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Investigating the Impact of Digital Learning on Academic Achievements of Young Learners in Voinjama City

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Abstract

The purpose of this study is to look at the impact of digital learning on preschool academic achievement in Voinjama City, Lofa County, Liberia. The study, which included 20 participants, found that financial constraints as well as educational problems. A significant 40% of respondents, however, indicated a positive impact on academic attainment. The findings shed light on the complicated dynamics of digital learning in the context of early childhood education in Liberia. Despite economic limits and pedagogical challenges, the observed gain in academic performance demonstrates that digital learning interventions may be effective. These findings are critical for improving and optimizing digital learning practices in preschool education, as well as alerting educators, policymakers, and stakeholders in Voinjama City about the obstacles and opportunities associated with incorporating technology into the early childhood learning environment. Liberia continues to navigate advancements in education, understanding the impact of digital learning on preschoolers' academic achievement becomes imperative for fostering a more effective and inclusive early education system.

Keywords: ***Academic achievements, Digital learning, enhance, Young***

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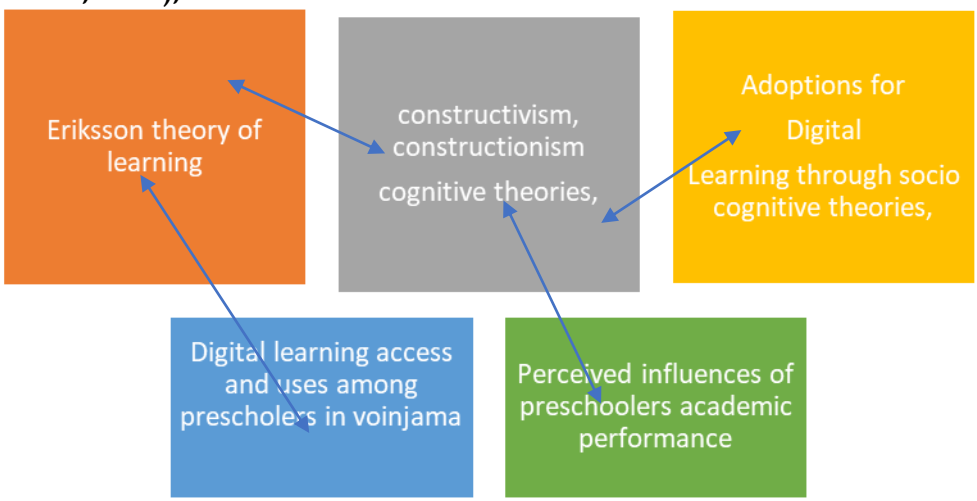
Introduction

With the introduction of digital technologies, the educational landscape witnessed tremendous transformation, introducing numerous breakthroughs such as smart devices, IoT, AI, AR, VR, blockchain, and software applications (Timotheus et al., 2023). During the COVID-19 pandemic, African governments, particularly Liberia's, quickly adopted educational broadcasts via television, radio, and online channels. Despite these measures, addressing the most vulnerable areas remained difficult due to restricted technology availability. Notably, 89% of African learners did not have access to computers at home, and just 34% had internet access, raising concerns about fair technology access (Lorente et al., 2020). Understanding these dynamics was critical for educators, politicians, and parents looking to deliberately integrate technology into early learning contexts to make educated decisions.

The study was based on Eriksson et al.'s (2022) learning theory, highlighting the relevance of social connections and tools in children's cognitive growth through computer interactions. It used parts of the Technology Acceptance Model (TAM) to assess preschool teachers' and parents' preparedness to accept digital learning in the educational process. This highlighted the scarcity of assessments that focused on learning transfer and controlled groups, underlining the importance of learning theory application. It also acknowledged four important theoretical approaches on learning: constructivism, constructionism, cognitive theories, and socio-cognitive theory. Rogers' Diffusion of Innovations theory, a well-established framework that explained the movement of new ideas, technologies, or innovations through a population, was also used in the study. The research looked at the key components and potential outcomes of applying this theory to the setting of digital learning in preschools in Voinjama City, Lofa County. The effects were determined by the rate at which digital learning was adopted, the available resources, and the level of community support. The study recognized the potential for positive changes in preschool education via careful application of strategies to address difficulties and disparities. In addition, the ADDIE model, a well-known instructional design framework, was used to create effective educational programs and resources, including digital learning. The use of the ADDIE paradigm required a methodical approach to assure success.

Conceptual Framework

(Eriksson etal., 2022),



The conceptual framework integrates Eriksson's learning theory, constructivism, constructionism, and socio-cognitive theories to investigate the adoption and impact of digital learning among preschoolers in Voinjama, emphasizing perceived influences on

academic performance, providing a comprehensive understanding of the complicated dynamics in early childhood education.

The purpose of this study was to address the disparities of digital learning among preschoolers in urban and the rural setting of Liberia as it relates to their academic achievement. The key issue highlighted was children in voinjama at the preschools level, has never had any interactions with digital technology, and has resulted in to a decrease in digital technology adoption (DTA). Besides, inadequate equipment, lack of technology training for teachers, and the Ministry of Education's refusal to include digital education programs in the school's curriculum, has negatively affected children's cognitive development in voinjama. In addition, preschoolers in the urban region like Monrovia have some access to digital technology where as those in the rural setting lack such facilities which is a major gap this study has achieved in mitigating.

The study was chosen because the preschool years are key for cognitive development, addressing the disparities of digital learning among preschoolers in urban and the rural setting of Liberia, is important for Mitigation. Investigating the impact of digital learning on academic achievement can indicate how technology influences cognitive processes in young learners, allowing educators and parents to make educated decisions about technology use in early childhood education programs.

Methodology

When using an exploratory sequential design, the researchers will gather and examine qualitative data before proceeding to the quantitative stage. Through qualitative methods like, interviews, and theme analysis, they are able to thoroughly investigate and comprehend the phenomenon of interest to this methodical approach (Subedi, 2016). The researchers were able utilize their newfound understanding to guide the development and execution of the quantitative phase after they have collected and examined the qualitative data. Typically, the quantitative phase entails gathering numerical data using techniques such as surveys and experiments. The researchers hope to improve the overall validity and reliability of their study by combining both qualitative and quantitative parts, so leveraging the advantages of each approach. Mixed methods research integrates qualitative and quantitative approaches in a single study, fostering a thorough knowledge of research problems (Creswell, 2013).

Data Collection/Administering:

Qualitative and quantitative data through interview and surveys were distributed to preschool teachers and parents.

The formula to estimate the sample size is:

$n = Z^2 * (p) * (1-p) / E^2$

Where:

- n is the sample size

- Z is the z-score (which corresponds to the confidence level you want to achieve. For example, for a 95% confidence level, Z is 1.96).

- p is the estimated proportion of the population that has the attribute in question (if you don't know, you can assume p=0.5) - E is the margin of error. I was able to derive a sample size of 10 from the population of 21 based on the equation (Lu & Lohr, 2010).

Data Gathering and analusis

Researchers designed interview protocols with open-ended questions, recruited participants, and performed one-on-one sessions to acquire qualitative insights through theme. Surveys generated quantitative data, which was then analyzed statistically to uncover patterns and connections.

Analysis: Interview and Survey responses will be qualitatively and quantitatively analyzed using statistical software like SPSS to identify trends and correlations between digital learning exposure and academic performance.

Result dan Discussion

Result

Findings obtained have been presented and analyzed in line with the specific objectives of the study in two ways; first, analysis were done for teachers' responses and the second was done for parents in the following format: What are the perceived barriers faced in the implementation of the digital learning by:

1.1 preschool Teachers

1.2 parents

- ★ **What are the issues and challenges of the digital learning resources used by preschoolers?**
- ★ To what extent does the use of digital learning resources positively affect the preschoolers in their academic performance?

Objective	Themes	Reference
Preschool Teachers' Perceived Barriers	Perception - Teachers feel unprepared to use digital tools.	Ruggiero & Mong (2015)
faced in the Implementation of Digital Learning	Analysis - Adequate training is required.	**Interview October, 2023**
Parents' Perceived Barriers Faced	Perception - Parents face challenges due to limited access to digital devices or reliable internet connectivity.	Livingstone et al. (2015)
In the Implementation of Digital Learning mitigated gap.	Analysis - Bridging the digital gap is crucial.	**Interview October, 2023**
Issues and Challenges of Digital Learning Resources for	Perception - Socioeconomic disparities impact technological access for preschoolers, hindering equal learning opportunities.	Suzana et al. (2020)
Preschoolers	Analysis - Efforts are needed to bridge the digital gap.	**Interview October, 2023**
Positive Effects of Digital Learning Resources on Preschoolers'	Exposure to digital learning tools leads to the development of technology literacy abilities.	Drigas, Kokkalia, & Lytras (2015)
Academic Performance	Analysis - Early exposure prepares toddlers for a digital environment.	**Interview October, 2023**

This table provides a clear and organized summary of the different themes related to the specified objectives and their corresponding references.

Preschool Teachers' Perceived Barriers Faced in the Implementation of Digital Learning

These objectives deal with the preschoolers' perceived barriers faced in the implementation of digital learning and can be seen through the table below:

What are the perceived barriers faced in the implementation of the digital learning by teachers?	AF (Absolute Frequency)	RF (Relative Frequency)
The cultural beliefs of some parents to stick to the archaic pattern of teaching their kids thereby refusing to adopt and use new and advanced technology	2	20%
Availability and accessibility of digital learning devices to teachers	3	30%
Funds for the implementation of digital learning is scarce, if not easily made available to the teachers	4	40%
Individual choice to implement digital learning varies and most, if not all of the people, are not ready to adopt the new technology	10	100%
Total		

Source: Field survey October, 2023

From the table above, it could be seen that out of the total number of teachers interviewed, 4 (40%) of them said funds for the implementation of digital learning is scarce, if not easily made available to the teachers, while 3 (30%) of them interviewed said availability and accessibility of digital learning devices to teachers, whereas 2 (20%) of them said the cultural beliefs of some parents to stick to the archaic pattern of teaching their kids thereby refusing to adopt and use new and advanced technology, and finally, 1 (10%) of them said individual choice to implement digital learning varies and most, if not all of the people, are not ready to adopt the new technology. Conclusively, 4 (40%) of the teachers interviewed said funds for the implementation of digital learning is scarce, if not easily made available to the teachers in the study area.

Parents' Perceived Barriers Faced in the Implementation of Digital Learning

What are the perceived barriers faced in the implementation of the digital learning by parents?	AF (Absolute Frequency)	RF (Relative Frequency)
Funds for the purchase of digital devices are not easily made available	**4**	**40%**
Preference for the archaic method of teaching kids at home	**2**	**20%**
The government's lethargic efforts to include digital	**3**	**30%**

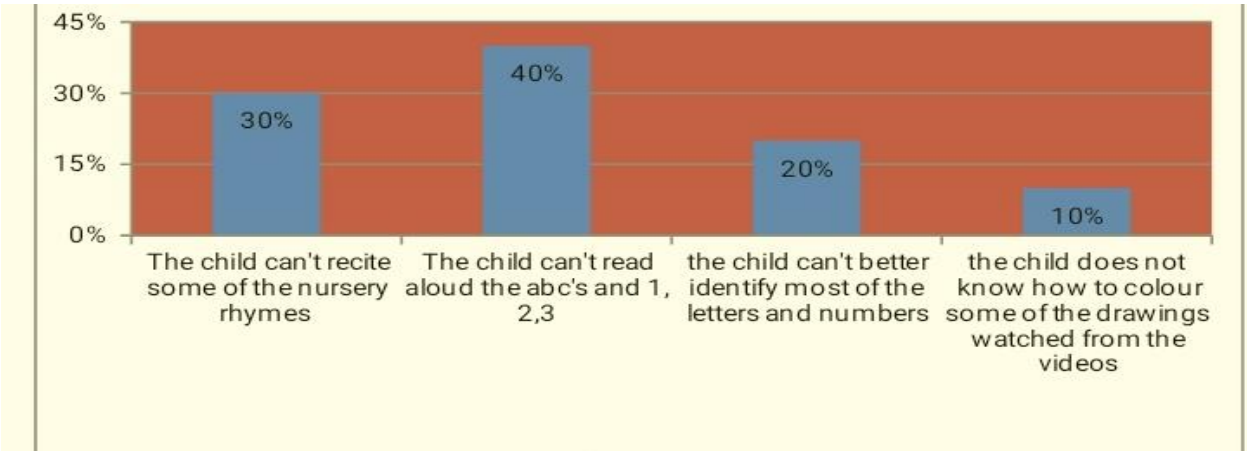
learning for preschool in the national curriculum		
Students find it difficult to use the digital learning devices	**1**	**10%**
Total	**10**	**100%**

Source: Field Survey October, 2023

From the table above, it could be deduced that out of the parents interviewed in the study area, 4 (40%) said funds for the purchase of digital devices are not easily made available, while 3 (30%) of them said the government's lethargic efforts to include digital learning for preschool in the national curriculum, whereas
2 (20%) of them said preference for the archaic method of teaching kids at home and 1 (10%) said students find it difficult to use the digital learning devices. Conclusively, 4 (40%) of the parents said funds for the purchase of digital devices are not easily made available in the study area.

What are the issues and challenges of the digital learning resources used by preschoolers?

This objective deals with the issues and challenges of the digital learning resources used by preschoolers and can be seen below:



Source: Field survey October, 2023

From the figure above, it could be seen that out of the total number of people interviewed in the study area, 8 (40%) of them said that the child can't read loud the ABC's and 1, 2, 3, while 6 (30%) of them said that they child can't recite some of the nursery rhymes, whereas, 4 (20%) said the child can't better identify most of the letters and numbers and finally, 2 (10%) of them said the child does not know how to colour some of the drawings watched from the videos. Conclusively, majority (40%) of them said that the child can't read aloud the A, B, C's and 1, 2, 3 in the study area.

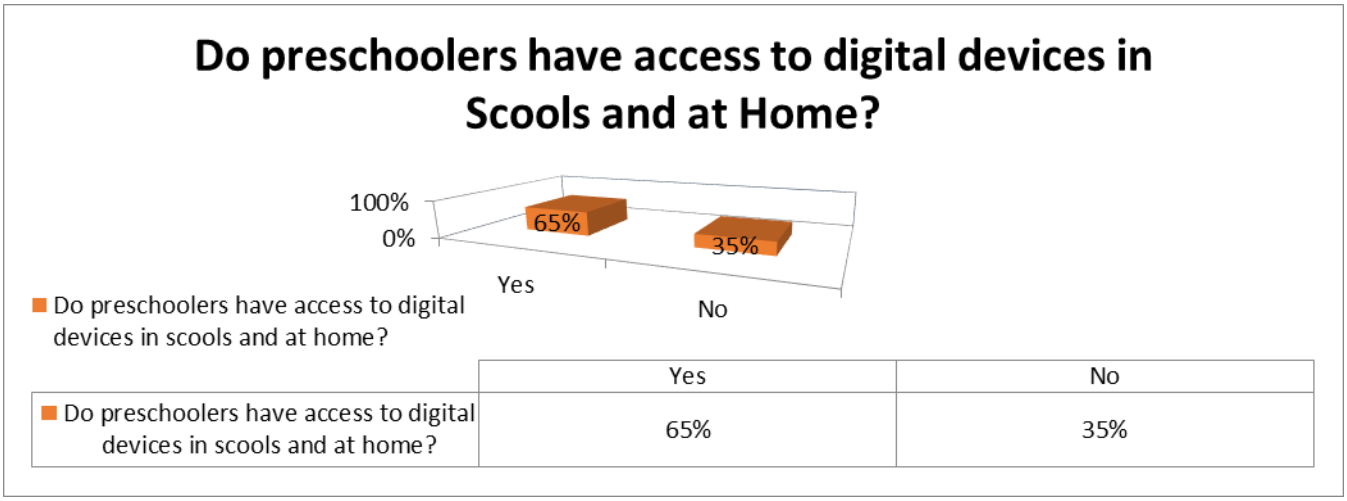
To what extent does the use of digital learning resources positively affect the preschoolers in their academic performance?

To what extent does the use of digital learning resources positively affect the preschoolers in their academic performance?	AF (Absolute Frequency)	Relative Frequency (RF)
The child can operate the digital devices without any help from an adult and can recite some of the nursery rhymes	6	30%
The child is exposed to the outside world through the use of digital technology	4	20%
The child has improved on his/her existing knowledge of learning	8	40%
The child's usage of the digital device can help ease the burden of parents and teachers alike	2	10%
Total	20	100%

Source: Field Survey October, 2023

From the above table, it could be reduced that out of the total number of people interviewed with reference to how the usage of digital learning devices has positively affected preschoolers in their academic performance, 8 (40%) said that the child has improved on his/ her existing knowledge of learning, while 6 (30%) said that the child can operate the digital learning devices without any help from an adult and can recite some of the nursery rhymes, whereas 4 (20%) said that the child is exposed to the outside world thought the use of digital technology, and finally, 2 (10) said that the child's usage of the digital devices can help ease the burden of parents and teachers alike. Conclusively, majority (40%) of them said that the child has improved on his/her existing knowledge of learning in the study area.

Do preschoolers have access to digital devices in Schools and at Home?

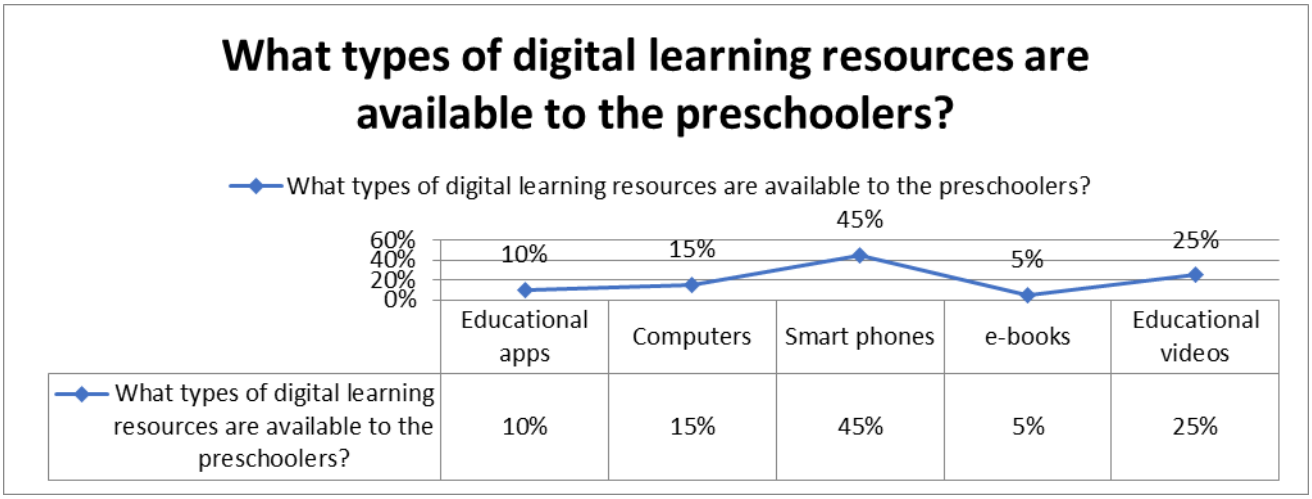


	Yes	No
Do preschoolers have access to digital devices in scools and at home?	65%	35%

Source: Field Survey October, 2023

From the above figure, it can be deduced that majority (65%) of the respondents said that preschoolers have access to digital devices in schools and at homes. Conclusively, the figure shows that majority (65%0 of the respondents said that preschoolers have access to digital devices both at home and in school.

What types of digital learning resources are available to the preschoolers?

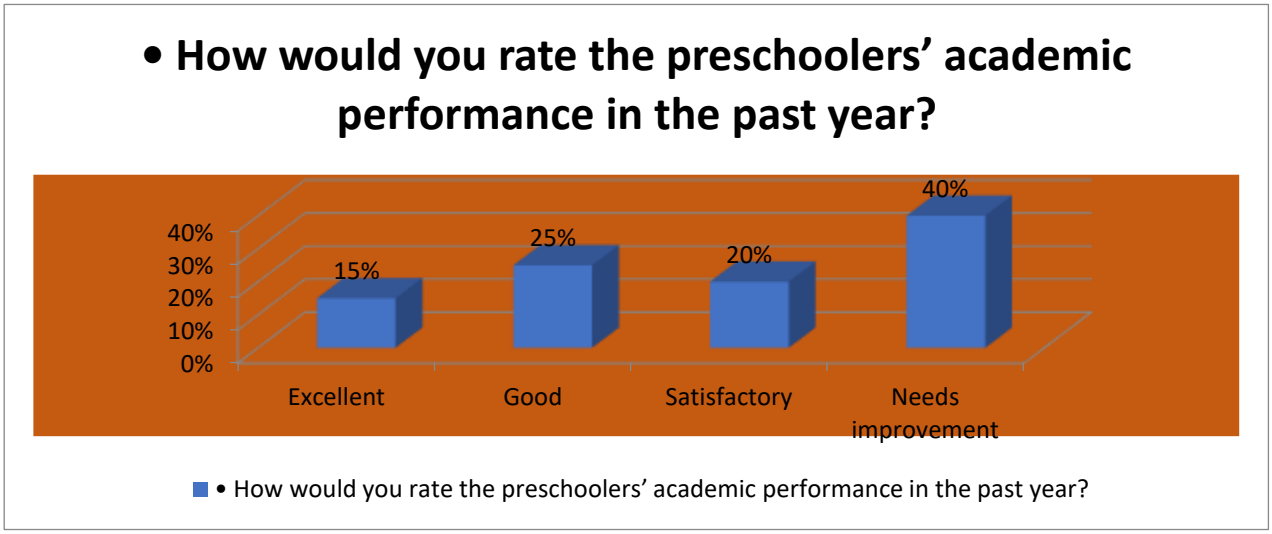


	Educational apps	Computers	Smart phones	e-books	Educational videos
What types of digital learning resources are available to the preschoolers?	10%	15%	45%	5%	25%

Source: Field Survey October, 2023

From the figure above, it could be deduced that out of the total number of respondents, majority (45%) of them said that smart phones are available to preschoolers for digital learning, while 25% of them said that educational videos are available and 15% of them said that computers are available to preschoolers. However, 10% of them said that educational apps are available while a minute population (5%) said that e-books are available to preschoolers for learning. Conclusively, it could be said that majority (45%) of the respondents said that smart phones are available to preschoolers for digital learning in the study area.

How Would You Rate the Preschoolers' Academic Performance in The Past Year?



Source: Field Survey October, 2023

The figure above shows that out of the total number of respondents who responded to the questionnaire, majority (40%) of them said the preschoolers need improvement in the usage of digital learning, while 25% of them rated the preschoolers' academic performance as good, whereas, 20% rated their performance as being satisfactory and 15% of them rated the preschoolers' academic performance as being excellent in the study area. Conclusively, it could be deduced that majority of the respondents rated the preschoolers' academic performance needs improvement in the study area.

Discussion

The interview and survey findings highlight widespread unpreparedness among teachers as a result of insufficient training in the most recent instructional technologies, demanding extensive professional development. Simultaneously, parents encounter difficulty in actively participating in their child's digital learning due to limited access, underscoring the critical need to bridge the digital gap. Socioeconomic gaps worsen the problem by limiting fair learning opportunities for children and demanding initiatives to supply adequate equipment and connectivity. Drigas, Kokkalia, and Lytras emphasize the transformative potential of digital technologies in improving technical literacy among preschoolers and preparing them for a digital future. Methodologically, the study's questionnaire segmentation reveals financial limits experienced by both teachers and parents, with 40% reporting difficulties in obtaining finances for digital learning or gadget achievement. In addition, it was deduced that majority (65%) of the respondents said that preschoolers have access to digital devices in schools and at homes.

More besides, the figure shows that majority (65%0 of the respondents said that preschoolers have access to digital devices both at home and in school. Furthermore, it was assumed that out of the total number of respondents, majority (45%) of them said that smart phones are available to preschoolers for digital learning, while 25% of them said that educational videos are available and 15% of them said that computers are available to

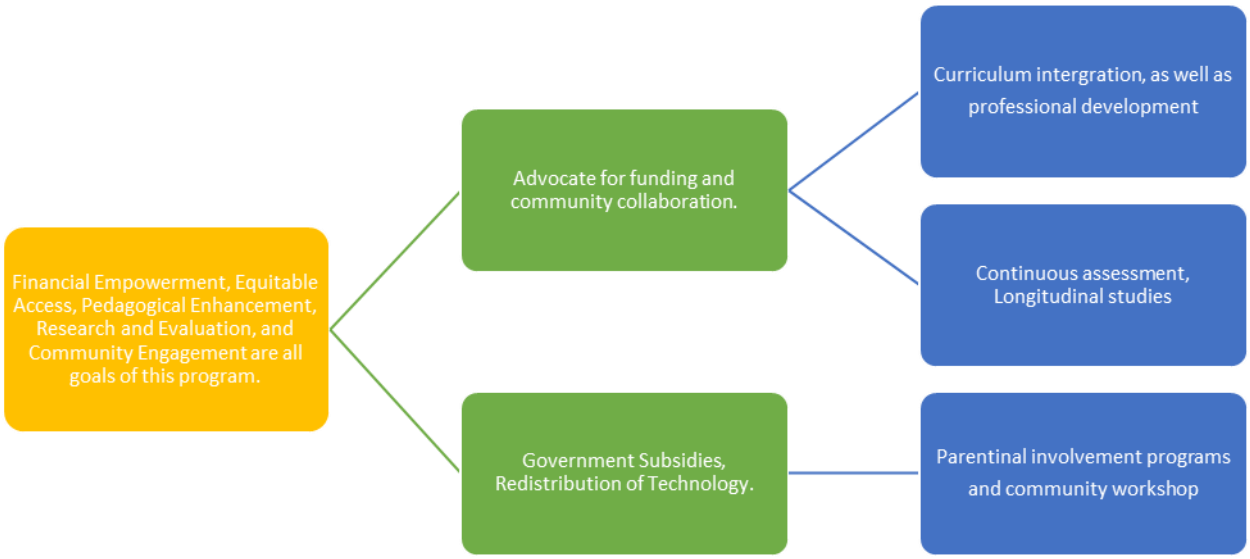
preschoolers. However, 10% of them said that educational apps are available while a minute population (5%) said that e-books are available to preschoolers for learning. More besides, it could be said that majority (45%) of the respondents said that smart phones are available to preschoolers for digital learning in the study area. Moreover, it was presumed that, the total number of respondents who responded to the questionnaire, majority (40%) of them said the preschoolers need improvement in the usage of digital learning, while 25% of them rated the preschoolers' academic performance as good, whereas, 20% rated their performance as being satisfactory and 15% of them rated the preschoolers' academic performance as being excellent in the study area. Conclusively, it could be deduced that majority of the respondents rated the preschoolers' academic performance needs improvement in the study area. Notably, the replies show a general agreement that digital learning improves children's academic achievement. Despite a little variation in perceived barriers between instructors and parents, the study recommends a thorough, targeted approach to addressing the multiple problems and opportunities in building effective digital learning environments for preschoolers in Voinjama Liberia.

Conclusion

Inadequate equipment, lack of technology training for teachers, and the Ministry of Education's refusal to include digital education programs in the preschool school's curriculum, has negatively impacted children's cognitive development and their academic performance of digital learning in preschools of the Voinjama community.

Emergent theory.

The results from the segmented interview and surveys provided to teachers and parents indicate a comprehensive theory known as the Dual Challenge theory in Preschool Digital Learning Implementation. Within this theory, financial and pedagogical hurdles emerge as interconnected issues. Teachers reported a lack of funding for digital learning implementation, while parents reported challenges in obtaining cash for digital device purchases. This highlights a structural issue in which financial resources devoted to incorporating digital technologies into preschool education are insufficient, resulting in unequal access among preschoolers. Furthermore, both teachers and parents observed literacy issues in preschoolers' interactions with digital learning materials. Despite these pedagogical challenges, there is awareness of a favorable impact on academic performance, underlining the potential benefits of digital tools. Emerging framework for actions.



The emerging framework strives to achieve educational goals by eliminating socioeconomic constraints and enhancing equal access to digital resources for preschoolers. Objectives involve securing funding, fostering community collaborations, investing in teacher development, and refining curriculum integration. Continuous assessment and community engagement align with the goal of data-driven improvement, aiming to create a collaborative educational environment for optimal digital learning efficacy in early childhood education. Furthermore, equitable access is pushed through programs such as technology redistribution and government subsidies. Community engagement techniques, such as parental involvement programs and workshops, aim to develop knowledge and support for preschool digital learning.

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