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INFLUENCE OF SCREEN TIME EXPOSURE ON COGNITIVE DEVELOPMENT, SOCIAL BEHAVIOUR AND LEARNING OUTCOMES AMONG EARLY CHILDHOOD LEARNERS IN KANO STATE, NIGERIA

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ABSTRACT
The increasing exposure of young children to digital devices has generated growing concern about its implications for early childhood development, particularly in contexts where evidence remains limited. This study examined the influence of screen time exposure on cognitive development, social behaviour, and learning outcomes among early childhood learners in Kano State, Nigeria. A correlational research design was adopted, and the study was conducted across seven metropolitan Local Government Areas of Kano State. A total of 756 respondents, comprising 252 early childhood education teachers and 504 parents or guardians, were selected from 84 public and private pre-primary schools through a multistage sampling procedure. Data were collected using the Screen Time Exposure Questionnaire (STEQ) and the Child Development and Learning Outcomes Assessment Scale (CDLOS). The instruments were validated by experts and subjected to reliability testing before administration. Data were analysed using descriptive statistics, Pearson Product-Moment Correlation, and regression analysis, with hypotheses tested at the 0.05 level of significance. The findings indicated high levels of cognitive development (M = 3.01), social behaviour (M = 3.25), and learning outcomes (M = 2.88) among the learners. Regression results further showed that screen time exposure significantly predicted cognitive development ($\beta = .113$, $p = .030$), social behaviour ($\beta = .212$, $p = .001$), and learning outcomes ($\beta = .220$, $p = .002$). The findings suggest that children's engagement with digital media is significantly associated with important developmental and educational outcomes, although the relatively modest coefficients indicate that screen exposure is only one of several factors shaping children's development. The study concludes that the developmental implications of screen use depend substantially on its content, purpose, duration, supervision, and relationship with other experiences such as play, social interaction, and hands-on learning. It recommends purposeful and supervised digital media use, stronger home-school collaboration, teacher capacity development in digital pedagogy, and policies that promote balanced technology integration in early childhood education.

Keywords: screen time exposure, cognitive development, social behaviour, learning outcomes, early childhood learners, digital media, Kano State

Introduction

Early childhood represents one of the most critical periods of human development, during which rapid cognitive, social, emotional, and physical growth occurs. During the first six years of life, children's brains undergo substantial neurological development, forming the foundation for lifelong learning, behaviour, health, and well-being. Experiences during this developmental stage significantly influence children's language acquisition, problem-solving abilities, executive functioning, emotional regulation, social competence, and academic readiness. Consequently, the quality of children's learning environments and the nature of their daily experiences have become central concerns for educators, parents, health professionals, and policymakers worldwide. The rapid advancement of digital technology has transformed children's everyday experiences across the globe. Unlike previous generations, today's young children are exposed to various digital devices, including smartphones, tablets, televisions, computers, and internet-enabled educational gadgets from a very early age. These technologies provide opportunities for learning, communication, entertainment, and creativity. Educational applications, interactive games, animated videos, and virtual learning platforms have increasingly become part of children's daily routines, especially following the expansion of digital learning during and after the COVID-19 pandemic. Consequently, screen-based media have become one of the most influential environmental factors shaping early childhood development.

Screen time refers to the amount of time children spend using electronic devices with visual displays, including televisions, smartphones, tablets, computers, gaming consoles, and other digital technologies for educational or recreational purposes. While moderate and well-supervised educational screen use can support early literacy, language development, creativity, and problem-solving skills, excessive, unsupervised, or age-inappropriate screen exposure has generated growing concerns among researchers and child development specialists. Recent studies suggest that prolonged screen time may influence children's attention span, memory, executive functioning, emotional regulation, sleep quality, physical activity, language acquisition, and social interactions. Globally, international health organizations have developed recommendations to guide children's screen exposure. The World Health Organization recommends that children under two years should not be exposed to screen media, while children aged two to five years should not exceed one hour of high-quality screen time per day. Similarly, the American Academy of Pediatrics emphasizes balanced media use, parental supervision, and the prioritization of face-to-face interactions, physical play, adequate sleep, and age-appropriate learning experiences. These recommendations are based on increasing evidence linking excessive screen exposure to childhood obesity, sleep disturbances, reduced physical activity, behavioural challenges, delayed language development, and poorer academic outcomes. Despite these concerns, research findings regarding the developmental consequences of screen exposure remain inconsistent. Some studies report positive associations between educational screen use and children's vocabulary acquisition, early literacy, numeracy, and cognitive engagement, particularly when digital content is interactive, educational, and mediated by adults. Conversely, other studies have found that excessive recreational screen time is associated with reduced concentration, behavioural problems, poor peer relationships, delayed cognitive development, lower academic achievement, and diminished psychosocial well-being. These mixed findings suggest that the developmental effects of screen exposure may depend on factors such as duration of use, content quality, parental involvement, children's age, and socio-cultural context. In Africa, the increasing affordability of smartphones, internet connectivity, and digital learning initiatives has significantly expanded children's access to electronic media.

Nevertheless, limited parental awareness, inconsistent digital parenting practices, inadequate policy implementation, and disparities in digital literacy continue to shape

children's media experiences differently across countries. In Nigeria, rapid urbanization, increased smartphone ownership, widespread internet access, and changing family lifestyles have contributed to a noticeable increase in children's daily screen exposure. Many parents increasingly rely on digital devices to entertain children, facilitate learning, or occupy them while attending to household or occupational responsibilities. Although these practices provide convenience, concerns continue to emerge regarding their possible implications for children's cognitive growth, classroom behaviour, peer relationships, and academic performance. The situation appears particularly relevant in Kano State, one of Nigeria's most populous states with a rapidly growing population of young children. Increased access to smartphones, satellite television, internet-enabled devices, and digital educational resources has altered children's learning environments both at home and in schools. While some early childhood education centres have begun integrating digital technologies into teaching and learning, many children also spend considerable time engaging with recreational digital media without consistent parental guidance or regulation. Given that cognitive development, social behaviour, and foundational learning skills established during early childhood significantly influence future educational achievement and lifelong development, understanding how screen time exposure relates to these developmental outcomes has become increasingly important.

Although several international studies have investigated the health implications of children's screen time, relatively few empirical studies have comprehensively examined its influence on cognitive development, social behaviour, and learning outcomes among early childhood learners within the Nigerian context, particularly in Kano State. Differences in cultural practices, parental supervision, educational opportunities, digital access, and socio-economic conditions suggest that findings from developed countries may not be directly applicable to Nigerian children. Therefore, there is a need for context-specific empirical evidence that will assist parents, educators, school administrators, healthcare professionals, and policymakers in promoting balanced digital media use while supporting children's optimal cognitive, behavioural, and educational development. It is against this background that this study seeks to investigate the influence of screen time exposure on cognitive development, social behaviour, and learning outcomes among early childhood learners in Kano State, Nigeria.

Statement of the Problem

The increasing integration of digital technologies into children's daily lives has fundamentally changed the experiences of early childhood learners worldwide. Smartphones, tablets, televisions, computers, and internet-enabled devices have become readily accessible to many young children, exposing them to digital media for educational, recreational, and social purposes. Although digital technologies offer opportunities to enhance learning, creativity, and communication, concerns continue to grow regarding the developmental consequences of prolonged and poorly regulated screen exposure during the early years of life. Early childhood is a sensitive period during which cognitive abilities, language skills, social competence, emotional regulation, and foundational learning behaviours develop rapidly. During this period, children require rich interpersonal interactions, active play, exploration, and meaningful engagement with caregivers and peers to support healthy development. However, increasing dependence on digital devices may reduce opportunities for direct social interaction, physical activity, imaginative play, and teacher-child engagement, which are essential for optimal cognitive and social development. In Nigeria, particularly in urban centres such as Kano State, ownership of smartphones and other digital devices has increased considerably over the past decade. Many parents now use digital media to educate, entertain, or occupy young children, often without adequate monitoring of screen duration or content quality. While educational applications may contribute positively to children's learning experiences, prolonged exposure to recreational digital content may negatively influence attention, memory, classroom

participation, peer relationships, emotional behaviour, and academic readiness. Despite these concerns, little empirical evidence exists regarding the actual relationship between children's screen exposure and developmental outcomes within the socio-cultural and educational context of Kano State.

Existing studies have predominantly focused on adolescents or school-age children, while relatively few have investigated early childhood learners whose developmental characteristics differ considerably. Furthermore, many previous studies have concentrated on health-related outcomes such as obesity, sleep quality, or physical activity, with limited attention given to the combined influence of screen time on cognitive development, social behaviour, and learning outcomes among preschool children. The scarcity of locally generated evidence makes it difficult for educators, parents, health professionals, and policymakers to develop evidence-based guidelines for appropriate digital media use among young children. If excessive and poorly supervised screen exposure continues without adequate understanding of its developmental implications, children may experience challenges in cognitive functioning, social interaction, classroom engagement, and school readiness, thereby affecting their long-term educational achievement and overall well-being. Conversely, if educational screen use contributes positively to children's development under appropriate conditions, such evidence could support the effective integration of digital technologies into early childhood education. It is this gap in empirical knowledge that necessitates the present study. Specifically, the study seeks to determine the influence of screen time exposure on cognitive development, social behaviour, and learning outcomes among early childhood learners in Kano State, Nigeria, with the aim of providing context-specific evidence to guide parents, educators, policymakers, and other stakeholders in promoting healthy and developmentally appropriate digital media practices.

Aim and Objectives of the study

The aim of this study is to examine the influence of screen time exposure on cognitive development, social behaviour, and learning outcomes among early childhood learners in Kano State, Nigeria. Specifically, the study seeks to:

1. Determine the influence of screen time exposure on the cognitive development of early childhood learners in Kano State, Nigeria.
2. Examine the influence of screen time exposure on the social behaviour of early childhood learners in Kano State, Nigeria.
3. Assess the influence of screen time exposure on the learning outcomes of early childhood learners in Kano State, Nigeria.

Research Questions

The following research questions guide the study:

1. To what extent does screen time exposure influence the cognitive development of early childhood learners in Kano State, Nigeria?
2. To what extent does screen time exposure influence the social behaviour of early childhood learners in Kano State, Nigeria?
3. To what extent does screen time exposure influence the learning outcomes of early childhood learners in Kano State, Nigeria?

Research Hypotheses

The following null hypotheses was tested at a 0.05 level of significance:

1. H_{o1}: Screen time exposure has no statistically significant influence on the cognitive development of early childhood learners in Kano State, Nigeria.
2. H_{o2}: Screen time exposure has no statistically significant influence on the social behaviour of early childhood learners in Kano State, Nigeria.
3. H_{o3}: Screen time exposure has no statistically significant influence on the learning outcomes of early childhood learners in Kano State, Nigeria

Theoretical Framework

This study is anchored on Bronfenbrenner's Ecological Systems Theory (EST), originally developed by Urie Bronfenbrenner in 1979 and later refined into the Bioecological Model in 2005. The theory explains that a child's growth and development are shaped by continuous interactions between the child and the multiple environmental systems in which the child lives. Rather than viewing development as a product of biological maturation alone, Bronfenbrenner argued that children's cognitive, social, emotional, behavioural, and educational development results from reciprocal interactions between the individual and environmental contexts over time. According to Bronfenbrenner (1979), child development occurs within five interconnected environmental systems: the microsystem, mesosystem, exosystem, macrosystem, and chronosystem. Each system influences children's experiences and developmental outcomes in unique ways. The microsystem refers to the child's immediate environment where direct interactions occur. It includes the family, school, peer group, neighbourhood, caregivers, and early childhood education centres. These settings provide the daily experiences that most strongly influence children's learning and behaviour. In the context of screen time exposure, the microsystem includes parents' decisions regarding children's access to smartphones, tablets, televisions, computers, and other digital devices. Teachers' instructional practices, classroom use of digital technology, parental monitoring of media use, and children's interactions with siblings and peers all determine how screen exposure affects cognitive development, social behaviour, and learning outcomes. Children who experience balanced digital media use accompanied by parental guidance, teacher supervision, and educational content are more likely to develop positive cognitive and academic skills. Conversely, excessive recreational screen exposure with limited adult interaction may reduce opportunities for language development, imaginative play, problem-solving, and social interaction.

The mesosystem represents the relationships between different components of the child's microsystem. It focuses on the interactions between home and school, parents and teachers, family and community, and other social institutions directly connected to the child. Within this study, effective collaboration between parents and early childhood teachers can promote healthy digital habits. Parents who communicate regularly with teachers about children's screen use are better positioned to reinforce educational media practices at home. Likewise, schools that educate parents about age-appropriate screen time recommendations contribute to healthier developmental outcomes. Strong home-school partnerships therefore create consistency in children's digital experiences and support positive learning behaviours. The exosystem consists of settings that do not directly involve the child but indirectly influence the child's development. Examples include parents' workplaces, educational policies, media regulations, internet infrastructure, healthcare services, and community resources. For example, parents working long hours may rely on smartphones or television to occupy young children, thereby increasing daily screen exposure.

Similarly, the availability of affordable internet services, television programming, and digital devices within communities influences children's access to screen media. Government policies regulating children's media content and investments in digital education also indirectly shape children's developmental experiences. The macrosystem comprises the broader cultural, economic, political, religious, and societal values that influence child development. It reflects societal beliefs regarding parenting practices, technology use, education, and childhood. In Nigeria, increasing digitalization, widespread smartphone ownership, expansion of internet connectivity, and changing family lifestyles have significantly influenced children's exposure to electronic media. Many families increasingly consider digital devices essential learning tools, while others primarily use them for entertainment or child management. Cultural beliefs regarding parenting, educational priorities, and technology adoption influence how children

use digital devices and the extent of parental supervision. The chronosystem refers to changes occurring over time that affect children's development. These changes may include developmental transitions, technological innovations, family circumstances, educational reforms, and significant societal events. Recent technological advancements and the COVID-19 pandemic accelerated children's exposure to digital devices through online learning, virtual communication, and increased reliance on electronic media. As children grow, the cumulative effects of prolonged screen exposure may influence their cognitive functioning, behavioural development, academic achievement, and social competence differently across developmental stages. The chronosystem therefore emphasizes that the influence of screen time is dynamic and changes over time depending on children's age, developmental needs, and evolving technological environments.

Bronfenbrenner's Ecological Systems Theory provides a comprehensive framework for understanding how screen time exposure influences cognitive development, social behaviour, and learning outcomes among early childhood learners. The theory recognizes that children's use of digital media does not occur in isolation but is shaped by multiple interacting environmental factors. The theory therefore supports the proposition that the developmental outcomes associated with children's screen time depend not only on the duration of screen exposure but also on the quality of digital content, parental supervision, educational context, and broader environmental influences. Because this study seeks to investigate the influence of screen time exposure on cognitive development, social behaviour, and learning outcomes among early childhood learners in Kano State, Nigeria, Bronfenbrenner's Ecological Systems Theory provides the most appropriate theoretical lens. It captures the complex interactions between children and the family, school, community, and societal environments that shape how digital media affects early childhood development.

Empirical Review

The increasing penetration of digital technologies into children's daily lives has generated substantial empirical interest regarding the consequences of screen time exposure on early childhood development. Screen-based technologies such as smartphones, tablets, television, computers, and digital learning devices have become common features of children's home and school environments. Although digital media can provide educational opportunities through interactive learning applications, digital storytelling, and access to educational content, concerns have emerged regarding excessive, inappropriate, and unsupervised screen exposure among young children. Contemporary empirical research has therefore shifted from examining whether children use screens to understanding how, when, why, and under what conditions screen exposure influences developmental outcomes. Empirical evidence indicates that screen exposure is a complex developmental issue influenced by multiple factors, including duration of exposure, age of first exposure, type of content accessed, parental mediation, socio-economic background, and the extent of children's engagement with caregivers and peers during screen use. Recent studies have demonstrated that screen time is not uniformly harmful; rather, its effects depend largely on the quality and context of use. Educational and interactive screen activities accompanied by adult guidance may promote cognitive engagement and learning, whereas excessive passive viewing may reduce opportunities for physical exploration, social interaction, language stimulation, and play-based learning, which are fundamental components of early childhood development.

Screen Time Exposure and Cognitive Development

Cognitive development during early childhood involves the growth of children's attention, memory, reasoning ability, language development, problem-solving skills, and executive functioning. Several empirical studies have investigated whether screen exposure enhances or inhibits these developmental processes. Supanitayanon, Trairatvorakul, and Chonchaiya (2020) conducted a longitudinal study examining the relationship between early

screen media exposure and preschool cognitive development among 274 children followed from infancy to four years of age. The researchers measured children's screen exposure at different developmental stages and assessed cognitive outcomes using standardized developmental assessments. Findings revealed that early and prolonged screen exposure was associated with poorer cognitive outcomes, particularly when screen use replaced verbal interaction between caregivers and children. However, the study also demonstrated that caregiver interaction during screen use reduced potential negative effects, suggesting that adult mediation plays an important role in determining developmental outcomes. The strength of this study lies in its longitudinal design, which allowed researchers to examine changes in children's development over time rather than relying on a single measurement. However, the study was conducted in a specific cultural context, and the majority of participants had access to structured healthcare services, limiting direct generalization to developing countries such as Nigeria, where patterns of digital access, parental education, and childcare practices differ considerably.

Similarly, a cohort study by Madigan et al. (2020) investigated associations between screen time trajectories and developmental outcomes among young children. The researchers found that children experiencing increasing screen exposure patterns demonstrated poorer developmental outcomes compared with children who maintained lower levels of screen use. The study emphasized that the timing and developmental stage at which children are exposed to excessive screen media may be more important than screen duration alone. Supporting this argument, Yang et al. (2022) examined screen time trajectories among children aged 6–72 months and found that children with early increasing screen exposure patterns had weaker cognitive and social-emotional outcomes compared with children whose screen exposure remained consistently low. The researchers argued that excessive early exposure may interfere with essential developmental experiences such as caregiver interaction, physical play, exploration, and language-rich conversations. A systematic scoping review by Domingues-Montanari (2024) synthesized evidence from numerous studies examining screen exposure and early childhood development. The review showed that excessive screen exposure was frequently associated with undesirable developmental outcomes, including reduced cognitive performance, weaker language development, lower learning efficiency, and poorer social interaction. However, the review also highlighted that some studies reported neutral or positive outcomes, particularly when digital content was educational and children interacted with adults during screen activities. This finding suggests that the developmental consequences of screen time cannot be explained solely by duration of exposure but must consider the broader learning environment. More recent evidence from resource-limited settings further supports the importance of context. A population-based survey involving 1,052 households examined screen exposure and early childhood development outcomes. The study found that early exposure and longer duration of screen use were associated with increased developmental risks, while exposure to educational content and caregiver interaction during screen use were associated with improved cognitive and socio-emotional outcomes. Collectively, these studies indicate that screen time exposure may influence cognitive development through two major pathways. First, excessive screen exposure may displace developmentally important activities such as play, communication, and exploration. Second, carefully designed educational screen experiences may support learning when combined with adult guidance. However, most existing studies have been conducted in developed countries, creating a need for empirical evidence from African educational contexts where children's digital experiences may differ significantly.

Screen Time Exposure and Social Behaviour

Social behaviour in early childhood includes children's ability to communicate, cooperate, regulate emotions, establish relationships, and participate effectively with peers and adults. Researchers have increasingly examined whether excessive screen exposure affects

these social competencies. Jia, Deng, and Zeng (2025) conducted a meta-analysis examining the relationship between screen exposure and social-emotional development among children and adolescents. The review synthesized evidence from 30 studies involving 39,620 participants. Findings indicated that higher screen exposure was associated with reduced social-emotional competence and increased behavioural problems. The researchers concluded that excessive screen use may limit children's opportunities for interpersonal interaction, emotional learning, and social engagement. However, the researchers noted that effect sizes were relatively small, indicating that screen exposure alone does not determine children's social development. Instead, social outcomes are influenced by other factors such as parenting style, family relationships, children's temperament, and the quality of digital content accessed. In another study, Gillioz, Gentaz, and Lejeune (2025) investigated the relationship between screen habits, attention skills, and prosocial behaviour among toddlers aged 6–36 months. The findings indicated that patterns of screen use were associated with children's attentional abilities and social behaviours. The researchers emphasized that early childhood social development depends heavily on real-life interaction and that excessive digital engagement may reduce opportunities for practicing communication and cooperation skills.

Recent evidence has also highlighted the role of parental digital behaviour. Studies examining parental smartphone distraction ("technoference") suggest that when caregivers frequently prioritize digital devices over interaction with children, children's emotional security and social adjustment may be affected. This finding reinforces the ecological perspective that children's screen experiences are embedded within family relationships rather than occurring independently.

Methodology

The study adopted a correlational research design to investigate the relationship between screen time exposure and cognitive development, social behaviour, and learning outcomes among early childhood learners in Kano State, Nigeria. The correlational research design was considered appropriate because the study sought to determine the extent to which variations in children's screen time exposure were associated with differences in their cognitive abilities, social behaviour, and learning outcomes without manipulating the independent variable. According to Creswell and Creswell (2023), correlational research designs are appropriate for examining the direction, strength, and predictive relationships among naturally occurring variables. Consequently, the design enabled the researcher to measure children's screen time exposure as the independent variable and determine its relationship with cognitive development, social behaviour, and learning outcomes as the dependent variables. The study was conducted in the seven metropolitan Local Government Areas of Kano State, namely Kano Municipal, Fagge, Dala, Gwale, Tarauni, Nassarawa, and Ungogo. Kano metropolis is one of the largest urban centres in northern Nigeria and is characterized by rapid population growth, increasing urbanization, and widespread access to digital technologies such as smartphones, tablets, televisions, computers, and internet-enabled devices. These characteristics made the area suitable for investigating children's screen exposure patterns and their possible developmental implications.

The selected Local Government Areas comprised families from diverse socioeconomic backgrounds with variations in parental education, occupation, household income, and access to digital resources. Such diversity provided an appropriate setting for examining the relationship between children's screen time exposure and their cognitive development, social behaviour, and learning outcomes within early childhood education settings. The population of the study comprised all early childhood learners, their parents or guardians, and early childhood education teachers in registered public and private pre-primary schools within the seven metropolitan Local Government Areas of Kano State. However, because children aged 3–6 years may not possess the cognitive maturity required to provide

reliable information regarding their screen use patterns and developmental characteristics, data were collected from two categories of respondents: parents or guardians and early childhood education teachers. Parents and guardians provided information on children's screen exposure patterns, including duration, frequency, types of digital devices used, purposes of screen use, and parental monitoring practices. Teachers provided information on children's cognitive development, classroom behaviour, social interaction, participation, attention span, and learning outcomes based on their daily observations within the school environment. The use of parents and teachers as respondents was considered appropriate because children's screen exposure occurs predominantly within the home environment, whereas their developmental and learning behaviours are more objectively observed in school settings.

A multi-stage sampling procedure was employed to select the study participants. At the first stage, the seven metropolitan Local Government Areas (Kano Municipal, Fagge, Dala, Gwale, Tarauni, Nassarawa, and Ungogo) were purposively selected because of their high level of urbanization, widespread access to digital technologies, and increasing exposure of young children to electronic media. At the second stage, registered pre-primary schools were stratified into public and private schools to ensure adequate representation of different school environments and socioeconomic backgrounds. At the third stage, twelve (12) pre-primary schools comprising six public and six private schools were selected from each Local Government Area using simple random sampling, resulting in a total of eighty-four (84) participating schools. At the fourth stage, respondents were selected from each participating school. Three (3) early childhood education teachers were selected through simple random sampling from each school, while six (6) parents or guardians of enrolled children were also selected using simple random sampling. Accordingly, the sample consisted of 252 teachers (84 × 3) and 504 parents or guardians (84 × 6), giving a total sample size of 756 respondents. The sample size was considered adequate for correlational and multiple regression analyses because it provided sufficient statistical power and ensured adequate representation of early childhood education stakeholders within the metropolitan Local Government Areas of Kano State.

Data were collected using two researcher-developed instruments based on an extensive review of relevant literature. The first instrument, titled the Screen Time Exposure Questionnaire (STEQ), was completed by parents or guardians and caregivers and measured children's screen exposure patterns, including duration, frequency, type of digital devices used, purposes of screen use, and parental monitoring practices. The second instrument, titled the Child Development and Learning Outcomes Assessment Scale (CDLOS), was completed by the same respondents and assessed children's cognitive development, social behaviour, and learning outcomes. The CDLOS consisted of three sections covering cognitive development, social behaviour, and learning outcomes. The instruments were subjected to face and content validation by three experts in Early Childhood Education, Educational Psychology, and Measurement and Evaluation. The experts examined the instruments for relevance, clarity, appropriateness, language suitability, and alignment with the objectives and research questions of the study. Their observations and recommendations were incorporated before the instruments were administered. A pilot study was conducted among parents and early childhood education teachers from Local Government Areas outside the study area but possessing characteristics similar to those of the selected study locations. The internal consistency reliability of the instruments was established using Cronbach's Alpha coefficient. Reliability coefficients of 0.70 and above were considered acceptable for educational research.

An introductory letter was obtained from the researcher's institution before data collection commenced. Approval was also obtained from the relevant educational authorities and the administrators of the selected schools. Trained research assistants assisted in administering the instruments. Parents' questionnaires were distributed through the head teachers and caregivers of the selected schools, while teachers completed their questionnaires

directly. Participation in the study was voluntary, and respondents were assured of the confidentiality and anonymity of the information they provided. The completed questionnaires were coded and analysed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to answer the research questions relating to children's screen time exposure, cognitive development, social behaviour, and learning outcomes. Pearson Product-Moment Correlation (PPMC) was used to determine the relationships between screen time exposure and each of the dependent variables. Multiple regression analysis was employed to determine the predictive influence of screen time exposure on cognitive development, social behaviour, and learning outcomes. All null hypotheses were tested at the 0.05 level of significance.

Results

The results of the study are presented in this section in line with the research questions and hypotheses formulated to guide the investigation. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to describe the levels of children's screen time exposure, cognitive development, social behaviour, and learning outcomes among early childhood learners in the selected metropolitan Local Government Areas of Kano State.

Research Question One: To what extent does screen time exposure influence the cognitive development of early childhood learners in Kano State, Nigeria?

Table 1: *Table showing the extent does screen time exposure influence the cognitive development of early childhood learners in Kano State, Nigeria*

S/N	COGNITIVE DEVELOPMENT	Mean	Std. Deviation	Remark
1	The child demonstrates improvement in early literacy skills.	3.30	.724	High
2	The child recognizes letters and basic words appropriately.	3.18	.580	High
3	The child demonstrates understanding of basic numerical concepts.	3.34	.694	High
4	The child participates actively during lessons.	3.13	.844	High
5	The child completes classroom tasks successfully.	3.06	.612	High
6	The child shows interest in learning activities.	2.99	.501	High
7	The child demonstrates good classroom concentration.	2.86	.673	High
8	The child performs well in early childhood assessments.	2.97	.726	High
9	The child applies learned skills during classroom activities.	3.05	.602	High
10	The child demonstrates readiness for progression to primary education.	3.22	.632	High
	Mean	**3.01**		

Decision: Low: 1.00-2.49 **High: 2.50-5.00**

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Table 1 shows extent does screen time exposure influence the cognitive development of early childhood learners in Kano State, Nigeria**.** The mean is **3.01** which is greater than 2.49 the base line for positive opinion. This therefore shows a numeric indicator that screen time exposure has a significant influence on cognitive development of early childhood learners in Kano State, Nigeria**.**

Research Question Two: To what extent does screen time exposure influence the social behaviour of early childhood learners in Kano State, Nigeria?

Table 2: Table showing the extent does screen time exposure influence the social behaviour of early childhood learners in Kano State, Nigeria

S/N	SOCIAL BEHAVIOUR	Mean	Std. Deviation	Remark
1	The child interacts positively with classmates.	3.18	.568	High
2	The child participates in group activities.	3.04	.631	High
3	The child shares learning materials with other children.	3.34	.478	High
4	The child communicates effectively with peers and teachers.	3.09	.759	High
5	The child demonstrates emotional control during classroom activities.	3.37	.828	High
6	The child cooperates with other children during play.	3.00	.791	High
7	The child shows confidence when participating in classroom activities.	3.23	.747	High
8	The child respects classroom rules and instructions.	3.18	.765	High
9	The child demonstrates empathy towards other children.	3.61	.488	High
10	The child avoids excessive withdrawal from peer activities.	3.48	.579	High
	Weighted average	**3.25**		

Decision: Low: 1.00-2.49 **High: 2.50-5.00**

Table 2 shows extent does screen time exposure influence the social behaviour of early childhood learners in Kano State, Nigeria**.** The mean is **3.25** which is greater than 2.49 the base line for positive opinion. This therefore shows a numeric indicator that screen time exposure has a significant influence on social behaviour of early childhood learners in Kano State, Nigeria

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Research Question Three: To what extent does screen time exposure influence the learning outcomes of early childhood learners in Kano State, Nigeria?

Table 3: Table showing extent does screen time exposure influence the learning outcomes of early childhood learners in Kano State, Nigeria

S/N	LEARNING OUTCOMES	Mean	Std. Deviation	Remarks
1.	The child demonstrates improvement in early literacy skills.	3.14	.632	High
2.	The child recognizes letters and basic words appropriately.	3.02	.645	High
3.	The child demonstrates understanding of basic numerical concepts.	2.88	.754	High
4.	The child participates actively during lessons.	3.15	.481	High
5.	The child completes classroom tasks successfully.	3.22	.592	High
6.	The child shows interest in learning activities.	2.98	.734	High
	The child demonstrates good classroom concentration.	2.50	.544	High
	The child performs well in early childhood assessments.	2.61	.623	High
	The child applies learned skills during classroom activities.	2.76	.499	High
	The child demonstrates readiness for progression to primary education.	2.57	.679	High
	Mean	**2.88**		

Decision: Low: 1.002.49 **High: 2.50-5.00**

Table 3 shows extent does screen time exposure influence the learning outcomes of early childhood learners in Kano State, Nigeria**.** The mean is **2.88** which is greater than 2.49 the base line for positive opinion. This therefore shows a numeric indicator that screen time exposure has a significant influence on learning outcomes of early childhood learners in Kano State, Nigeria

Hypothesis One: Screen time exposure has no statistically significant influence one cognitive development of early childhood learners in Kano State, Nigeria

Table 4: Summary of Regression Analysis on influence of Screen time exposure on cognitive development of early childhood learners in Kano State, Nigeria

Table 4 *Test of influence*

		Unstandardized Coefficient		Standardized Coefficient			95% Confidence Interval	
Model		B	Std. Error	Beta	T	Sig.	Low/Bound	Up/Bound
1	(Constant)	29.508	.869		33.955	.001	27.799	31.217
	Screen time exposure	.121	.056	.113	2.183	.030	.012	.231

Dependent Variable: Cognitive Development

Source: Field Survey 2026

The test of influence results as presented in table 4 showed that screen time exposure statistically significantly influences cognitive development of early childhood learners in Kano State, Nigeria is B = .212; $t_{(755)} = 33.955$, P = 0.030). It indicated that at 5% level of significance there was enough evidence that the regression equation specified that, screen time exposure

statistically significantly influenced cognitive development of early childhood learners in Kano State, Nigeria. Based on this, the null hypothesis was rejected, and it was concluded that screen time exposure statistically significantly influences cognitive development of early childhood learners in Kano State, Nigeria

Hypothesis Two: Screen time exposure has no statistically significant influence on social behaviour of early childhood learners in Kano State, Nigeria

Table 5: *Summary of linear Regression Analysis on influence of Screen time exposure on social behaviour of early childhood learners in Kano State, Nigeria*

Test of influence

Model		Unstandardized Coefficient		Standardized Coefficient			95% Confidence Interval	
		B	Std. Error	Beta	T	Sig.	Low/Bound	Up/Bound
1	(Constant)	27.226	1.007		27.047	.001	25.247	29.206
	Screen time exposure	.270	.065	.212	4.158	.001	.0142	.231

Dependent Variable: Social Behaviour

Source: Field Survey 2026

The test of influence results as presented in table 5 showed that screen time exposure statistically significantly influences social behaviour of early childhood learners in Kano State, Nigeria ($B = .270$; $t_{(755)} = 27.047$, $P = 0.001$). It indicated that at 5% level of significance there was enough evidence that the regression equation specified that screen time exposure statistically significantly influence social behaviour of early childhood learners in Kano State. Based on this, the null hypothesis was rejected, and it was concluded that screen time exposure statistically significantly influences social behaviour of early childhood learners in Kano State

Hypothesis Three: Screen time exposure has no statistically significant influence on learning outcomes of early childhood learners in Kano State, Nigeria

*Table 6: Summary of Regression Analysis***:** Screen time exposure on learning outcomes of early childhood learners in Kano State, Nigeria

Test of influence

Model		Unstandardized Coefficient		Standardized Coefficient			95% Confidence Interval	
		B	Std. Error	Beta	T	Sig.	Low/Bound	Up/Bound
1	(Constant)	27.145	.986		27.537	.002	25.207	29.084
	Screen time exposure	.258	.060	.220	4.329	.002	.141	.376

Dependent Variable: Learning outcomes

Source: Field Survey 2026

The test of influence results as presented in table 6 showed that screen time exposure statistically significantly influences learning outcomes of early childhood learners in Kano State, Nigeria ($B = .258$; $t_{(755)} = 27.537$, $P = 0.002$). It indicated that at 5% level of significance there was enough evidence that the regression equation specified that screen time exposure statistically significantly influence learning outcomes of early childhood learners in Kano State, Nigeria. Based on this, the null hypothesis was rejected, and it was concluded that screen time exposure statistically significantly influences learning outcomes of early childhood learners in Kano State, Nigeria

Discussion of Findings

The study examined the relationship between screen time exposure and three key developmental outcomes cognitive development, social behaviour, and learning outcomes among early childhood learners in the metropolitan Local Government Areas of Kano State, Nigeria. Overall, the findings showed that screen time exposure significantly predicted all three

outcomes, with positive regression coefficients. However, these findings should be interpreted with caution. The results do not imply that screen time is inherently beneficial to young children or that increased exposure necessarily produces better developmental outcomes. Rather, they suggest that children's experiences with digital media are embedded within broader family, school, and community environments, where the content, purpose, duration, supervision, and context of use may determine their developmental significance. The first finding revealed a relatively high level of cognitive development among the learners, with an overall mean score of 3.01. Screen time exposure significantly predicted cognitive development ($B = 0.121$, $\beta = 0.113$, $t = 2.183$, $p = .030$), leading to the rejection of the first null hypothesis. Although the relationship was statistically significant, the relatively small standardized coefficient indicates that screen exposure was only a modest predictor of cognitive development. This is an important distinction because children's cognitive development is influenced by a range of factors, including the quality of early childhood education, parental involvement, language-rich interaction, nutrition, socioeconomic circumstances, play, and teacher-child relationships. The positive association observed in this study may reflect the increasing role of digital resources in children's learning experiences. Educational applications, digital stories, alphabet and number activities, interactive games, and audiovisual materials can expose children to concepts and experiences that reinforce classroom learning. This interpretation is consistent with Radesky, Schumacher, and Zuckerman (2020), who argued that the developmental consequences of mobile and interactive media depend largely on the nature and context of use. Similarly, Neumann (2020) reported that appropriately selected digital devices and applications could support early literacy, while Papadakis, Kalogiannakis, and Zaranis (2020) emphasized that the educational value of digital technologies depends on the quality, developmental appropriateness, and pedagogical integration of digital content.

The finding can also be understood through Bronfenbrenner's Ecological Systems Theory, which provides the theoretical foundation for the study. From this perspective, screen exposure is not an isolated experience but part of the child's developmental ecology. The influence of digital media is shaped by interactions among the child, family, school, peers, and wider social environment. A child who uses an educational application under the guidance of a parent or teacher is likely to have a different experience from one who spends extended periods watching passive entertainment content without adult supervision. Thus, the positive relationship identified in the present study may partly reflect the way digital media are being incorporated into children's existing educational and family environments. The finding also differs from studies that have linked excessive screen exposure with poorer developmental outcomes, such as Madigan et al. (2019). This apparent difference may be explained by the fact that "screen time" represents diverse experiences rather than a single form of activity. The present study did not sufficiently separate educational, interactive, and recreational screen exposure. Consequently, the significant positive association should not be interpreted as evidence that more screen time improves cognitive development. Rather, it suggests that certain forms of screen engagement may coexist with, or potentially support, cognitive development when embedded within appropriate learning and social contexts. The relatively lower rating for classroom concentration compared with early literacy and numerical understanding further suggests that digital media may support certain forms of learning more readily than sustained attention. This reinforces the need for a balanced approach in which digital resources complement, rather than replace, play, conversation, physical activity, and direct teacher-child interaction.

The second finding indicated a high level of social behaviour, with an overall mean of 3.25. Screen time exposure significantly predicted social behaviour ($B = 0.270$, $\beta = 0.212$, $t = 4.158$, $p = .001$), resulting in the rejection of the second null hypothesis. The positive direction of this relationship is particularly noteworthy because previous research has raised concerns

about the potential for excessive screen use to reduce children's opportunities for face-to-face interaction and affect social-emotional development. Jia, Deng, and Zeng (2025), for example, reported associations between higher screen exposure and poorer social-emotional competence and increased behavioural difficulties. One possible explanation for the present finding is that digital media use among the children may occur within socially mediated environments. Children may watch programmes with parents, participate in digital storytelling with teachers, or engage in interactive activities that involve communication and cooperation. Under such conditions, digital technology may serve as a tool within social interaction rather than as a replacement for it. However, an alternative explanation is that children who already possess stronger communication and social skills may be more likely to engage in structured educational technology activities. Because the study adopted a correlational design, the direction of the relationship cannot be established. Therefore, the finding should not be interpreted to mean that screen exposure directly improves children's social competence. The result further supports the ecological perspective of child development. Within the microsystem, parents, teachers, siblings, and peers influence children's experiences with technology. The quality of adult mediation may determine whether digital media support or undermine social development. The descriptive results also revealed relatively strong empathy among the learners but comparatively lower cooperation during play. This suggests that digital technology should not be allowed to displace opportunities for cooperative play, peer interaction, role play, storytelling, and group problem-solving. These experiences remain essential for developing communication, emotional regulation, empathy, negotiation, and conflict-resolution skills.

The third finding showed that learners demonstrated relatively high learning outcomes, with an overall mean score of 2.88. Screen time exposure significantly predicted learning outcomes ($B = 0.258$, $\beta = 0.220$, $t = 4.329$, $p = .002$), leading to the rejection of the third null hypothesis. Of the three outcomes examined, learning outcomes recorded the strongest standardized coefficient ($\beta = .220$). Although the relationship was statistically significant, the effect remains modest, indicating that screen exposure is only one of several factors associated with children's learning outcomes. The result suggests that digital media may provide useful opportunities for reinforcing early literacy, numeracy, language development, and classroom learning. Digital storytelling, animated instructional resources, interactive games, and educational applications can present information in visually engaging ways and allow children to revisit concepts at their own pace. This finding is consistent with Papadakis et al. (2020) and Neumann (2020), who emphasized that digital technologies can support early learning when their use is intentional, developmentally appropriate, and guided by sound pedagogical practices. Nevertheless, the comparatively lower ratings for classroom concentration, assessment performance, and readiness for primary education require attention. This pattern may indicate that screen-based activities can promote immediate engagement without necessarily developing the deeper and more sustained competencies needed for long-term learning. Digital technology may capture children's attention, but effective learning also requires sustained interaction, practice, reflection, language use, problem-solving, and hands-on experiences. As Barr (2020) noted, children's development in a digital environment requires a nuanced understanding of how screen media interact with other forms of learning and social experience.

Taken together, the three findings provide evidence that screen time exposure was significantly associated with cognitive development, social behaviour, and learning outcomes. The strongest standardized association was with learning outcomes ($\beta = .220$), followed closely by social behaviour ($\beta = .212$), while cognitive development recorded a weaker association ($\beta = .113$). The pattern suggests that children's digital experiences may be relevant to their development and learning, but screen exposure alone does not provide a sufficient explanation

for developmental differences among children. The findings therefore support a shift away from viewing screen time solely as a developmental risk and towards a more contextual understanding of children's digital experiences. In line with Bronfenbrenner's Ecological Systems Theory, the effects associated with screen use are likely to emerge from interactions among multiple systems. At the family level, parental monitoring and modelling are important; at the school level, teachers determine how technology is integrated into learning; and at the broader environmental level, socioeconomic conditions, electricity, internet access, cultural expectations, and educational policies shape children's digital experiences. The findings consequently highlight the need to examine screen time in terms of its content, purpose, context, and quality rather than duration alone. Importantly, the study's correlational design limits causal interpretation. Although screen time exposure significantly predicted the three developmental outcomes, the results do not demonstrate that screen exposure caused the observed differences. It is equally possible that children's developmental characteristics, family environments, educational experiences, or other unmeasured variables influenced both their screen use and developmental outcomes. Future research should therefore investigate these relationships using longitudinal and intervention-based designs. Overall, the findings suggest that the question facing early childhood education in Kano State is not whether digital technology should be accepted or rejected, but how it can be used responsibly within a developmentally appropriate learning environment. Digital media may provide meaningful opportunities for learning and engagement when used intentionally and under adult guidance. However, their use should remain balanced with the experiences that are central to early childhood development: human interaction, language-rich communication, active play, physical activity, creativity, and hands-on exploration.

Conclusion

The study concludes that screen time exposure was significantly associated with cognitive development, social behaviour, and learning outcomes among early childhood learners in the metropolitan Local Government Areas of Kano State, Nigeria. The positive direction of the relationships indicates that children's engagement with digital media may coexist with favourable developmental outcomes, particularly when screen experiences are integrated into meaningful educational and social environments. However, the study does not provide evidence that increasing children's screen time will necessarily improve their development. Rather, the findings suggest that the developmental implications of screen exposure depend on what children watch or do, why they use digital media, how long they use them, the extent of adult supervision, and whether screen-based activities complement or displace play, social interaction, physical activity, and hands-on learning. The study therefore concludes that digital technology should be regarded as a complementary resource within early childhood education rather than a substitute for human relationships and developmentally appropriate pedagogy. Parents, teachers, schools, and policymakers have a shared responsibility to ensure that children's engagement with digital media is purposeful, moderated, developmentally appropriate, and socially supported. Consistent with Bronfenbrenner's Ecological Systems Theory, children's developmental outcomes reflect the combined influence of family, school, peer, community, and wider societal environments. Consequently, effective digital parenting, informed teacher practices, home-school collaboration, and supportive educational policies are essential for maximizing the potential benefits of technology while protecting children from inappropriate or excessive use.

Recommendations

Based on the findings and conclusion of the study, the following recommendations are made:

1. Parents and guardians should practise purposeful and supervised screen use. They should monitor the duration, content, and purpose of children's digital activities,

prioritize age-appropriate educational content, and participate in children's screen experiences whenever possible.

2. Early childhood teachers should integrate digital technology selectively. Digital resources should be used where they provide clear educational value, particularly in literacy, numeracy, storytelling, language development, and concept reinforcement. Technology should complement, rather than replace, play, songs, storytelling, creative activities, physical movement, and direct interaction.
3. Schools should establish developmentally appropriate digital-use guidelines. Early childhood centres should develop clear policies concerning the purpose, duration, content, and supervision of digital activities, ensuring an appropriate balance between technology-based and play-based learning.
4. Home-school collaboration on children's digital practices should be strengthened. Teachers should provide parents with practical guidance on responsible technology use, while parents should communicate relevant information about children's screen habits at home to promote consistency between home and school.
5. Professional development in digital early childhood pedagogy should be prioritized. Education authorities should provide teachers with training on selecting quality digital resources, evaluating educational applications, managing classroom screen use, and integrating technology within play-based and interaction-rich pedagogy.
6. Parent education should address responsible digital parenting. Programmes should focus on content quality, co-use, parental modelling, online safety, privacy, and developmentally appropriate technology use, rather than concentrating only on the number of hours children spend on screens.
7. Educational authorities should promote balanced digital integration. Efforts to expand digital learning should be accompanied by investments in teacher capacity, quality digital content, reliable electricity, internet access, child protection, and evidence-based technology guidelines for early childhood settings.
8. Children's opportunities for active play and social interaction should be protected. Families and schools should ensure that screen use does not displace outdoor play, cooperative activities, peer interaction, storytelling, creative expression, physical movement, and meaningful communication with adults.
9. Parents and caregivers should model responsible technology use. Adults should reduce unnecessary device use during family interactions, meals, conversations, and play, thereby strengthening parent-child relationships and demonstrating appropriate digital behaviour.

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