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# Effect Of Assistive Technology On The Social Interaction Of Students With Special Needs In Inclusive Classrooms In Ilorin, Kwara State

**Olubukola Christianah Dada PhD1, Ganiyu Akanbi Yusuf 2**

1Department of Special Education, Faculty of Education, Kwara State University, Malete
Phone Number: +2348034468438
Email Address: olubukola.dada@kwasu.edu.ng
2Centre for Language immersion and translation
Phone number: 09053644928
Email Address: ganiyu.yusuf19@kwasu.edu.ng ORCID: 0000-0002-9580-7477

**Abstract:** *Students with special needs in inclusive classrooms may struggle with social engagement, resulting in restricted involvement in peer activities, communication obstacles, and social isolation. Therefore, this study investigated the effect of assistive technology on the social interaction of students with special needs in inclusive classrooms in Ilorin, Kwara State, Nigeria. A quasi-experimental research design with pre-test and post-test control groups was adopted. The population included all pupils with specified special needs in public primary schools, with 83 individuals chosen using purposive and stratified sampling approaches. Data were obtained using a validated Social Interaction Rating Scale (SIRS), with a reliability coefficient of 0.78 established by PPMC. The experimental group received assistive technology such as speech-to-text programmes, communication boards, and interactive learning gadgets, whereas the control group received traditional instructional support without assistive aids. Analysis of Covariance (ANCOVA) was used to test all the hypotheses at the 0.05 level of significance. It was revealed among others that there was a significant effect of assistive technology on social interaction of students with special needs in inclusive classroom $F(1, 79) = 20.478$, $p < 0.05$, Students exposed to assistive technology had higher levels of peer interaction, communication, and cooperative participation than their peers in the control group. The study concluded that assistive technology has demonstrated its efficacy as a tool for improving communication, peer engagement, and collaboration The study recommended among others that proper teacher training, controlled classroom implementation, and the utilisation of collaborative learning methodologies to maximise AT's social benefits*

**Keywords:** inclusive classroom, student with special needs, social interaction, assistive technology

## Introduction

An inclusive classroom is a learning environment in which all students, regardless of skills, disabilities, backgrounds, learning styles, language, or socioeconomic status, are educated together, and given equal opportunity to engage, learn, and succeed. It is founded on the principles of equity, respect for diversity, and equal access to quality education, ensuring that students with special educational needs are not separated but rather supported through differentiated instruction, adaptive teaching strategies, collaborative learning, and the use of appropriate resources or assistive technologies. In such a classroom, teachers intentionally design instruction to accommodate individual differences, promote social interaction, and foster a sense of belonging, thereby enabling every students especially students with special needs to develop academically, socially, and emotionally within a supportive and accepting community.

Students with special needs are those who require more support, accommodations, or specialised instructional methodologies due to physical, cognitive, emotional, behavioural, or learning challenges that prevent them from fully participating in standard educational settings. These kids may have a variety of challenges, including autism spectrum disorder, visual or hearing impairments, intellectual disabilities, attention deficit hyperactivity disorder (ADHD), and specialised learning problems. The notion emphasises the importance of inclusive and equitable education, which recognises individual differences and offers individualised interventions to improve learning outcomes, social integration, and overall development. Supporting students with special needs frequently entails the use of assistive technologies, individualised education plans (IEPs), and collaborative efforts among educators, parents, and specialists to ensure that each learner reaches their full potential.

Inclusive classrooms help students with special needs succeed academically, socially, and emotionally. In inclusive settings, children with disabilities learn alongside their typically developing peers, exposing them to more diversified language models, problem-solving approaches, and greater academic demands. This atmosphere improves their communication and collaboration abilities as they participate in group activities and peer-assisted learning. Social inclusion minimises emotions of isolation and stigma, promoting a sense of belonging, self-esteem, and acceptance. It also promotes the development of empathy and mutual respect among all pupils, resulting in a helpful classroom environment. Furthermore, inclusive education frequently includes personalised instruction and the

use of assistive technology, allowing students with special needs to access the curriculum and achieve improved learning outcomes (Ainscow, 2020; UNESCO, 2021) more effectively.

Despite all of the advantages of inclusive classrooms meant to provide equitable learning opportunities for all learners, kids with special needs frequently face a number of chronic problems that can impede their academic and social growth. One important issue is insufficient individualised support, as teachers may not have had proper training in special education practices, making it difficult to tailor instruction to varied learning needs. Overcrowded classrooms and restricted resources (such as assistive technologies and specialised learning materials) might further diminish the effectiveness of inclusion. Students with special needs may also face social isolation, bullying, or stigmatisation from their peers, which lowers their self-esteem and involvement. Furthermore, strict curriculum and standardised testing processes frequently fail to accommodate diverse skills, resulting in low academic achievements. These challenges are exacerbated by insufficient policy implementation and funding, making inclusive education less effective in practice and, as a result, affecting the social interaction of students with special needs with their peers without special needs, despite its theoretical benefits ( Florian, 2019; UNESCO, 2020).

Social interaction is the dynamic and reciprocal processes by which individuals or groups communicate, influence one another, and establish shared meanings in a social context. It includes both verbal and nonverbal exchanges such as language, gestures, and emotional expressions that take place in person or through mediated environments, such as digital platforms. From a sociological and psychological standpoint, social interaction is essential for the creation of social relationships, identity formation, and the transmission of cultural norms and values. It also functions as a tool for individuals to negotiate roles, establish social order, and respond to environmental cues in their communities. Recent research emphasised that social contact is more than just the exchange of information; it is a complicated, context-dependent process influenced by factors such as social institutions, technology, and individual agency(Ainscow, 2020)

Students with special needs' social interaction in an inclusive classroom refers to their active participation in reciprocal relationships, communication, shared activities, and peer acceptance in a mainstream educational setting. Recent empirical research has defined this interaction as a multifaceted construct that includes peer connections, social behaviour, collaborative engagement in classroom activities, and students' sense of belonging (Koster et al., 2010; Bossaert et al., 2013; Schwab, 2018). For example, a large-scale synthesis of 63 empirical studies discovered that social interaction (also known as social participation) among students with special needs is shaped by interactions with peers, teachers, and classroom structures, and is typically measured using sociometric techniques, observations, and standardised rating scales (Bossaert et al., 2013).The findings also revealed that, while inclusive classrooms allow for interaction, students with special needs frequently experience lower levels of peer acceptance, reduced participation, and a higher risk of social isolation than their typically developing peers (Avramidis, 2013; Schwab, 2018; Neal et al., 2020). These difficulties are usually associated with variables such as weak social skills, negative peer attitudes, and insufficient implementation of inclusive strategies in classroom settings.

Recent empirical research suggested that effective implementation of inclusive measures can lead to favourable societal effects. For example, a 2025 mixed-method study of 150 students found significant improvements in communication skills, peer interaction, and overall social integration in inclusive settings, with both teachers and parents confirming increased social engagement in and out of the classroom (Smith & Brown, 2025). Similarly, a quantitative study of peer contact with 385 children discovered that structured collaborative activities greatly improve social competence and emotional development in individuals with exceptional needs (Johnson et al., 2024).

Research constantly challenges the premise that inclusive classrooms result in robust social connection for students with special educational needs (SEN), demonstrating that simple placement alongside peers does not ensure meaningful, reciprocal engagement. For example, a recent scoping review synthesising 63 empirical studies found that students with SEN frequently demonstrate poorer social participation outcomes, including limited peer relationships, reduced time in social behaviours, and negative self-perceptions compared with their typically developing classmates, with their involvement influenced by individual, peer, and support factors rather than the inclusive setting per se (e.g., sociometric measures showed lower engage(Wang, Huang , Wang , Liu,2023). Furthermore, quantitative research showed that even when contact opportunities exist, unstructured or superficial interactions without targeted supports may fail to improve acceptance or deeper social integration, demonstrating that interaction frequency alone is a poor predictor of meaningful social outcomes for students with disabilities in inclusive settings specifically without the assistive technology

Assistive technology is any item, piece of equipment, software programme, or product system that increases, maintains, or improves the functional capabilities of people with disabilities. This includes both low-tech and high-tech solutions tailored to specific needs. AT equipment and services include mobility assistance, communication interfaces, sensory enhancement tools, and advanced digital and AI-assisted systems. They aim to reduce constraints in activity and participation caused by impairments or chronic health conditions. This functional concept is consistent with legislative and research frameworks that emphasise individual empowerment and task achievement (Wisbey & Burns, 2025). In scholarly and clinical contexts, assistive technology as a set of tools and supports that enable people with disabilities to perform functions that would otherwise be difficult or impossible, emphasising its role in

bridging the gap between an individual's abilities and environmental demands. This viewpoint positions AT as a type of accommodation that not only compensates for individual disabilities but also contributes to broader objectives of independence and involvement in social, educational, and professional life (Lourenço, de Jesus, Lourenço, Canciglieri, & Schaefer, 2025).

Smith and Tyler's (2018) worked on Assistive Technology and Social Engagement: Effects on Students with Autism in Inclusive Classrooms," examined the impact of tablet-based communication apps on the social interactions of 72 elementary students with Autism Spectrum Disorder (ASD) in six inclusive classrooms. The researchers used a mixed-methods approach, including standardised observational checklists and semi-structured teacher interviews to assess both quantitative changes in peer interaction and qualitative opinions on classroom dynamics. Students who used communication apps had significantly higher frequency and duration of reciprocal peer contacts than those in the control group ($p < .01$). Teachers observed greater initiation of social exchanges and maintained participation in group tasks, implying that structured AT can effectively scaffold social engagement for children with ASD in inclusive contexts. These findings empirically support the claim that AT promotes social inclusion by lowering communication barriers and allowing for clearer expressions of intent and affect.

In contrast, Brown et al. (2021) conducted a longitudinal cohort research, "Evaluating Assistive Technology Integration and Peer Interaction among Students with Cerebral Palsy," which focused on 54 secondary school students with cerebral palsy (CP) attending mainstream schools. The study used repeated measures of peer contact frequency, sociometric surveys, and instructor observations over the course of a single academic year. Although AT technologies such speech-generating devices increased communication skills, there was no significant improvement in peer-initiated social interactions ($p>.05$). Furthermore, several teachers observed that relying on individualised devices appeared to unintentionally separate target pupils from spontaneous group involvement, as peers were unfamiliar with the specific interfaces and modalities used. Brown et al. found that, while AT improves communicative accuracy in adolescents with CP, its impact on authentic social integration may be limited in the absence of purposeful peer training and structured social facilitation procedures. This study suggests that AT alone may not be enough to overcome broader social hurdles in inclusive settings.

Nguyen and Harper (2019) used a multiple-case comparative design to study the facilitators and barriers to using assistive technology for social interaction in inclusive classrooms. The study included 88 students with diverse special needs, such as intellectual disability, hearing impairment, and ASD. Their findings showed that contextual implementation elements such teacher training, peer awareness programmes, and classroom culture impacted AT's effectiveness on social interaction outcomes. Students in classes with extensive AT support systems demonstrated more social initiative and peer acceptance (mean social interaction score rise of 23%) compared to schools with inadequate support (mean increase of 7%). Qualitative interviews demonstrated that when teachers and classmates actively participated in AT facilitation, students with special needs experienced increased communication as well as embedded social participation.

Despite a wealth of research highlighting the potential of inclusive classrooms and assistive technology (AT) to increase social interaction among children with special needs, there remain substantial gaps in empirical understanding (Schwab, 2018). Existing research primarily provide generalised findings on social participation without fully disaggregating outcomes by gender, despite emerging evidence that male and female students have different social experiences (Neal et al., 2020). Furthermore, while some research show that AT improves communication and peer involvement (Smith & Tyler, 2018; Okafor Chinedu, 2024), others show limited or even negative social consequences, especially in environments without organised peer-mediated support ( Martinez, 2025).This mismatch demonstrates a lack of agreement on the particular conditions under which AT fosters meaningful social contact (Nguyen & Harper, 2019).

Some of the existing research have been conducted in developed countries, with limited attention to resource-constrained contexts such as Nigeria, where factors like inadequate infrastructure, limited teacher preparedness, and prevailing cultural attitudes towards disability may significantly influence the effectiveness of AT in inclusive classrooms (Ajuwon, 2008; Okafor Chinedu, 2024). As a result, there is a clear need for context-specific, gender-sensitive empirical research that investigates how assistive technology interacts with classroom practices to impact the social interaction of male and female students with special needs in inclusive settings.

Okafor Chinedu (2024) conducted a recent empirical study on the Gendered Outcomes of Assistive Technology Use on Social Interaction among Students with Special Needs in Inclusive Classrooms, using a quasi-experimental research method to investigate differential effects across gender. The study used stratified random sampling to choose 124 pupils (62 boys and 62 females) with identified special educational needs from six inclusive primary schools in southwestern Nigeria. Data were gathered using the Social Interaction Observation Checklist and peer sociometric assessments, then analysed using ANCOVA. The study found that assistive technology improved social interaction for both male and female students ($F(1,121) = 18.67$, $p < 0.05$), with female students showing slightly higher benefits in cooperative communication and peer engagement. The study concluded that tools like speech-generating devices and interactive learning applications promote inclusion by lowering communication barriers, resulting in equitable peer involvement regardless of gender.

Martinez Laura's (2025) study, "Assistive Technology and Social Isolation Risks in Inclusive Settings: A Gender-Based Analysis," used a mixed-methods design and included 98 students with special needs (51 males and 47 females) from inclusive middle schools

in the United States. The study used regression analysis and thematic coding to evaluate data collected from surveys, classroom observations, and semi-structured interviews. The findings revealed that, while assistive technology enhanced task completion, it had no statistically significant effect on improving social contact for male students and, in some circumstances, contributed to decreased peer engagement due to an overreliance on individualised gadgets. Female students showed moderate progress, although qualitative studies revealed occasional social disengagement due to stigmatisation of gadget use. The study argued that without planned peer-mediated treatments, assistive technology alone may not adequately foster meaningful social engagement and may unwittingly reinforce social divides. Consequently, this study investigated the effect of assistive technology on the social interaction of students with special needs in inclusive classrooms in Ilorin, kwara state

**Statement of the Problem**

Despite global support for inclusive education and theoretical acceptance of inclusive classrooms as spaces that promote equity, participation, and belonging, the practical implementation of these values remains a challenge, particularly for students with disabilities. Although inclusive classrooms are designed to promote academic and social development through shared learning experiences, empirical evidence suggests that simply placing students with special needs alongside their typically developing peers does not ensure meaningful social interaction. Many of these students continue to face limited peer involvement, low social acceptance, and limited participation in collaborative classroom activities. This disparity between the expected goals of inclusion and the actual social experiences of children with special needs raises concerns about the efficiency of present inclusive strategies in achieving holistic development. While assistive technology has been widely advocated as a key tool for improving access, communication, and engagement among students with special needs, its impact on social interaction is yet unknown and context dependant. Empirical studies yield mixed results: some report that assistive technologies improve communication, increase peer engagement, and promote social inclusion, while others suggest that over-reliance on individualised devices may reduce spontaneous peer interaction and contribute to social isolation. Furthermore, differences in gender outcomes complicate the discussion, as evidence suggests that male and female students may derive different amounts of social benefit from assistive technology use. These discrepancies highlight a critical gap in understanding how assistive technology influences the social interaction of students with special needs in inclusive classrooms, particularly when moderating factors such as gender, teacher competence, peer attitudes, and classroom structure are considered..

Contextual factors such as insufficient teacher training, restricted availability of assistive technologies, overcrowded classrooms, and poor policy implementation compound the situation, particularly in developing countries such as Nigeria. These hurdles impede the proper implementation of assistive technology and the encouragement of inclusive practices, reducing opportunities for meaningful social engagement among students with special needs. Given that social contact is an important predictor of students' emotional well-being, sense of belonging, and overall educational outcomes, the recurrence of these issues emphasises the need for empirical research. The concern with this study is that the impact of assistive technology on the social interaction of male and female students with special needs in inclusive classrooms are unclear and inconsistent, as are the contextual elements that influence these outcomes. It is against this that , this study investigated the effect of assistive technology on the social interaction of students with special needs in inclusive classrooms in Ilorin, kwara state

**Purpose of the Study**

The main purpose of this study was to study investigated the effect of assistive technology on the social interaction of students with special needs in inclusive classrooms in Ilorin, kwara state while the specific once intends to:

1. To examine the effect of assistive technology social interaction of students with special needs in inclusive classrooms
2. To establish the interaction effect of assistive technology and gender on social interaction of students with special needs

**Research Hypotheses**

**$H_0$1:** There is no significant effect of assistive technology social interaction of students with special needs in inclusive classrooms in Ilorin, kwara state

**$H_0$2:** There is no interaction effect of assistive technology and gender on social interaction of students with special needs in Ilorin, kwara state

**Methodology**

This study employed quasi-experimental research design with pre-test and post-test control groups. The population included all students with special needs in public secondary schools, with 83 participants chosen using purposive and stratified sampling approaches. Data were obtained using a validated Social Interaction Rating Scale (SIRS), with a reliability coefficient of 0.78 established by PPMC. The treatment lasted for seven weeks and was carried by the researcher and the research assistants. The procedure adopted was to observe and fill Social Interaction Rating Scale (SIRS), while they were carrying out the tasks as pre-test before the treatment began. After this, The experimental group received assistive technology such as speech-to-text programmes, communication boards, and interactive learning gadgets, whereas the control group received traditional instructional support without assistive aids. Analysis of Covariance (ANCOVA) was used to test all the hypotheses at the 0.05 level of significance

**Results**

**Research Hypothesis 1:** There is no significant effect of assistive technology social interaction of students with special needs in inclusive classrooms in Ilorin, kwara state

Table One: Showing the summary of Analysis of Co-variance (ANCOVA) on significant effect of assistive technology social interaction of students with special needs in inclusive classrooms in Ilorin, kwara state

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Corrected Model | 8537.106[a] | 4 | 2134.276 | 6.227 | .000 |
| Intercept | 8188.259 | 1 | 8188.259 | 23.889 | .000 |
| Pretest | 30.518 | 1 | 30.518 | .089 | .766 |
| Assistive technology | 7019.103 | 1 | 7019.103 | 20.478 | .000 |
| Assistive technology * Gender | 929.656 | 1 | 929.656 | 2.712 | .104 |
| Error | 26735.786 | 79 | 342.766 | | |
| Total | 324550.000 | 83 | | | |
| Corrected Total | 35272.892 | 82 | | | |

Table 1 shows the no significant effect of assistive technology social interaction of students with special needs in inclusive classrooms in Ilorin, kwara state. There was significant effect of assistive technology on social interaction of students with special needs in inclusive classroom $F(1, 79) = 20.478$, $p < 0.05$. The hypothesis is therefore rejected in the light of the result since the significant value (.000) is less than 0.05. This implies that assistive technology had significant effect on social interaction of students with special needs in inclusive classrooms in Ilorin, kwara state

**Table Two: Summary of Bonferroni's Post Hoc pairwise Comparison of the scores within the two Groups**

| Treatment | Mean Score | Experimental 1 | Experimental 2 |
|---|---|---|---|
| Assistive technology | 85.498 | * | |
| Conventional Method | 33.651 | | * |

Table 2 reveals the significant effect exposed by table 1 is as a result of the significant difference among: assistive technology and Conventional teaching method. assistive technology refers to experimental group and conventional method known as control group. This implies that those students with special needs who used assistive technology have effective social interaction in an inclusive classroom significantly better than those who did not use assistive technology

**Research Hypothesis 2:** There is no significant interaction effect of assistive technology and gender on social interaction of students with special needs in inclusive classroom in Ilorin, kwara state

Table 1 shows the no significant interaction effect of assistive technology and gender on social interaction of students with special needs in Ilorin, kwara state. There was no significant interaction effect of assistive technology and gender on social interaction of students with special needs in inclusive classroom in Ilorin, kwara state, $F(1, 79) = 2.712$, $p > 0.05$. The hypothesis is therefore not rejected in the light of the result since the significant value (.104) is greater than 0.05. This implies that assistive technology and gender had no significant effect on social interaction of students with special needs in inclusive classrooms in Ilorin, kwara state

**Discussion of Results**

The findings of this study revealed that there was a significant effect of assistive technology (AT) on the social interaction of students with special needs in inclusive classrooms, $F(1, 79) = 20.478$, $p < 0.05$. This result was in tandem with the empirical position that AT serves as a critical mediating tool for enhancing communication and social participation among learners with disabilities. For instance, Smith and Tyler (2018) demonstrated that the use of tablet-based communication applications significantly increased both the frequency and duration of reciprocal peer interactions among students with Autism Spectrum Disorder, suggesting that AT reduces communication barriers and promotes active engagement. Similarly, Okafor Chinedu (2024) found that assistive technologies such as speech-generating devices and interactive applications improved peer engagement and cooperative communication among students in Nigerian inclusive classrooms. The present finding is further supported by Nguyen and Harper (2019), who reported that students exposed to well-supported AT environments showed higher levels of social initiative and peer acceptance. Collectively, these studies reinforce the conclusion that AT, when effectively implemented, enhances social interaction by facilitating clearer expression, participation in group activities, and a stronger sense of belonging within inclusive settings.

In another development, the findings should also be interpreted with caution, as not all empirical evidence uniformly supports the effectiveness of AT in fostering social interaction. The result contrasts with Brown et al. (2021), who found that although AT improved communication skills among students with cerebral palsy, it did not significantly enhance peer-initiated interactions, largely due to the isolating nature of individualized devices and lack of peer familiarity with the technology. Similarly, Martinez Laura (2025) reported that AT had no significant effect on improving social interaction among male students and, in some cases, contributed to social disengagement due to overdependence on devices and associated stigma. These contrasting findings suggest

that while AT has the potential to improve interaction, its effectiveness is highly dependent on contextual factors such as classroom structure, peer involvement, and teacher facilitation. Therefore, the significant main effect observed in this study may be attributed to the presence of supportive instructional strategies and structured implementation of AT within the study environment.

Also, the study found no significant interaction effect between assistive technology and gender on social interaction, $F(1, 79) = 2.712$, $p > 0.05$. This implies that the impact of AT on social interaction does not differ significantly between male and female students, indicating that both groups benefit relatively equally from its use. This finding corroborates Okafor Chinedu (2024), who also reported that AT improved social interaction for both genders, despite slight variations in the degree of benefit. However, this outcome contradicts studies such as Neal et al. (2020) and Martinez Laura (2025), which suggest that gender differences may influence social experiences and engagement patterns in inclusive settings. The absence of a significant interaction effect in the present study might be due to uniform exposure to AT tools, similar classroom conditions, or culturally influenced interaction patterns within the study area. Overall, this finding highlights that while gender may shape social experiences in some contexts, AT can function as an inclusive equaliser when appropriately integrated into classroom practices, thereby promoting equitable social participation among students with special needs.

## Conclusion

The study concluded based on the discussion of the results that assistive technology (AT) has a significant positive effect on the social interaction of students with special needs in inclusive classrooms, demonstrating its efficacy as a tool for improving communication, peer engagement, and collaboration. The findings show that, when appropriately applied, AT reduces communication obstacles and develops a stronger sense of belonging in learners, fostering reciprocal connections and social inclusion. However, the study emphasises that the success of AT is not automatic and is heavily influenced by contextual factors such as peer support, instructor facilitation, and how technology is integrated into classroom procedures. In circumstances when there is little assistance or an overreliance on gadgets, AT's ability to improve true social integration may be limited. As a result, the study emphasises the importance of combining AT with structured instructional methodologies and inclusive classroom practices. Furthermore, the data show that gender has no significant influence on the effect of AT on social interaction, implying that both male and female students benefit equally from its use in inclusive educational environments.

## Recommendations

1. Schools and educational stakeholders should prioritise the supply and successful integration of assistive technology (AT) in inclusive classrooms, as it has been found to improve social interaction among students with special needs. This should include proper teacher training, controlled classroom implementation, and the utilisation of collaborative learning methodologies to maximise AT's social benefits.
2. Since there was no significant gender difference in the effect of AT on social interaction, educators should guarantee that both male and female students have equitable access to assistive technology. Inclusive policies and procedures should be designed to serve all learners consistently, with a focus on individual needs rather than gender stereotypes.

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