International Journal of Innovative Environmental Studies Research 14(3):236-247, July-Sept, 2026

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DOI:10.5281/zenodo.22542708

Enhancing Circulation through Universal Design Principles in Vocational Centers: A Case Study of Selected Vocational Schools in Katsina Metropolis, Nigeria

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ABSTRACT

This paper examines the application of Universal Design (UD) principles in circulation spaces within vocational centers in Katsina State, Nigeria. Using case studies of the Community Skill Acquisition Centre Katsina and the Katsina Youth Craft Village, the research identifies circulation-related design features such as ramps, handrails, signage, and spatial flow. Findings reveal significant gaps in inclusive circulation, including the absence of wheelchair zones, inadequate wayfinding systems, and lack of tactile surfaces. The study concludes that circulation systems in vocational centers remain exclusionary for persons with disabilities, despite existing policies on disability inclusion. Recommendations are made for integrating UD principles to improve accessibility and mobility, thereby enhancing inclusiveness in training environments.

Keywords: Universal Design, Circulation, Vocational Centers, Accessibility, Persons with Disabilities.

1. INTRODUCTION

The concept of Universal Design (UD) has gained increasing global recognition as a design philosophy that promotes accessibility, inclusivity, and usability for people of diverse abilities. First articulated in the 1970s by architect Ronald Mace and later formalized into seven principles by the Center for Universal Design at North Carolina State University (1997), UD has since become a central theme in discussions on architecture, product design, and the built environment. The central philosophy of UD is that environments should be designed to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design.

In developing countries such as Nigeria, the question of inclusivity in public and institutional buildings remains a critical concern. Despite national disability laws and global commitments such as the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), physical barriers in the built environment continue to limit opportunities for persons with disabilities (PWDs). These barriers manifest in inadequate access to circulation spaces, poor signage, and lack of provisions for wheelchair users. Such limitations create what Imrie (2012) terms *"architectural disability"*—a situation where design itself disables individuals by failing to accommodate their needs.

Vocational training centers are particularly significant in this context. They serve as platforms for youth empowerment, skill acquisition, and socio-economic integration of marginalized groups, including persons with disabilities. In northern Nigeria, and Katsina State in particular, vocational centers such as

the Community Skill Acquisition Centre and the Youth Craft Village provide training in diverse trades ranging from carpentry and tailoring to information technology and catering. These centers are expected to serve as inclusive spaces where all individuals, regardless of ability, can learn and develop marketable skills. However, the circulation systems within these centers—comprising walkways, ramps, staircases, corridors, and parking areas—often fall short of UD standards.

Circulation plays a critical role in determining how accessible and inclusive a facility is. It refers not only to the physical movement of individuals within buildings and across sites, but also to how easily they can navigate, orient themselves, and access various functions. According to Preiser and Ostroff (2001), circulation is a core determinant of usability because poorly designed circulation can exclude large groups of users even when other facilities are available. In vocational centers, inadequate circulation restricts participation by persons with physical, visual, or mobility impairments, thus undermining the goal of inclusive skill development.

Recent studies highlight circulation challenges in Nigerian institutional buildings. For instance, Abubakar and Adebayo (2020) found that most tertiary institutions in northern Nigeria lack ramps and wheelchair-accessible pathways. Similarly, Inclusive Friends Association (2020) reported that over 70% of vocational facilities in Katsina and Kano States had no tactile flooring, inadequate wayfinding systems, and insufficient space for wheelchair maneuvering. These findings resonate with observations from global studies in low- and middle-income countries (LMICs), which emphasize that inclusive design is often treated as an afterthought rather than a core design principle (Grech, 2018).

Against this backdrop, the present study examines circulation in vocational centers within Katsina State, with specific focus on the Community Skill Acquisition Centre and the Youth Craft Village. It assesses the extent to which UD principles are incorporated in circulation spaces and identifies barriers that hinder inclusivity for persons with disabilities.

Universal Design (UD) is a design philosophy that seeks to create environments usable by all people, to the greatest extent possible, without the need for adaptation or specialized design (Mace, 1985; Center for Universal Design, 1997). The seven core principles—equitable use, flexibility in use, simple and intuitive use, perceptible information, tolerance for error, low physical effort, and size and space for approach and use—form the foundation of UD applications in architecture. Among these, the principle of *size and space for approach and use* is particularly critical for circulation, as it ensures adequate clearance and movement pathways for people with varying physical abilities (Story et al., 1998).

In the Nigerian context, UD is gradually gaining recognition, although much of the built environment continues to reflect exclusionary practices. Scholars such as Hamzat and Dada (2005) argue that Nigerian public buildings rarely provide accessible circulation features such as ramps, tactile pathways, or adequate signage. This exclusion not only creates barriers for persons with disabilities (PWDs) but also undermines social inclusion and national development goals.

Circulation in architectural design refers to the movement systems that enable people to navigate and access various functions within a building or site. According to Ching (2014), circulation encompasses horizontal movement (corridors, walkways, ramps) and vertical movement (stairs, lifts, ramps), as well as the spaces that support orientation and wayfinding (signage, landmarks, spatial sequencing). Effective circulation is vital for usability, safety, and inclusivity in public facilities.

Preiser and Ostroff (2001) identify circulation as a core determinant of building performance, noting that poor circulation restricts access to otherwise functional facilities. For PWDs, circulation determines not only mobility but also participation in social, educational, and economic activities. Hence, inadequate circulation contributes to what Imrie (2012) terms *architectural disability*.

In vocational centers, circulation is particularly important because training involves movement across diverse facilities—workshops, classrooms, administrative blocks, and common spaces. Poorly connected walkways, absence of ramps, and inadequate space for wheelchair maneuvering hinder full participation, thereby marginalizing disabled students.

Steinfeld and Maisel (2012) argue that circulation spaces must prioritize accessibility, safety, and flexibility to ensure independent navigation for all users. Key Universal Design (UD) strategies include

ramps and handrails, tactile flooring, signage, wide corridors, and connected pathways. These are standard and regulated features in developed countries under laws such as the Americans with Disabilities Act Standards (2010) and the UK Equality Act (2010). However, in many African countries, UD provisions are often missing or poorly enforced (Mukhopadhyay & Samanta, 2015).

Nigeria ratified the UN Convention on the Rights of Persons with Disabilities in 2007 and enacted the Discrimination Against Persons with Disabilities (Prohibition) Act in 2019, mandating accessibility features like ramps and elevators in public buildings. Despite this, implementation remains weak due to poor enforcement, low awareness, and financial barriers (Adebisi et al., 2020).

Abubakar and Adebayo (2020) observed inadequate ramps and walkways in northern Nigerian tertiary institutions.

Hamzat and Dada (2005) found poor circulation for persons with disabilities (PWDs) in public hospitals.

Inclusive Friends Association (2020) reported that vocational centers in Katsina and Kano lacked tactile flooring, had narrow corridors, and no wheelchair zones.

These reveal a gap between policy and practice, with vocational centers failing to promote inclusivity due to poor circulation design.

Internationally, circulation in vocational centers has been shown to affect PWD participation. In India, Singh and Gupta (2016) found significant barriers due to lack of ramps and tactile guidance. In South Africa, Smit (2018) noted that centers built with UD principles improved retention rates of students with disabilities.

Two key insights emerge namely Circulation is vital to inclusive vocational education and UD integration enhances usability for all, not just PWDs.

While Nigerian literature has examined accessibility in institutions and hospitals, vocational centers remain under-researched. Circulation design, though central to UD, has received little focus compared to other elements like toilets or classrooms. Particularly in Katsina State, there is a lack of empirical data on vocational center circulation.

This study addresses that gap by analyzing circulation features in Katsina's vocational centers using UD principles, contributing locally and aligning with global inclusive design discussions.

The study is grounded in Universal Design theory, especially the principle of size and space for approach and use, which promotes spaces usable regardless of body size or mobility. It also draws on Imrie's (2012) concept of architectural disability, which critiques how poor design disables users. These frameworks guide the analysis of circulation in Katsina's vocational centers.

Despite Katsina State's disability law of 2019 and Nigeria's commitment to the UNCRPD, vocational centers in the state continue to exhibit design features that marginalize persons with disabilities. Circulation spaces in these centers—critical for access to workshops, classrooms, and administrative units—are often poorly designed, with disconnected walkways, lack of ramps, absence of tactile guidance, and inadequate wayfinding landmarks. This creates barriers that restrict participation by PWDs, thereby contradicting the inclusive vision of vocational training. The problem lies not in lack of policy, but in the absence of effective application of UD principles in the design and management of vocational facilities.

Aim and Objective

The aim of this study is to examine how Universal Design principles for circulation are integrated into vocational centers in Katsina State, Nigeria. The specific objective is:

- To identify the principles of Universal Design that enhance circulation in the existing vocational centers of Katsina State.

Significance of the Study

This research is significant for three main reasons. First, it provides empirical data on the inclusivity of vocational centers in Katsina, a region that has received limited scholarly attention compared to southern Nigeria. Second, by focusing on circulation, it highlights a fundamental yet often neglected aspect of design that directly impacts usability for persons with disabilities. Third, the study contributes to policy

and practice by offering evidence-based recommendations for integrating UD principles into vocational centers, thereby supporting Nigeria's broader goals of disability inclusion and youth empowerment.

Scope of the Study

The study focuses on two vocational centers in Katsina State: The Community Skill Acquisition Centre and the Youth Craft Village. While other centers exist across the state, these two were selected because they represent government-led initiatives with significant student populations and diverse training programs. The study limits its assessment to circulation spaces—including walkways, ramps, corridors, signage, parking areas, and spatial organization—while acknowledging that other aspects of UD (such as acoustics, lighting, and ergonomics) are also important but beyond the scope of this objective.

METHODOLOGY

Research Design

This study adopts a qualitative case study design, which is appropriate for exploring real-life settings where the boundaries between context and phenomenon are not clearly evident (Yin, 2018). The objective was to investigate how Universal Design (UD) principles related to circulation are incorporated (or neglected) in vocational centers in Katsina State, Nigeria. Case study methodology was chosen because it enables an in-depth, contextual analysis of specific centers, providing rich empirical data that can illuminate broader challenges of inclusive design in Nigeria.

Study Area: Katsina State

Katsina State, located in northwestern Nigeria, was selected because of its commitment to youth empowerment through vocational training and its status as one of the states with high rates of unemployment among young people (National Bureau of Statistics, 2022). The state is situated between latitudes **11°08′N and 13°22′N** and longitudes **6°52′E and 9°20′E**, lying within the West Sudanian (park) savannah belt. The climate is characterized by hot, dry conditions interspersed with a five-month rainy season. These environmental conditions affect building design, particularly circulation features such as ramps, pathways, and open spaces.

Figure 5.1 Map of Katsina State
Source: nigeriazipcodes, 2025

Katsina State is also renowned for its cultural heritage, including traditional crafts such as embroidery and leatherwork. The state's capital, Katsina city, is a historical hub that features landmarks like the 15th-century Gobarau Minaret. Katsina State covers a land mass of approximately **24,192 square kilometers**. This vast area contributes significantly to its agricultural capabilities, providing ample space for crop

cultivation and livestock rearing. The state's diverse geographical features include fertile plains, savannahs, and some hilly regions, which all play a role in its agricultural productivity and beauty.

Case Study Selection

Two vocational centers in Katsina State were selected for detailed investigation:

i. **Community Skill Acquisition Centre, Katsina** – Established in 1972, this center is one of the oldest vocational training facilities in the state, offering conventional trades such as mechanics, welding, and carpentry, as well as non-conventional trades like tailoring. Its long history provides insights into traditional design approaches to circulation.
ii. **Katsina Youth Craft Village** – Established in 2009, this facility represents a more recent effort to promote youth empowerment through skills acquisition. It trains over 2,000 students annually in trades ranging from ICT to tailoring and catering. The center is particularly significant because it was designed as a large-scale, government-supported project, yet concerns about accessibility persist.

These two centers were selected because they represent both old and new generations of vocational facilities in Katsina, allowing for comparative analysis of circulation design across time.

Data Collection Methods

Multiple data collection techniques were employed to ensure triangulation and robustness of findings.

Field Observation

Structured observation checklists were developed based on UD principles related to circulation, including:

i. Provision of ramps and handrails.
ii. Presence of tactile flooring for visually impaired users.
iii. Availability and clarity of signage for wayfinding.
iv. Corridor and doorway widths.
v. Connectivity of walkways across functional zones.
vi. Presence of wheelchair zones in circulation hubs.
vii. Flow of movement (spatial organization).

Field visits were conducted to each case study site, and detailed notes and sketches were recorded. Photographs were also taken to document circulation features and deficiencies.

Interviews

Semi-structured interviews were conducted with key stakeholders, including:

i. **Facility managers** (to understand design intentions and challenges).
ii. **Instructors** (to identify circulation barriers encountered by students).
iii. **Students with disabilities** (to gain firsthand insights into circulation difficulties).

A total of 15 interviews were conducted: 5 at the Community Skill Acquisition Centre and 10 at the Youth Craft Village.

Document Review

Relevant policy documents, architectural drawings, and previous reports were reviewed. These included the Discrimination Against Persons with Disabilities (Prohibition) Act (2019), the National Building Code (2006), and internal reports from the Katsina State Ministry of Education.

Sampling Technique

Purposive sampling was employed, as the study specifically targeted vocational centers that are representative of Katsina's training facilities and participants who could provide meaningful insights into circulation design. Within each center, interviewees were selected based on their role (manager, instructor, or student) and availability.

Data Analysis

Data analysis followed a thematic approach, with field notes, interview transcripts, and documents coded against UD principles. Themes included:

i. Accessibility of walkways.

ii. Connectivity of circulation systems.
iii. Orientation and wayfinding.
iv. Provision of circulation aids (ramps, tactile flooring, signage).
v. Space for maneuvering (wheelchair zones, corridor widths).

Comparative analysis was then carried out between the two case study sites to identify similarities and differences in circulation design.

Ethical Considerations

The study adhered to ethical guidelines for research involving human participants. Informed consent was obtained from all interviewees, and anonymity was assured. Photographs taken on site excluded identifiable personal images to protect privacy. Permission to conduct fieldwork was granted by the Katsina State Ministry of Education and the management of the two centers.

Limitations of the Study

Several limitations are acknowledged:

i. The study focused only on two centers in Katsina, which may not represent all vocational centers in northern Nigeria.
ii. Resource constraints limited the scope of data collection to qualitative methods rather than mixed methods.
iii. Accessibility audits were based on observation and interviews rather than technical measurements (e.g., slope gradients, exact corridor widths).

Despite these limitations, the study provides valuable empirical insights into circulation challenges in Katsina's vocational centers and highlights the urgent need for inclusive design strategies.

RESULTS

This section presents findings from the field survey, observations, and interviews conducted in the two vocational centers studied in Katsina State. The results are structured around the research objective: to identify Universal Design (UD) principles that enhance circulation in vocational centers. Data are organized under thematic categories derived from the UD framework: accessibility, connectivity, orientation/wayfinding, circulation aids, and space for maneuvering.

Case Study One: Community Skill Acquisition Centre, Katsina

Background

The **Community Skill Acquisition Centre Katsina** was established in 1972 and remains one of the state's most prominent vocational training facilities. It offers both conventional trades (mechanics, carpentry, welding, electrical installation) and non-conventional trades (tailoring, knitting). The site comprises an administrative unit and a training unit, arranged in clusters and linear forms respectively.

Circulation Features Observed

i. **Walkways & Connectivity**:
Walkways exist but are disconnected, with no clear central circulation spine linking administrative, workshop, and classroom facilities. Students often rely on informal footpaths created through repeated use.
ii. **Ramps & Handrails**:
Few ramps are provided, mainly at workshop entrances. However, gradients were inconsistent, and handrails were either absent or poorly fixed, creating hazards for users with mobility impairments.
iii. **Signage & Wayfinding**:
No visible directional signage exists within the center. Students reported confusion when navigating between scattered blocks, particularly first-time visitors. The absence of landmarks or orientation maps exacerbates this challenge.
iv. **Flooring for the Visually Impaired**:
There are no tactile paving surfaces to aid navigation for blind or low-vision users. Corridors and verandas rely on cement screed floors, which provide no tactile cues.

v. **Flow of Movement**:
Buildings are unevenly scattered, and circulation patterns lack logical order. Interviewed instructors noted that "students often lose time trying to locate workshops because the layout is disorganized." The absence of a defined hierarchy of spaces limits smooth circulation.

vi. **Spaces for Maneuvering**:
Doorways and corridors are relatively narrow, averaging about 900 mm in observed measurements, insufficient for wheelchair access. No designated wheelchair waiting or maneuvering zones were observed.

Figure 1

Figure 2

Figure 1 and figure 2 Shows inadequate circulation space and absence of wheelchair zone, signages, corridors and walkways around the workshops and classes.
Source(s): Authors field work (2025)

Key Findings

- Walkways are fragmented and unconnected, impeding smooth circulation.
- Lack of ramps, handrails, and tactile paving limits accessibility for disabled users.
- The absence of signage and wayfinding landmarks hinders orientation.
- Narrow circulation points make wheelchair use impractical.
- Circulation flow is inefficient due to scattered building arrangement.

Case Study Two: Katsina Youth Craft Village

Background

Established in **2009**, the **Katsina Youth Craft Village** was designed to provide large-scale training in over 14 trades, including ICT, auto-repair, tailoring, and catering. With an intake of over 2,000 students annually, the center was envisioned as a flagship project to address unemployment and youth restiveness in the state.

Circulation Features Observed

i. **Walkways& Connectivity**
Paved walkways link some administrative and workshop areas. However, connectivity remains partial, with several key routes lacking defined pedestrian pathways. Open areas between blocks often turn muddy during the rainy season, further limiting access.

ii. **Ramps & Handrails**:
Ramps were observed at some workshop entrances, but similar to Case Study One, gradients were not standardized, and handrails were absent. Accessibility to upper floors was entirely absent, as no lifts or continuous ramps were provided.

iii. **Signage & Wayfinding**:
Some signage was present, particularly at the entrance, but interior wayfinding remains poor. Students reported difficulties navigating between departments, especially visitors unfamiliar with the site layout.

iv. **Flooring for the Visually Impaired**:
As with the Community Centre, no tactile paving was provided for the visually impaired. Plain concrete finishes dominate circulation paths.

v. **Flow of Movement**:
Unlike the scattered arrangement at the Community Centre, the Youth Craft Village exhibits some attempt at order, with workshops clustered by trade. However, circulation remains inefficient due to inadequate covered pathways, leading to congestion during peak hours.

vi. **Spaces for Maneuvering**:
Open courtyards provide potential maneuvering zones, but these are not formally designated or marked for wheelchair use. Corridors within workshops remain narrow, creating difficulties for users with mobility aids.

Figure 1

Figure 2

Figure 1 Shows provision of inadequate ramp at the mechanic pit and **Figure 2** Shows front view of admin building with no consideration of disable.
Source(s): Authors field work (2025)

Key Findings

i. Walkway connectivity exists but is inconsistent and seasonally unreliable.
ii. Provision of ramps is partial, with no vertical circulation to upper floors.
iii. Signage is limited and lacks universal symbols, reducing its effectiveness.
iv. Circulation is partially structured but still congested due to poor spatial planning.
v. Wheelchair zones are absent, and corridor widths are inadequate.

Comparative Summary of Case Studies

The findings from both centers reveal **systemic deficiencies in circulation design**, though with slight variations.

UD Circulation Indicator	**Community Centre Katsina**	**/Youth Craft Village Katsina**
Walkway connectivity	Absent, fragmented	Partial, unreliable
Ramps & Handrails	Few ramps, no handrails	Some ramps, no handrails
Signage & Wayfinding	No signage or landmarks	Minimal signage, not effective
Tactile flooring	Absent	Absent
Flow of movement	Disorganized, scattered	Semi-structured but congested

UD Circulation Indicator	Community Centre Katsina	/Youth Craft Village Katsina
Spaces for maneuvering	Narrow, no wheelchair zones	Courtyards but not designated
Vertical circulation	Absent	Absent (no lifts/ramps to upper floors)

Perspectives from Stakeholders

i. **Students with Disabilities** reported that they avoid certain workshops because "getting there is too stressful" due to disconnected walkways and narrow corridors. One visually impaired respondent stated, *"I always depend on colleagues to guide me because there are no tactile floors or signs to direct us."*
ii. **Instructors** emphasized that poor circulation negatively affects punctuality and learning. According to one instructor, "Students waste time moving between blocks. If the circulation was better planned, training efficiency would improve."
iii. **Facility Managers** acknowledged circulation shortcomings, attributing them to "budgetary constraints" and "lack of initial planning for special persons."

Overall Findings

The overall findings demonstrate that circulation in vocational centers in Katsina State is **neither inclusive nor universally designed**. Specific challenges include:

i. **Inadequate Accessibility** – Few ramps exist, with no lifts or standardized handrails.
ii. **Poor Wayfinding** – Absence of tactile cues, landmarks, and signage disorients users, particularly the visually impaired.
iii. **Narrow Circulation Points** – Doorways and corridors are below recommended UD standards, excluding wheelchair users.
iv. **Disconnected Layouts** – Building scattering and lack of central circulation patterns undermine efficient movement.
v. **Absence of Wheelchair Zones** – No designated areas for wheelchair maneuvering in high-traffic spaces.

These shortcomings create an environment of **architectural disability**, where circulation constraints further marginalize persons with disabilities, contrary to Nigeria's Disability Act (2019).

DISCUSSION

The objective of this research was to identify the Universal Design (UD) principles that enhance circulation in vocational centers within Katsina State. The case studies—Community Skill Acquisition Centre Katsina and Katsina Youth Craft Village—provided valuable insights into the circulation challenges that limit inclusivity in skill acquisition facilities. The findings indicate systemic design flaws that hinder accessibility and participation for persons with disabilities (PWDs), revealing a mismatch between policy frameworks, universal design theory, and actual practice in the built environment of Katsina.

Circulation as a Determinant of Inclusion

Circulation is the ability to move freely, safely, and efficiently through built spaces—is central to the inclusivity of vocational centers. The results show that circulation in Katsina's centers is poorly designed, with disconnected walkways, narrow corridors, absence of tactile flooring, and lack of standardized ramps. These conditions align with what Steinfeld & Maisel (2012) describe as *architectural disability*, where the built environment creates unnecessary barriers that exclude certain users.

The absence of circulation aids means that PWDs in Katsina face daily challenges in accessing training spaces, which contradicts the intent of Nigeria's Discrimination Against Persons with Disabilities (Prohibition) Act of 2019, which mandates accessibility in all public facilities. The gap between legislation and implementation underscores the persistent marginalization of PWDs in the educational and vocational landscape of northern Nigeria.

Inadequacies in Universal Design Features

i. **Accessibility Features**

Both case studies revealed insufficient accessibility features. While some ramps were provided, they lacked handrails and standard gradients, making them unsafe. Vertical circulation aids such as lifts or continuous ramps were entirely absent, effectively excluding wheelchair users from upper floors. This deficiency mirrors findings by Adeyemi (2020), who noted that most public buildings in Nigeria are not designed with disabled persons in mind, despite policy provisions.

ii. **Wayfinding and Orientation**

Wayfinding emerged as a critical weakness. Neither center provided tactile surfaces, landmarks, or clear directional signage. This particularly disadvantages the visually impaired, who rely on non-visual cues for navigation. Preiser & Ostroff (2001) emphasized that perceptible information—clear, redundant communication of orientation cues—is a cornerstone of UD. Its absence in Katsina's vocational centers indicates a neglect of principle four of UD (Perceptible Information).

iii. **Space for Maneuvering**

The lack of designated wheelchair zones and narrow corridor widths highlight a disregard for UD principle seven (Size and Space for Approach and Use). According to the Center for Inclusive Design and Environmental Access (IDEA, 2013), circulation points should provide at least 1.5m clear width to allow wheelchairs to pass or turn. Observed corridor widths of ~900mm in Katsina fall significantly below this threshold, creating systemic exclusion for mobility-impaired users.

iv. **Comparative Insights from Case Studies**

While both centers exhibited shortcomings, their circulation challenges varied in emphasis.

a. The **Community Centre Katsina** had fragmented layouts with no central circulation spine, producing disorganization and inefficiency.
b. The **Youth Craft Village** displayed partial connectivity and more structured clustering of workshops, but circulation remained congested, and accessibility features were inconsistent.

This comparison suggests that circulation inadequacies are **systemic across facilities**, not merely the product of one-off design failures. The issue lies in the absence of UD as a guiding framework during planning and construction.

Implications for Disability Inclusion in Katsina

The findings carry serious implications for disability inclusion in Katsina:

i. **Educational Inequality** – PWDs face barriers that discourage or prevent their participation in vocational training. This perpetuates cycles of unemployment and dependency.
ii. **Architectural Disability** – The poor design of circulation spaces imposes disabilities on otherwise able-bodied users, particularly the elderly or temporarily injured.
iii. **Policy-Practice Gap** – Although Nigeria has ratified international conventions such as the UNCRPD (2007), actual implementation at local levels, as evidenced in Katsina, remains weak.
iv. **Social Exclusion** – Inadequate circulation does not merely inconvenience users; it symbolizes the neglect of marginalized groups, reinforcing their social exclusion.

Universal Design as a Corrective Framework

The study reinforces the value of UD as a corrective framework for circulation in Katsina's vocational centers. UD principles—such as **equitable use, perceptible information, tolerance for error, and low physical effort**—can transform circulation from an exclusionary to an inclusive aspect of design. For example:

i. **Equitable Use**: Providing ramps and lifts ensures that both able-bodied and disabled users can access facilities equally.
ii. **Perceptible Information**: Incorporating tactile surfaces and multilingual signage assists both visually impaired and non-native speakers.
iii. **Size and Space**: Allocating wheelchair zones at strategic circulation points prevents congestion and exclusion.

These interventions are not merely technical corrections but also social statements affirming the right of all citizens to participate in educational and vocational life.

Lessons for Katsina and Northern Nigeria

The lessons from Katsina can be generalized to other parts of northern Nigeria, where vocational centers face similar planning and budgetary challenges. The results suggest three key lessons:

i. **Design from the Outset** – Inclusive circulation must be planned from project inception, not retrofitted as an afterthought.
ii. **Cost-Effectiveness** – Many circulation improvements (signage, tactile paving, wider corridors) are low-cost interventions but yield high social returns.
iii. **Stakeholder Engagement** – Inclusion of PWDs in the planning process can ensure that circulation systems respond to actual user needs rather than assumptions by designers.

Towards Inclusive Skill Acquisition in Katsina

If vocational centers in Katsina are to fulfill their mandate of preparing youth for self-reliance, circulation must be addressed as a fundamental design issue. As the results show, circulation deficiencies not only marginalize PWDs but also undermine the efficiency of training for all users. Applying UD principles is therefore not an act of charity but of necessity—ensuring that skill acquisition centers maximize human potential and align with global standards of inclusion.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study set out to examine the Universal Design (UD) principles that enhance circulation in vocational centers, focusing on Katsina State. The analysis of two key facilities—the Community Skill Acquisition Centre and the Katsina Youth Craft Village—revealed that circulation systems in these centers are inadequate, fragmented, and exclusionary.

Key findings showed that walkways are disconnected, ramps are poorly designed, wayfinding systems are absent, and corridor widths fall below international accessibility standards. These design flaws restrict mobility for persons with disabilities (PWDs), particularly those with physical and visual impairments, and create what can be described as *architectural disability*.

In effect, circulation in Katsina's vocational centers does not support equitable participation. It places barriers in the paths of users who are already marginalized, contradicting the inclusive spirit of Nigeria's Disability Act (2019) and the principles of the UNCRPD. While the facilities provide valuable skills training, their physical environments remain structurally biased against PWDs.

The study concludes that circulation—often treated as a technical detail in design—must be reimagined as a social justice issue. Just as a river without bridges divides communities, a vocational center without inclusive circulation divides people into those who can participate and those who cannot. By embedding UD principles into circulation design, Katsina's centers can transform into environments that genuinely serve all users.

Recommendations

Based on the findings, the following recommendations are proposed:

Policy and Regulation

i. **Enforce Disability Standards** – The Katsina State Government should adopt and enforce building codes aligned with the National Building Code and the Disability Act (2019), making circulation accessibility mandatory.
ii. **Accessibility Audits** – Regular audits of vocational centers should be carried out to ensure compliance with UD principles, focusing on circulation pathways.

Design and Infrastructure

i. **Connected Circulation Systems** – Walkways should be continuous, well-paved, and linked to all functional areas (workshops, classrooms, and hostels).
ii. **Wheelchair Zones** – At least 1.5m² circulation zones should be provided at key points such as lobbies, corridors, and parking areas to reduce congestion and allow maneuvering.

iii. **Standardized Ramps and Handrails** – Ramps must meet international gradient standards (1:12), with sturdy handrails for safety.
iv. **Wayfinding Systems** – Incorporate tactile flooring for the visually impaired, as well as clear, multilingual signage and landmarks to aid orientation.

Capacity Building, Future Development and Awareness

i. **Training for Designers and Contractors** – Professionals working on public projects should undergo training in UD principles to avoid repeating exclusionary designs.
ii. **User Participation** – PWDs should be involved in the design and evaluation of vocational centers, ensuring that circulation systems reflect lived experiences rather than assumptions.
iii. **Pilot Inclusive Center** – Katsina State could establish one model skill acquisition center that fully integrates UD circulation features, serving as a benchmark for future projects.
iv. **Retrofitting Existing Centers** – Affordable retrofitting measures—such as adding ramps, widening corridors, or installing tactile paving—should be prioritized in older facilities.

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