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Effectiveness of Inclusive Design For Children With Disabilities In Nigerian Education Buildings

Ahmed, S.*[1], Isiaka N. A.[1], Tauheed I. A.[1]

[1] *Department of Architecture, School of Environmental Technology, Federal University of Technology, Minna, Postal Code : 920271, Nigeria*

*Corresponding Author: salawu.ahmed@futminna.edu.ng

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ABSTRACT

The United Nations Educational, Scientific, and Cultural Organisation (UNESCO) report that twenty million Nigerian children lack access to basic school education. This is due to inadequate support for children with unique educational needs and impairments in primary school buildings. This study aims to assess how inclusive design ideas have been applied in Abuja public primary school buildings to accommodate children with unusual academic needs, including disabilities, in Nigeria. A descriptive study design with a survey technique was employed as the methodology. A standardised questionnaire with a five-point Likert scale was used to collect information and was delivered to a sample size of 133 people. According to the data, physically challenged pupils and older staff were more concerned with the proportions of overall desires and security, skills, and perception. Additionally, no ramps were installed in the school buildings, prohibiting disabled students from moving vertically, and students with impairments have difficulty reaching areas of conveniences. These findings indicate that inclusive design ideas have not been included into the architectural designs of Federal Capital Territory Administration (FCTA) community primary academic buildings. The findings suggest the need for strong legislation to create an inclusive design special unit to ensure all architectural designs meet FCTA institutional standards for primary school building delivery

Keywords: accessibility, children, disabilities, inclusive design

1. Introduction

The United Nations Children's Emergency Fund [1] demographic health study states that nearly 95% of disabled children in poor countries are not into formal education and 90% might by no means have access to fundamental schooling. According to the survey, there were more than 10.5 million kids not attending school in Nigeria in 2015, but by September 2022, the figure had climbed to 20 million. This forecast is consistent by World Bank records and World Health Organisation (WHO) outcrops that individuals with impairments account for around 15% of the population in poor nations, with 80 to 90% of them lacking admittance to the essential requirements of existence, including fundamental schooling [2]. The survey stated that 69% of Nigeria's out-of-school children live in the north, out of which about 13% of these youngsters reside in the Federal Capital Territory (FCT) of Abuja. School design has been demonstrated to have a significant impact on students' experiences [3-5]. Furthermore, inclusive design has the ability to allow and inspire children kids due to peculiar academic wants including impairments to completely involve in school life events and in the greater community [6]. Schools are under growing demands to be choosy in their admissions, while a

rising number of pupils are being barred, and for some kids that have particular learning wants and disabilities, there is no school placement at all [7].

The degree to which a school's design and practice foster logic of connectedness is a critical characteristic in the building of secure, stable environments where staff and kids may flourish [8, 9]. Studies have shown that not all schools in Nigeria are planned to present a comprehensive surroundings despite pupils that have a broad range of wants [10]. Nwabueze and Grace [11] and Sholanke, Adeboye [12] both focused on access to quality education for children with disabilities in primary schools and universities respectively in Nigeria. These studies revealed that lack of equitable structural accessibility provisions and other facilities constitutes a barrier to achieving universal design in school buildings for children and students with disabilities in Nigeria. However, these studies differ in focus, as the former dealt with access to primary education while the latter focused on universities, with differences in the ages of the respondents and settings. This study aims to investigate how inclusive design principles are applied in Nigerian public primary schools and their impact on children with disabilities.

Context of All-inclusive Design Environment

Inclusive design refers to a general approach to plan that involves end users in removing hurdles in the companionable, technological, political with fiscal procedures supporting structure and design, regardless of age or ability [13, 14]. Heylighen, Van der Linden [15], asserted that inclusive design necessitates interest to the methods that persons intermingle and their acquaintance with impairment like a familiarity in preference to a disablement of performance [4]. Inclusive design attempts to dismantle needless obstacles and prohibitions. Therefore, it will frequently accomplish astonishing and better design results directed to advantage everybody [16]. The intent was to give a secure and friendly milieu that permits every affiliates of the academy neighborhood to access and walk through the building, then they could relish and partake in every features of academy existence to the greatest of their aptitudes and welfares [17, 18].

Universal design is footed on seven values: impartial exploit, suppleness in exploit, easy and instinctive exploit, and discernible data, broadmindedness for mistake, little bodily attempt, magnitude and space [19, 20]. These values can be employed to appraise extant designs, lead the plan procedure, and teach jointly designers and clients concerning the attributes of further exploitable commodities and settings, including their accessibility [6]. Moriña and Morgado [21], asserted that hindrances to universal access are grouped into five dimensions, which comprise urban barriers that consist of streets, sidewalks, and public spaces outside the university. Another factor is transportation barriers that include difficulties using both public and private vehicles. Then, building barriers that comprise impediments in school edifices, places, including lecture room while, environmental barriers are elements within the classrooms such as furniture, confined illumination, extreme sound, including insufficient hotness [22]. Likewise, communication barriers, which primarily influence learners by earshot including ocular disabilities; these are classified as signposting (s) and communication barriers [23, 24]. Consequently, the design of school buildings should overcome all these universal access barriers.

Accessibility is a broad notion that includes the capability of persons with impairments to use settings, services, and resources [25]. Physical areas for instance, academies, recreational areas, and water, hygiene, and cleanliness amenities are instances of milieus [3, 26]. The accessibility and universal design movements share a common foundation, which is a call for inclusion, full participation, and social equality. Universal design extends beyond accessibility to encompass all individuals, which it achieves by encouraging incorporated and standardised commodities, environmental aspects, and services [27]. Powell and Pfahl [28], alludes that the goal must be moved from subjects of admittance to ones of spatial expertise as this is further motivating and resound healthier with designers.

For people to experience space, the physical infrastructure accessibility attributes must be present in the environment. These attributes comprise symbols, available entry, hallways, conveniences/restrooms with clutch bars, switch and controls, ramps, lifts, obtainable small tables, playgrounds, canteens, water taps, and

the design of outside amenities [21, 29, 30]. For a school to be considered obtainable, it should permit every learners, instructors, and parents to enter securely, utilise every amenities, partake completely in every instructional exercises with as greatly independence as feasible, and leave in crises [5, 31]. Gargiulo, Richard [16], states that inaccessible and poor architectural designs create physical hurdles for kids with impairments and their relatives, limiting access to school services and facilities. The WHO defined architectural barriers as features of a person's surroundings that limit functions and cause disability [32]. Van der Linden, Dong [33], showed that inclusive design is still not extensively adopted in architectural design practice and that education is a means to negate the tendency. The study of Fauconnier, Dickinson [34] identified a great number of wheelchair users that require broad entrances, with some perceiving intricacies emotional about the academy, playground and utilising academic amenities. Parents were concerned about the absence of disability support in mainstream schools, which created challenges regarding their children's scholastic, social, and emotional requirements [6]. These characteristics were utilised to assess the inclusive design of the primary school building environment.

Recent research has made considerable advances in understanding the inclusive design of the built environment for students with impairments. Alhusban [35] emphasised the need for public institutions to increase accessibility and satisfaction levels for physically challenged students. Similarly, Soyupak [36] emphasised the importance of experience in raising architecture students' knowledge of disability and its influence on design decisions. Yadav [26] advocated for a more holistic approach to inclusive design in higher education institutions, taking into account the varying demands of all forms of impairments. Jebril [37] proposed architectural techniques for establishing accessible teaching environments for intellectually impaired children. However, there is a void in the literature on the implementation and efficacy of these tactics in actual educational settings. Further research is needed to explore the practical application of inclusive design principles in the built environment for students with disabilities.

2. Methods

The study used a descriptive research design based on large procedures for collecting primary data and a survey approach was employed. The study's population comprises primary six students preparing to transition to JSS 1. The two oldest public primary schools in Gwagwalada, a satellite town of the Federal Capital Territory of Abuja, Nigeria were chosen using purposeful random sampling. These schools comprises of Gado Nasko School, Gwagwalada (Case A) and Pilot Science School, Gwagwalada (Case B). Because of the schools' lengthy history and consistent government funding, it is assumed that they will have most, if not all, of the basic, predictable buildings found in a primary school setting. The professionals in the FCTA Education Secretariat project office were the third group of respondents randomly sampled.

Structured, closed-ended survey questionnaires and photography were used to collect data which started on 3rd -14th April, 2023 for ten days, Monday - Friday from 9:00am to 4:00pm each day. The questionnaire for the study was adapted from prior research [38, 39]. There were five sections to the questionnaire. Section A focused on the respondent's profile, while sections B, C, D, and E focused on children's experiences under headings such as access to school buildings and outdoor spaces, usability of amenities in buildings, spatial analysis of functional areas, and an overall assessment column. Sections B, C, D, and E contain items based on a five-point Likert scale of strongly agree (SA), agree (A), disagree (D), severely disagree (SD), and uncertain or not applicable (NA). The research instrument was face-evaluated by a team of professionals and subjected to a field test before being deployed in the field as espoused by Verma [40]. Moriña and Morgado [21], confirmed that a panel of experts knowledgeable about the notion could assess its validity. As such, to ensure the validity of the questionnaires, the survey was made available to seminar researchers who examined the responses of the items to the precise intended measurements. The researchers and two research assistants who were teaching staff at the two public primary schools chosen for this study administered the questionnaires to the pupils for the data collected. Also, the researchers distributed the survey to practicing architects in the Federal Capital Territory Administration (FCTA) Education Secretariat project office.

Before conducting the questionnaires, the respondents' consent was obtained for ethical consideration. A total of 250 questionnaires were administered to these three groups, labelled Case A, Case B, and FCTA architects. Finally, one hundred and thirty-three (133) surveys were concluded and rebounded satisfactorily, reflecting a response rate of 53.2% (See Table 1). The data obtained from the survey was analysed utilising the Statistical Package for Social Science (SPSS) version 23 software.

Table 1. Administered Questionnaire Analysis (Researchers' field work, 2023)

Sample Frame Stakeholders	Administered Questionnaire	Returned Questionnaire	Items Analysed	Response Rate %
• Gado Nasko School, Gwagwalada (Case A)	110	52	52	52
• Pilot Science School, Gwagwalada (Case B)	120	68	68	57
• FCTA Education Project Division, Abuja	20	13	13	65
TOTAL	**250**	**133**	**133**	**53.2**

The study encountered difficulty in administering questionnaires to deaf and dumb children since they were unable to react due to their impairment, posing a constraint to the study. However, children with merely physical problems were able to respond positively, which aided in shaping the research's outcome. Also, there are the possible potential biases in the survey responses. In addition, few schools were selected which is a limitation in scope and could affect the generalisation of the study. Further research is recommended to cover more schools, particularly, the private schools, and use qualitative interview instrument instead of survey questionnaire used.

3. Results and Discussion

3.1 Questionnaire Survey Results

The Cronbach's alpha coefficient was used to assess the questions' reliability. As indicated in Table 2, the Cronbach's alpha coefficient was 0.70. This demonstrates that the questionnaire was effective. Consequently, the products' internal dependability was determined to be moderate, falling within the standard range of 0.70 to 0.90. This was consistent with the findings of Mcguire, Scott [41], who found that if an analysis has strong internal consistency, most measurement specialists agree that it demonstrate just moderate correlation among items.

Table 2. Reliability Statistics

Cronbach's Alpha	N of Items
0.70	37

3.2 Demographic Information of Respondents

Figures 1–3 depict the demographic characteristics of respondents in Gwagwalada Satellite Town's selected public primary schools. According to Figure 1, 52% of respondents were from Pilot Science School PSS, 43% were from Gado Nasko School GNS, and the remaining 5% were from FCTA Education Projects Division. From Figure 2, the gender of the respondents was 65% male and 35% female. This means that men made up the vast majority of respondents.

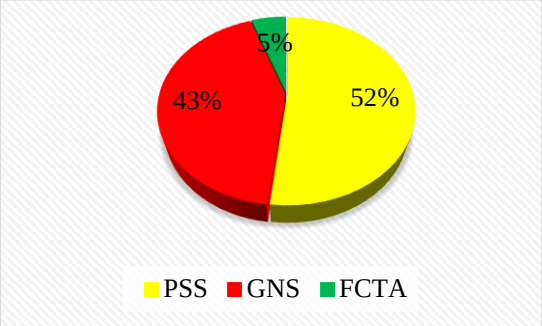

Figure 1. Number of questionnaires administered
Source: Authors fieldwork, 2023

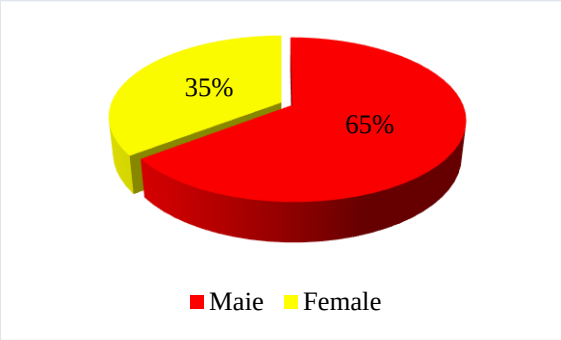

Figure 2. Respondents' gender
Source: Authors fieldwork, 2023

Figure 3 depicts the age group of the respondents: the majority (68.4%) was between the ages of 5 and 13, 19.5% were between the ages of 41 and 55, 11.3% were between the ages of 26 and 40, and 0.8% were between the ages of 56 and above. This demonstrates that all the samples represent all age categories (teenagers, young people, and adults).

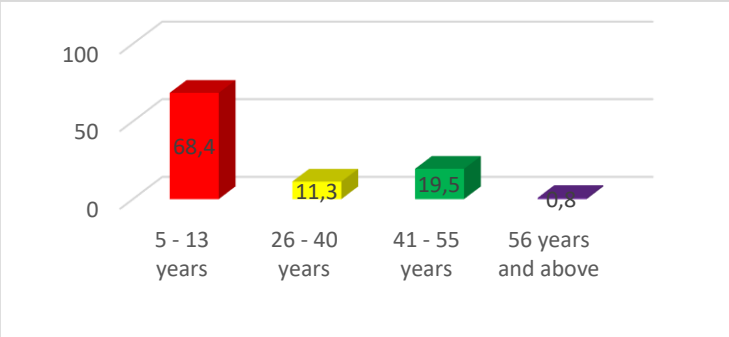

Figure 3. Age of the Respondents
Source: Authors fieldwork, 2023

Table 3 depicts the demographic characteristics of respondents from the selected public primary schools in Gwagwalada Satellite Town. In terms of the highest academic qualification attained by respondents, 1.5% had none, the majority (66.7%) had a first school leaving certificate (FSLC), and 31.8% had other higher credentials. The data on the respondents' vocations revealed that majority (66.9%) of the respondents are students, 27.8% are teachers, and the remaining 5.3% are architects. This means that the majority of respondents are students with spatial accessibility experience. The findings on whether the respondent has any disability demonstrate that 85.0% had no disability, while 15% stated differently. Among those with

disabilities, 12.8% had a physical handicap, and 2.3% had a visual impairment. This indicates that 15.1% of people with disabilities were not adequately accommodated by the school's design regarding accessibility and inclusivity. In terms of the numeral of years respondents had worked in schools, the majority (66.2%) had worked for 6 or more years, while 33.8% had worked for 1 to 5 years. It suggests that the majority of the respondents are capable of providing accurate information on student's spatial experience of their accessibility and inclusiveness in the institutions. In terms of inclusive design expertise, 32.4% of respondents had poor or no understanding, 45.1% had fair knowledge, and 22.6% had strong knowledge. This implies that 67.6 percent of the respondents understand the meaning of inclusive design which assisted very well in the accuracy of the data collected. Finally, the findings addressing

Table 3. Demographics Characteristics of Respondents (Author's field work, 2022)

Variables	Variables	Frequency	Percentage (%)	
Highest Academic qualification obtained	None	2	1.5	
	FSLC	89	66.9	
	Vocational or ND	1	0.9	
	Degree, HND, ND	36	27.1	
	Postgraduate	5	3.8	
	Total	133	100	
Occupation	Pupil	89	66.9	
	Teacher	37	27.8	
	Architect	7	5.3	
	Total	133	100.0	
Do you suffer from any disability	Yes	20	15.0	
	No	113	85.0	
	Total	133	100.0	
If yes above, please indicate by tick	Physical disability	17	12.8	
	Visual impairment	3	2.3	
	Not applicable	113	85.0	
	Total	133	100.0	
How long have you stayed or worked in school or office	1 - 5 years	45	33.8	
	6 -10 years	64	48.1	
	11 - 15 years	18	13.5	
	16 years and above	6	4.6	
	Total	133	100.0	
Knowledge of inclusive design	No knowledge	15	11.3	
	Poor knowledge	28	21.1	
	Fair knowledge	60	45.1	
	Good knowledge	28	21.1	
	Very good knowledge	2	1.5	
	Total	133	100.0	
Importance of inclusive design to you personally	Not important	7	5.3	
	Slightly important	13	9.8	**15.1**
	Moderately important	26	19.5	
	Very important	71	53.4	
	Extremely important	16	12.0	**65.4**
	Total	133	100.0	

The relevance of inclusive design to the respondents show that 15.1% believe it is either slightly or not at all essential, 19.5% believe it is moderately important, and 65.4% believe it is either extremely or very

important. This means that the majority of the respondents (66.4%) thought inclusive design was highly essential to their spatial experience.

3.3 Access to School Buildings and Outdoor Areas

Table 4 summarises the mean value (MV) analysis results for access to school buildings and outdoor areas. The results showed that students with impairments were unable to move freely within school facilities such as the classroom and library due to changes in floor levels (MV = 4.62, scored first). Furthermore, the distance between the vehicle lot and the classroom buildings makes it stressful for children with impairments to arrive at school (MV = 4.50). Following that, "toilets with steps in front of the entrance prevents children with disabilities from using them" (MV = 4.11, ranked third), thus the conveniences were not accessible to the physically challenged children. These findings show that a ramp should be installed in school buildings to help students move vertically. This substantiates the research findings of Ackah-Jnr and Danso (5) that school buildings classroom configuration and amenities were inaccessible to children and not suitable for schools inclusive design in Ghana. However, the opinion on whether the walkways within the school compound are difficult to navigate for students with impairments was ranked the lowest (6th). All perspectives on access to school buildings and outdoor areas were broadly agreed upon (MV = 3.73 on average).

Table 4. Access to School Buildings and Outdoor Areas

SN	Access to School Buildings and Outdoor Areas	MV	Rank	Decision
B2	Children with disabilities cannot move freely within School buildings such as Classroom to Library due to the changes in floor levels in those building	4.62	1st	Strongly agree
B6	Location of car park away from Classroom buildings makes it stressful for Children with disabilities when they arrive School	4.50	2nd	Strongly agree
B4	Toilets with steps in front prevent Children with disabilities from using them	4.11	3rd	Agree
B3	Classrooms with steps in front sometimes causes injury to Children with disabilities during climbing	4.07	4th	Agree
B1	Children with disabilities avoid coming to School regularly because of difficulty in climbing steps into their classrooms	3.95	5th	Neither agree nor Disagree
B5	Walkways inside the School compound are not convenient to walk on for Children with disabilities	3.34	6th	Neither agree nor Disagree
	Average Mean Value (AMV)	**3.73**		**Agree**

3.4 Usability of Academic Amenities for Pupils with Impairments

The Mean Value (MV) analysis results of the views of respondents on usability of academic amenities for kids with impairments are summarized in Table 5. It revealed that playground facilities are difficult to utilise and play with for children with impairments ranked first, while toilets with hangers help children with disabilities by providing support, ranked second. Children with disabilities have trouble opening bathroom doors and the planning of wash hand basins in toilets makes it difficult for them to use were ranked third and fourth, respectively. These findings substantiate the results of Gargiulo, Richard [16] that playgrounds, toilets and running water within schools are often not accessible to children with disabilities. This implies that there are spatial challenges affecting the use of academic amenities and services for pupils with infirmities, therefore, policy direction framework is required to effect positive change in school buildings.

Table 5. Usability of Academic Amenities for Pupils with impairments

SN	**Usability of** Academic Amenities for Pupils with impairments	MV	Rank	Decision
C7	Playground facilities are not convenient to use and play with for Children with disabilities	4.64	1st	Strongly agree
C5	Toilets with hangers assist Children with disabilities with support when they go inside to use them	4.37	2nd	Agree
C2	Children with disabilities find it hard to open toilet doors	4.35	3rd	Agee
C6	Position of wash hand basin in toilets make it difficult for Children with disabilities to use	4.14	4th	Agee
C1	Children with disabilities find it hard to open doors and windows of the Classrooms	4.11	5th	Disagree
C4	Classrooms lockers and wardrobes are not easily accessible to use by Children with disabilities	4.06	6th	
C3	Children with disabilities do not find it comfortable to sit on the chairs made for them in the Classrooms	4.05	7th	
	Average MV	**4.24**		Agee

3.5 Spatial Analysis of Functional Areas

Table 6 summarises the findings of the functional area spatial analysis. The results show that item D1 (the toilet spaces is too small for children with disabilities) ranked first as the most important functional area, while item D4 (width of walkways and corridors is too narrow for children with disabilities) ranked second. This implies that there should be an increase in toilet space sizes, walkway and corridor widths for children with disabilities to walk through alongside other able-bodied children. D2 (arrangement of chairs and tables within the classroom space) and D3 (classroom spaces are not large enough to accommodate children with disabilities) were ranked third and fourth, respectively.

Table 6. Spatial Analysis of Functional Areas

SN	**Spatial Analysis of Functional Areas**	MV	Rank	Decision
D1	The space in the toilets are too tight to allow Children with disabilities go in and out conveniently either with wheelchairs, clutches or walking stick	4.60	1st	Agreed
D4	The width of walkways and corridors are too small to allow Children with disabilities and special needs walk through alongside other able Children	4.55	2nd	Agreed
D2	Arrangement of chairs and tables within the classroom space does not allow Children with disabilities move around without obstruction	4.41	3rd	Agreed
D3	The Classroom spaces are not large enough to allow for partitioning of another space to accommodate Children with disabilities and special needs	4.40	4th	Agreed
	Average MV	**4.51**		Agreed

This suggests that classroom furniture disallows children with disabilities to move freely within the small classroom spaces. These findings were corroborated by the studies of Van der Linden, Dong [33] and Moriña and Morgado [21] that school facilities such as toilet spaces, walkways and corridors sizes, fu rniture

dispositions, and classroom spaces were not flexible and inaccessible; and services such as water were not usable by those with physical impairments. Similarly, overall, all spatial analyses of functional regions were significant (average MV = 4.51).

3.6 Accessibility and Usability Factors of School Buildings

Table 7 shows the ranking of the factors on the accessibility and usability of school buildings for children with disabilities and the staff's perceptions of indoor comfort levels with respect to their work. The maximum mean score is 5, while 1 is the lowest mean value. The general assessment of school building accessibility and usability for children with disabilities ranged from expanding the door size of classroom doors (mean = 4.98; p =0.00) to construction of ramps in front of the school buildings (mean = 4.34; p = 0.00). The findings reveal that the physically challenged students and elderly staff were mainly worried with the sizes of overall wants and security, competences and perception. The results revealed that all ten variables for assessing the accessibility and usability of school buildings for children with disabilities were significant and effective. This implies that these factors were agreed upon to be important in assessing the accessibility and usability of school buildings for children with disabilities. This result substantiates the research findings of Sholanke, Adeboye [12] that all the ten accessibility provisions examined were measured effectual and usable. This corroborates the recommendation of the National Teachers Institute cited in Bakaira [42] that planners and administrators of schools should ensure that their buildings are architecturally friendly for kids due to peculiar academic wants plus infirmities. This result substantiates the research findings of Sholanke, Adeboye [12] that all the ten accessibility provisions examined were measured effectual and usable. This suggests that these factors should be captured in the inclusive design policy framework for effective implementation.

Table 7. Factors on the Accessibility and Usability of School Buildings for Children with Disabilities

S/N	EFFECT	MV	*SD*	t-value (μ = 3.5)	*df*	Sig. (2-tailed)	Rank (R)
E6	Expanding the door size of Classroom doors	4.98	4.43	3.86	132	0.00*	1
E5	Provision of adjustable chairs/ tables in Classrooms	4.73	0.80	17.53	132	0.00*	2
E10	Providing private rooms within classrooms for Children with special needs such as hearing impairment	4.69	0 . 81	16.88	132	0.00*	3
E8	Lowering the position of door handles	4.62	0.72	17.75	132	0.00*	4
E7	Expanding the door size of toilet doors?	4.61	0.73	17.35	132	0.00*	5
E9	Lowering the position of wash hand basins	4.57	0.81	15.25	132	0.00*	6
E3	Making level and spacious playgrounds	4.55	0.77	15.64	132	0.00*	7
E4	Reduction of changing levels between rooms inside the buildings and toilets	4.46	0.84	13.03	132	0.00*	8
E2	Complete removal of changing levels between rooms inside the buildings and toilets	4.43	0.75	14.24	132	0.00*	9
E1	Construction of ramps in front of the School buildings	4.34	0.84	11.47	132	0.00*	10

Note: *SD* = Standard Deviation; R = Rank; Sig. = Level of significance; MS = Mean score *Significant at the 95 per cent level ($p < 0.05$), df = degrees of freedom. Source: Authors' field work 2023.

3.7 Photographs and Observation

Figure 4a and 4b shows that there were steps in front of the classrooms with disabled pupils approaching the wants including impairments to access their classrooms. Figure 4 (c) shows high steps in the front of the admin block in case A with exposed tree roots that could obstruct the movement of wheelchair user, thereby making it inaccessible for kids due to peculiar academic wants including infirmities. Figure 5 (a) shows uncovered drainage in front of the classroom at Pilot Science School (PSS), which makes it difficult for children with disabilities to access their classrooms. Figure 5 (b) shows classroom furniture for children with

special needs at PSS while Figure 6 and Figure 5(c) shows classroom with high steps at the entrance and toilet blocks respectively. The chairs are fixed, but adjustable chairs could be more suitable for children with disabilities. Figure 5(d) has four toilets but the fixtures were not accessible by the physically challenged school children.

(a) Steps in front of classroom at case A

(b) A wheel chair pupil approaching classroom

(c) High steps in front of case study A Admin Block

Figure 4. Classroom with steps

(a) Uncovered drainage in front of Classroom at case study B

(b) Classroom furniture for case study B

(c) 3 Classroom block with high steps at the entrance at case study A

(d) 4 Numbers of toilet block at case study B

Figure 5. Inclusiveness of facilities (a, b, c, d)
Source: All the figures are Researchers' fieldwork, 2023

3.8 Summary of Findings

The table 8 below summarise all the findings in the study. The results indicate the deficiencies in the design of the school buildings and facilities provided that hinder pupils accessibility and use of them. This ranges from playgrounds, ramps, restrooms, classroom furniture and hallways.

Table 8. Summary of findings

Summary of findings
• The study revealed that 66.4% of respondents viewed inclusive design as crucial for their spatial experiences, and 65.4% deemed it relevant and important for primary school buildings for disabled children. • The study found that school buildings lack a ramp, limiting vertical movement for students with disabilities. • They also found difficulties in accessing restroom doors, toilet wash basins, and play facilities. Thus, toilet hooks were absent, but could have assisted disabled students. • Bathroom area sizes are too small, and hallway widths are too narrow. • Classroom furniture also restricts mobility. • The study highlights the importance of making primary school environments accessible to students with special educational needs and impairments.

4. Conclusions

The study investigates the application of inclusive design principles in Nigerian public primary schools and their impact on children with disabilities. The study reveals that the school environment and the facilities in the building were not inclusive and accessible to the physically challenged students. The study found that physically challenged students and elderly staff struggle with accessibility and security in Abuja public primary schools. No ramps were installed, and students with disabilities had difficulty accessing restroom doors, toilet wash basins, and play facilities. Corridors, hallway sizes and classroom furniture also restricted mobility. The study found that ten criteria for accessibility and usability were significant at $p < 0.00$, but not reflected in existing buildings. This finding corroborates the recommendation that planners and administrators of schools should ensure that their buildings are architecturally friendly for kids due to peculiar academic wants including infirmities [30, 38]. Inclusive design in educational settings is crucial for students with physical disabilities' well-being and academic success. Strategies like universal design, instructional supports, and student choice enhance learning experiences [43]. School leaders/proprietors play a key role in creating inclusive schools, but improvements are needed in infrastructure and assistive aids to address the diverse needs of students with physical disabilities [26]. Social models of disability and universal design are also important in higher education.

Consequently, the primary school environment should be enhanced and accessible to kids due to their peculiar academic wants including impairments. This suggests that common spaces at school buildings should be reachable by signposts, ramp, broad entrances and conveniences, and non-skid. Also, classrooms should be planned devoid of steps, with possess places kept in the obverse lines for students including infirmities, by sufficient auricular as well as discernibility. The aim is to achieve complete broad-gauge, via versatile plan as the authority including modifying the extant/existent developed surroundings to lessen intimidation toward a broad variety of users. However, the study concludes that inclusive design principles have not been integrated into FCTA Public Primary School buildings. The policy implication of this research suggests the establishment of an inclusive design special unit in FCTA institutions for primary school delivery, responsible for ensuring architectural designs adhere to inclusive design standards.

This study had difficulties in administering the questionnaires to the deaf and dumb children since they could not respond due to their disability. However, children with only physical disabilities were evaluated which provided positive responses and has helped to form the outcome of this research. This study recommends that future research should endeavour to evaluate the accessibility and inclusive design of school buildings' environment for the deaf and dumb children.

5. Acknowledgements

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6. Conflict of interest

The authors assert that they have no conflict of interest.

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