407 | 5.90 |
| Children give names of pictures embedded in environmental print | 102 | 2.9412 | .23646 | 5.94 |
| Children producing alphabet letter names of letters embedded in the environmental print | 102 | 2.0000 | .0000 | 2.64 |
| Children recognise alphabet letter Names embedded in the environmental Print | 102 | 2.0000 | .0000 | 2.64 |
| Children attending to contextual cues | 102 | 2.9608 | .19507 | 6.00 |
| Children attending to non-contextual cues | 102 | 1.0000 | .00000 | 1.00 |
| Kendall's w | .931 | | | |
| Chi-square | 664.562 | | | |
| Df | 7 | | | |
| Asymp Sign | .000 | | | |

Source: *Researcher (2021)*

DISCUSSION OF THE FINDINGS

Amos et al. (2015) found that no single instructional strategy is appropriate for all subjects. Amos and others align with the present study, which found that direct or indirect instructional strategies enhance knowledge of letter names. In addition, Salaway (2008) also supports the present study, which found that a combination of direct instruction and Developmentally Appropriate Preschool (DAP) improves pre-academic and early literacy skills. Vera (2010) and Roberts et al. (2018) are inconsistent with the current findings, and the previous studies found that direct instruction influences alphabet knowledge, including letter name knowledge. Direct instructional strategy, as a fast-paced instruction method, has been found to promote literacy acquisition in developing readers (Keaton et al., 2007). According to Carnine et al. (1997), it is asserted that, across all academic areas, children have shown success when their teachers use a direct instructional strategy as an approach, which is inconsistent with the present study's findings.

Theoretical Implications: Both constructivism (indirect instruction) and sociocultural theory

(direct instruction) by Vygotsky (1978) are significant in enhancing alphabet letter name knowledge. A pre-primary teacher enhances letter name knowledge for an indirect instructional strategy by ensuring individual learning requirements are met through observation and trial-and-error play-based activities (Grisham et al., 2009). With the aid of environmental print in this context, children observe and assimilate alphabet letters through their learning experiences guided by teacher-designed opportunities. Under direct instruction, learning is improved step-by-step, whereas modelling through a teacher's demonstration and discussion (social interaction) between a teacher and a child plays a significant role in acquiring the alphabet.

CONCLUSIONS

Direct or indirect instructional methods, when supported by environmental print knowledge, are effective in promoting the development of alphabet letter name knowledge. Incorporating a variety of teaching approaches and environmental contexts can enhance early literacy skills."

Recommendations

The study recommends the use of either direct or indirect instruction with exposure to print in the child's environment to enhance letter name knowledge. Further research should examine how different combinations of direct and indirect instruction affect the development of letter name knowledge.

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