

**Technology-Based Intervention and Early Years
Science Teaching Effectiveness in Public
Preschools in Lagos State**

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Abstract

This study investigates Technology-Based Intervention and Early Years Science Teaching Effectiveness in Public Preschools in Lagos State. The study employed descriptive survey design, the population of the study comprised 1,120 caregivers and simple percentage was used to determine the sample size for the study which is 112 caregivers. Simple random sampling technique was used to select 4 Local Government Education Authorities (LGEA) from the 20 Local Government Education Authorities in Lagos State and 4 schools from each of the 4 selected Local Government Education Authorities. Purposive sampling technique was used to select 7 caregivers from each of the 16 selected preschools. Two research instruments were used for the study. Reliability of the instruments was done with the use of Test-Retest Reliability technique and the coefficient value of $r = 0.84$ obtained. Data collected were analysed using Pearson Product Moment Correlation PPMC at 0.05 level of significance. The findings of this study reveals that technology-based intervention enhance effective teaching of early years science and therefore, concludes that purposeful integration of varieties of modern technological tools in teaching early years science will enhance caregivers early years science teaching effectiveness and stimulate preschoolers' motivation, concept acquisition, hands-on exploration and active participation in early years science learning activities and recommend that various modern developmentally appropriate technology tools be provided to public preschools in Lagos state for ease of teaching and learning early years science, among others.

Keywords: Technology-Based Intervention; Early Years Science; Teaching Effectiveness; Preschool Children; Public Preschools.

Introduction

Early years science concepts and activities refers to the science education and exploration conducted during a child's early childhood years, typically from birth to age five (0 - 5) (Bredekamp, 2019). It involves introducing young children to basic scientific concepts and skills through hands-on activities, observations, experiments and exploration of the natural world. Early years science focuses on nurturing children's curiosity, critical thinking and problem-solving skills. It aims to provide a foundation for their understanding of the natural world and lays the groundwork for future scientific learning (Adbo & Vidal Carulla, 2020).

Early years science activities include exploring nature and the outdoors, conducting simple experiments to observe cause and effect relationships, investigating the properties of materials, observing and categorizing living things, learning about the seasons, weather and natural phenomena and developing an understanding of basic scientific processes such as learning to make predictions and draw conclusions based on observations. Early years science activities also emphasizes the development of important scientific practices, such as asking questions, making observations, gathering data, forming explanations and communicating findings (National Science Teachers Association, 2019).

Early Years Science Teaching Effectiveness (EYSTE) is the process of providing effective science experiences to preschool children by caregivers, through observation and experimentation that can stimulate their curiosity and motivate them to become interested in their environment and in the activities of nature (NAEYC, 2021). Early years science teaching effectiveness is concerned with a focus on what preschool children are attracted to that can build on preschool children's developing interests and their previous experiences, linking the known with the unknown as it involves and underpins their learning and development (Rosicka & O'Connor, 2020). Early years science teaching effectiveness develops preschool children's intelligence and sense of curiosity and inspire them to explore their ecological system (Milford & Tippett, 2015). Developing preschool children's natural interest is one of the main objective of early

years science teaching effectiveness, which can help develop their scientific curiosity and question-asking ability (Perdue, 2016).

Early years science proficiencies required of caregivers to nurture and to be developed in the preschool children for the attainment of early years science and technological know-how include: ability to take risk, ability to solve problems, ability to exploration of objects in the natural environment, ability for decision-making, ability for tentative explanation of ideas, ability to carry out simple experiment observing and recording the experimental procedures and results, ability to make inquiries and pose questions, ability to communicate ideas and new perspectives, ability to predict experimental outcome and ability to use modern technological tools to extend learning (Sarikaya & Coskun, 2015).

Preschool children's early exposure to science proficiency acquisition and development has positive impacts across the entire spectrum of learning. For instance, early knowledge in technology not only predicts later success in technological know-how, but might also predict later achievement in blended learning through the use of modern technological tools (Gonzales & Kuenzi, 2012). Early years science learning from an early age is important because early science learning can connect preschool children's natural curiosity and motivation to learn about their natural ecosystem or the world around them.

Early years science teaching effectiveness can be associated with the following indices: active participation of preschool children in early years science activities; caregiver-preschool children interpersonal relationship; classroom management strategies; hands-on teaching; preparation of early years science lesson plan; presentation of early years science activities to preschool children; innovative teaching of early years science activities; knowledge of using modern technological tools in teaching early years science concepts and activities.

Technology-Based Intervention (TBI) refers to the application and integration of modern technological tools in various domains or contexts to bring about positive changes or improvements (Dore & Dynia, 2020). It involves utilizing modern technological tools to address challenges, enhance efficiency and

promote innovation. Technology-based interventions also refers to the use of tools, systems, or methods to solve problems or achieve goals and can range from simple software applications to complex systems and devices (Ertmer & Ottenbreit-Leftwich, 2020).

In the context of early years science teaching and learning activities, technology-based intervention refers to the use of various technological tools, such as Smart Television, Digital Camera, Tablets among others, to support and enhance early years science teaching and learning experiences for caregivers and preschool children respectively (Rosicka & O'Connor, 2020). Preschool children are growing up in a rapidly advancing technological age with varieties of modern technological tools. Technology-based intervention in public preschools, will help preschool children to acquire sufficient digital competence at school to undertake lifelong learning (Bredekamp, 2019).

In a study conducted by Dore & Dynia (2020), on four (4) devices caregivers used with preschool children in their classroom (tablet, digital camera, computer, Smart television). Tablet was most frequently used in early years science teaching and learning because of its portable nature and audiovisual features (Neumann, 2016). However, digital camera was best made use of in teaching early years science activities to preschool children, reason being that the use of digital camera in early years science teaching enhances caregivers early years science teaching effectiveness (Otterborn, et al. 2018) and also enhance preschool children's early years science learning experiences by capturing and documenting pictures of early years sciences activities carried out in the classroom. Based on these and similar findings, Pasnik et al., (2016) and Daugherty et al., (2014) argued that digital camera could be beneficial for learning in preschool settings as it promotes caregivers teaching effectiveness and preschool children learning experiences; also as it produces visual materials like pictures and keeps alive in the mind of the preschool children what they were taught the previous days.

Statement of the Problem

Effective early years science teaching to preschool children in Lagos State has remained a problem to the three spheres of influence in a child's life, because modern technological tools such as the computers, digital cameras, multimedia projectors and interactive white board, among others are lacking or not adequate in public preschools. Besides, caregivers lack the knowledge of using modern technological tools in teaching preschool children. Therefore, they teach early years science by rote learning making their teaching ineffective as preschool children could not acquire science inquiry skills and proper scientific knowledge through rote learning. This is evident on the preschool children's inability to exhibit proficiencies in science inquiry capabilities needed in early years science contexts such as: risk-taking, problem-solving, exploration of objects, materials and living things, decision-making, tentative explanation of ideas, experimentation, observation and recording procedures and results, making inquiries and asking questions, communicating ideas and new perspectives, making predictions and using modern technology tools to extend knowledge. However, the ineffective teaching of early years science by caregivers is partly caused by non-availability of modern technological tools. To curb the menace, the government supplied modern technological tools to public schools. It is against this background that the researcher deemed it fit to investigate if the technological intervention carried out by the government could relate significantly with effective teaching of early years science in public preschools in Lagos State.

Objectives of the Study

The objectives of the study are:

1. To identify the relationship between the use of smart television and caregivers' teaching effectiveness in early years science teaching in public preschools in Lagos state.
2. To establish the relationship between the use of tablets and caregivers' teaching effectiveness in early years science in public preschools in Lagos state.
3. To investigate the relationship between the use of digital camera and caregivers' teaching effectiveness in early years science in public preschools in Lagos state.

Research Questions

1. What is the relationship between the use of smart television and caregivers teaching effectiveness in early years science in public preschools in Lagos state?
2. How does the use of tablets relate with teaching effectiveness in early years science activities in public preschools in Lagos state?
3. To what extent does use of digital camera relate with caregivers teaching effectiveness in early years science in public preschools in Lagos state?

Research Hypotheses

H0₁ – There is no significant relationship between the use of smart television and caregivers teaching effectiveness in early years science in public preschools in Lagos state.

H0₂ – There is no significant relationship between the use of tablets and caregivers teaching effectiveness in early years science in public preschools in Lagos state.

H0₃ – Significant relationship does not exist between the use of digital camera and caregivers teaching effectiveness in early years science in public preschools in Lagos state.

Methodology

The study employed correlational research design, the population of the study comprised 1,120 caregivers in the 20 Local Government Education Authorities. Multistage sampling procedure was employed. The sample size for the study is 112 caregivers which is 10% of the population of the study. Simple random sampling technique was used to select 4 Local Government Education Authorities (LGEA) in Lagos State (these are Alimosho, Amumo-Odofin, Ojo and Badagry) from the 20 Local Government Education Authorities. Simple random sampling technique was used to select 4 preschools from each of the selected Four (4) Local Government Education Authorities, making it a total of 16 preschools. Purposive sampling technique was used to select three (3) caregivers from each of the selected sixteen (16) preschools, because that is the number of caregivers obtainable in each of the selected preschools. Two research instruments were used for the study, titled: Technological tools Questionnaire (TTQ) Early Years Science Teaching

Effectiveness Questionnaire (EYSTEQ). Reliability of the instrument was done using Test-retest method with a reliability coefficients value of $r = 0.84$ which is acceptable. Data collected was analysed using Pearson Product Moment Correlation PPMC at 0.05 level of significance.

Presentation of Results

Demography of the Respondents

Table 1: Sex Distribution of Respondents

Sex	Respondents	Percentage (%)
Male	40	36
Female	72	64
Total	112	100

Source: Field Survey of 2026

Table 4.1 shows that 36% of the respondents are males while 64% are females. This indicates that there are more female respondents than male respondents participating in this study by answering the questionnaire.

Table 2: Marital Status of Respondents

Marital Status	Respondents	Percentage (%)
Married	67	60
Not Married	45	40
Total	112	100

Source: Field Survey of 2026

Table 2 reveals that 60% of the respondents are married, while 40% are not married. This suggests that majority of the respondents are responsible individuals.

Table 3: Age Distribution of Respondents

Age Brackets	Respondents	Percentage (%)
21 - 30	22	20
31 - 40	56	50
41 - 50	34	30
Total	112	100

Table 3 shows that 20% of the respondents are within the age bracket of 21-30 years, 50% of the respondents are within the age bracket of 31-40 years and 30% of the respondents are within the age bracket of 41-50 years of age. This shows that there are matured respondents participating in the study.

Table 4: Qualification of the Respondents

Qualifications	Respondents	Percentage (%)
M.Ed	46	41
B.Ed	38	34
NCE	28	25
TOTAL	112	100

Source: field survey of 2026

Table 4 shows the highest qualifications of the respondents at different levels. 41% of the respondents have M.Ed. 34% of the respondents have B.Ed. 28% have NCE. This reveals the respondents have education background, therefore are qualified to participate in the research study by answering the questionnaire.

Research question 1: What is the relationship between the use of smart television and caregivers teaching effectiveness in early years science in public preschools in Lagos state?

Table 5: Showing use of Smart Television and Caregivers Teaching Effectiveness in Early Years Science in Public Preschools.

S/N	Items	SA	A	D	SD	Mean	St.D
1.	Smart Television have no impact on caregivers early years science teaching effectiveness	45 (40.2)	44 (39.3)	13 (11.6)	10 (8.9)	3.10	.933
2.	Smart Television can bridge the gap between theory and practice in caregivers' early years science teaching	31 (27.7)	40 (35.7)	23 (20.5)	18 (16.1)	2.75	1.03
3.	Smart Television do not provide positive reinforcement for encouraging caregivers in early years science teaching.	17 (15.2)	12 (10.7)	30 (26.8)	53 (47.3)	1.93	1.09
4.	Smart Television encourage preschoolers in early science learning activities.	47 (42.0)	45 (40.2)	10 (8.9)	10 (8.9)	3.15	.922
5.	Use of smart television does not encourage caregivers' commitment in early years science teaching	11 (9.8)	13 (11.6)	40 (35.5)	48 (42.9)	1.88	.965
Grand Mean = 2.56							

Table 5 showing the impact of smart television on preschool children’s active participation in early year’s science classroom activities. The detailed analysis revealed that smart television encourage preschoolers in early years science learning activities (mean = 3.15), smart television have no impact on caregivers teaching effectiveness in early years science (mean = 3.10), smart television can bridge the gap between theory and practice in caregivers’ early years science teaching (mean = 2.75), smart television do not provide positive reinforcement for encouraging caregivers in early years science teaching effectiveness (mean = 1.93) Use of smart television does not encourage caregivers’ commitment in early years science teaching (mean = 1.88).

Research question 2: How does tablet relate with use of audio-visual resources in early years science activities by caregivers in public preschools in Lagos state?

Table 6: The use of tablets in teaching early years science activities in public preschools in Lagos state.

S/N St.D	Items	SA	A	D	SD	Mean	
1.	Use of tablets in early years Science teaching enhance caregivers effectiveness	32 (28.6)	36 (32.1)	20 (17.9)	24 (21.4)	2.67	1.10
2.	Tablets promotes preschool children understanding of early years science concepts	42 (37.2)	26 (23.2)	30 (26.8)	14 (12.5)	2.85	1.06
3.	Tablet usage in early years science teaching does not enable preschoolers to ask intelligent questions.	24 (21.4)	20 (17.9)	36 (32.1)	32 (28.6)	2.32	1.10
4.	Caregivers use of tablets make early years science learning interesting to preschool children	55 (49.1)	40 (35.7)	10 (8.9)	7 (6.3)	3.27	0.87
5.	Caregivers’ use of tablets in early years science teaching hinders preschoolers acquisition of science inquiry skills.	12 (10.7)	10 (8.9)	40 (35.7)	50 (44.6)	1.85	0.97
Grand mean = 2.6							

Table 6 showing the use of tablets in teaching early years science activities in public preschools in Lagos state. The detailed analysis revealed that caregivers use of tablets make early years science learning interesting to preschool children (mean = 3.27), Tablets promotes preschool children understanding of early years science concepts (mean = 2.85), use of tablets in early years Science teaching enhance caregivers effectiveness (mean = 2.67), Tablet usage in early years science teaching does not enable preschoolers to ask intelligent questions (mean = 2.32), and Caregivers' use of tablets in early years science teaching hinders preschoolers acquisition of science inquiry skills (mean = 1.85).

Research question 3: To what extent do use of digital camera relate with caregivers teaching effectiveness in early years science in public preschools in Lagos state?

Table 7: Showing use of digital camera and caregivers teaching effectiveness in early years science in public preschools in Lagos state

S/N	Items	SA	A	D	SD	Mean	St.D
1.	Digital camera usage does not enhance caregivers early years science teaching effectiveness.	10 (8.9)	12 (10.7)	54 (48.2)	36 (32.1)	1.96	0.88
2.	Caregivers use of digital camera in early years science teaching enhance preschool children's cognitive development.	43 (38.4)	37 (33.0)	20 (17.9)	12 (10.7)	2.99	0.99
3.	Caregivers use of digital camera in early years science teaching encourage collaborative learning among preschool children.	60 (53.6)	35 (31.3)	13 (11.6)	4 (3.6)	3.34	0.82
4.	A sense of community is not been promoted among preschoolers by caregivers use of digital camera in early years science teaching.	5 (4.5)	18 (16.1)	26 (23.2)	63 (56.3)	1.68	0.90
5.	Memorable learning among preschoolers is facilitated by caregivers' use of digital camera in early years science teaching.	56 (50.0)	32 (28.6)	10 (8.9)	14 (12.5)	3.16	1.03
Grand mean = 2.62							

Table 7 showing use of digital camera and caregivers teaching effectiveness in early years science in public preschools in Lagos state. The detailed analysis revealed that caregivers use of digital camera in early years science teaching encourage collaborative learning among preschool children, (mean = 3.34), memorable learning among preschoolers is facilitated by caregivers' use of digital camera in early years science

teaching (mean = 3.16), caregivers use of digital camera in early years science teaching enhance preschool children's cognitive development (mean = 2.99), Digital camera usage does not enhance caregivers early years science teaching effectiveness (mean = 1.96) and a sense of community is not been promoted among preschoolers by caregivers use of digital camera in early years science teaching (mean = 1.68).

Testing of Hypotheses

HO₁: – There is no significant relationship between the use of smart television and caregivers teaching effectiveness in early years science in public preschools in Lagos state.

Table 8 showing summary of Pearson Product Moment Correlation showing relationship between the use of smart television and caregivers teaching effectiveness in early years science in public preschools in Lagos state.

Variable	Mean	Std.D	N	r	Sig.	Remark
Use of smart television	30.776	11.050				
Caregivers teaching effectiveness in early science in public preschools in Lagos state	12.830	4.555	112	.996**	.000	significant

**** correlation is significant at the 0.01 level (2 tailed)**

Table 8 shows that there is a significant positive relationship between the use of smart television and caregivers teaching effectiveness in early years science in public preschools in Lagos state ($r=.996$; $p<0.05$). This implies that use smart television has a correlates with caregivers teaching effectiveness in early years science in public preschools in Lagos state. The positive relationship implies that caregivers can teach early years science effectively using smart television, hence, the null hypothesis 1 is rejected.

HO₂: – There is no significant relationship between the use of tablets and caregivers teaching effectiveness in early years science in public preschools in Lagos state.

Table 9 Summary of Pearson Product Moment Correlation showing relationship between the use of tablets and caregivers teaching effectiveness in early years science in public preschools in Lagos state.

Variable	Mean	Std.D	N	r	Sig.	Remark
The use of tablets	30.776	11.050				
Early years science activities	12.991	4.793	112	.997**	.000	significant

**** correlation is significant at the 0.01 level (2 tailed)**

Table 9 shows that there is a significant positive relationship between the use of tablets and caregivers teaching effectiveness in early years science in public preschools in Lagos state ($r=.997$; $p<0.05$). This implies the use of tablets has a correlates with caregivers teaching effectiveness in early years science in public preschools in Lagos state. The positive relationship implies that the use of tablets in teaching early year's science activities enhances caregivers teaching effectiveness in public preschools in Lagos state, hence, the null hypothesis 2 is rejected.

HO₃: – Significant relationship does not exist between the use of digital camera and caregivers teaching effectiveness in early years science in public preschools in Lagos state.

Table 10 Summary of Pearson Product Moment Correlation showing relationship between the use of digital camera and caregivers teaching effectiveness in early years science in public preschools in Lagos state.

Variable	Mean	Std.D	N	r	Sig.	Remark
The use of digital camera	30.776	11.050	112	.989**	.000	significant
Team work among preschoolers	13.141	4.202				

**** correlation is significant at the 0.01 level (2 tailed)**

Table 10 shows that there is a significant positive relationship between the use of digital camera and caregivers teaching effectiveness in early years science in public preschools in Lagos state ($r =.989$; $p<0.05$). This implies that the use of digital camera has a correlate with caregivers teaching effectiveness in early years science in public preschools in Lagos state. The positive relationship implies that the use of digital camera in early years science teaching in public preschools in Lagos state improves caregivers' teaching effectiveness, hence, the null hypothesis 3 is rejected.

Discussion of Findings

The findings made in the analysis of hypothesis one shows that there is a significant positive relationship between the use of smart television and caregivers teaching effectiveness in early years science in public preschools in Lagos state. This implies that the use of smart television enhance caregivers teaching effectiveness in early years science in public preschools in Lagos state. The positive relationship indicates that the use of smart television by caregivers in teaching early years science to preschool children in public

preschools in Lagos state promotes caregivers teaching effectiveness. This agrees with Pasnik et al., (2016) and Daugherty et al., (2014), who stated that experts have argued that smart television could be beneficial for learning in preschool settings as it promotes caregivers teaching effectiveness and have called for hi-tech models for efficient early years science teaching and learning in preschools.

The findings made in the analysis of hypothesis two shows that there is a significant positive relationship between the use of tablets and caregivers teaching effectiveness in early years science in public preschools in Lagos state. This implies that the use of tablets has a correlates with caregivers teaching effectiveness in early years science in public preschools in Lagos state. The positive relationship implies that caregivers teach very well with the use of tablets and this enable preschool children understanding of early years science concepts. This agrees with Dore & Dynia (2020), who asserts that tablets were most frequently used in caregivers supported preschool settings for teaching early years science and other preschool themes. Tablets enable preschoolers' understanding of early years science activities and the incorporation of fundamental motivational activities that create a learning environment where preschoolers feel more motivated to participate in the classroom activities.

The findings made in the analysis of hypothesis three shows that the rejection of the null hypothesis was due to the significant positive relationship between the use of digital camera and caregivers teaching effectiveness in early years science in public preschools in Lagos state. This shows that use of digital camera has a correlates with caregivers teaching effectiveness in early years science. The positive relationship implies that teaching with digital cameras engender memorable learning of early years science activities in preschool children. This is in line with Pasnik et al., (2016) and Daugherty et al., (2014) argued that digital camera could be beneficial for learning in preschool settings as it promotes caregivers teaching effectiveness and preschool children learning experiences by producing and documenting visual materials like pictures, keeps alive in the mind of the preschool children what they were taught the previous days by watching those documented early years science activities which remain fresh in their memories. Summarily,

the findings of this study reveals that technology-based intervention enhance effective teaching of early years science.

Conclusion

In conclusion, purposefully integrating a variety of modern technology tools such as smart television, tablets digital cameras among others, by caregivers in teaching early years science will enhance caregivers early years science teaching effectiveness and stimulate preschoolers' motivation, concept acquisition, hands-on exploration, collaboration and social interaction and active participation in early years science learning activities public preschools in Lags state.

Recommendations

1. Based on the findings of this study, the following recommendations were made: It is recommended that various modern developmentally appropriate technology tools be provided to public preschools in Lagos state for ease of teaching and learning of early years science activities.
2. Besides, capacity building workshop is very important for caregivers to update their Content Knowledge (CK) in Early Years Science (EYS) and develop Pedagogical Content Knowledge (PCK) on the use of modern technology tools in teaching early years science to preschool children.

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