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# ACCESSIBLE CAMPUS INFRASTRUCTURE AND ACADEMIC ACHIEVEMENT OF UNIVERSITY STUDENTS IN INCLUSIVE EDUCATION SETTING TO ACHIEVE SDG-4.A

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**ABSTRACT**
The purpose of this study was to examine an Accessible Campus Infrastructure and Academic Achievement of University Students in Inclusive Education setting to achieve SDG-4.a. Accessible campus infrastructure is a backbone for academic achievement of students. The study was descriptive and survey type in nature. Population of this study was all students of Khwaja Fareed UEIT Rahim Yar Khan Pakistan (KFUEIT). Stratified and simple random sampling techniques were applied. Data was collected from students of all faculties (total 8) of KFUEIT. About 400 questionnaire was distributed in students of each department from each faculty. Thus, the final sample contained 320 usable responses (response rate = 80%). Collected primary data was analyzed through SPSS-23 with frequency, percentage, and ANOVA test. Study results revealed that accessible infrastructure is a crucial factor in academic success. SDG 4.a must be fulfilled to deliver equitable, quality education, as evidenced by the strong positive association between accessibility and achievement. Study recommended that accelerate physical facility upgrade by prioritize essential amenities such as restrooms, furniture, and mobility aids to ensure that all campus spaces fully accessible for people with disabilities to achieve SDG 4, a vision of inclusive learning environments, ensuring that every student participate fully and succeed academically, regardless of their ability.
**KEYWORDS:** Accessible Campus Infrastructure, Academic Achievement, University Students, Inclusive Education, SDG-4.a

## INTRODUCTION

The Sustainable Development Goals (SDGs) a worldwide call to action that strives to create a more just, sustainable, and prosperous future for all individuals within the global development fabric. SDG 4, which is seek to guarantee inclusive and equitable quality education and promote lifelong learning opportunities for all. It is a fundamental in recognizing education as both a fundamental human right and a critical enabler for achieving all other goals (Mutambara, 2025). SDG 4.a, an important, underdeveloped target in this ambition. It emphasized that educational facilities must be child, disability, and gender-sensitive and provide safe, non-violent, inclusive, and effective learning environments to all (Guerra et al., 2022). The goal goes beyond education and examine the quality, nature of the environments where learning happens. The pursuit of goal at the tertiary level in line with the global trend to inclusive education. A way of thinking and doing, demands that all students have the opportunity to participate fully, access information easily, and achieve their potential in a collaborative learning environment (Edwards Jr, Asadullah, & Webb, 2024). The relationship between campus infrastructure accessibility and the academic achievement of university students in an inclusive education setting a crucial question that arises when physical and digital infrastructure meet pedagogical ambition and what role this relationship play in achieving SDG 4.a? (Saxena, Ramaswamy, Beale, Marciniuk, & Smith, 2021)

Students with disabilities are often encounter a new set of formidable barriers when they transition to higher education, which a significant milestone. The inclusion of people with disabilities facilitated by legislative frameworks such as the Americans with Disabilities Act (ADA) or the UNCRPD, the lived experience on university campuses often reveals the persistence of obstacles (Unger, Sansosti, & Novotny, 2022). The true meaning of inclusive education not about admission policies or having a disability support office. The goals are to transform systems by removing barriers to learning and participation, valuing diversity, and transforming systems. The campus must undergo a transformation that includes curricula, teaching methodologies, attitudes, and, primarily, the physical and digital fabric. Infrastructure is not an active agent in the educational process and the ability to construct walls or bridges, and it can silently exclude or powerfully enable (Singun, 2025).

A comprehensive definition adopt when talking about accessible campus infrastructure that goes beyond the installation of a ramp (Amoah, Bamfo-Agyei, & Simpeh, 2023). The entire building environment cover: from classrooms with adequate space for wheelchair maneuverability and adjustable furniture, to laboratories with tactile signage and adaptable equipment, to libraries with accessible workstations and retrieval systems. The structure consists of residential halls that have roll-in showers, cafeterias that have lowered counters, and pathways that have consistent, tactile guiding surfaces (Fast, Lamoureux, & Derksen, 2023). Accessibility in the 21st century is irrevocably digital, which is crucial. It consists of university websites, learning management systems, digital libraries, and online course materials that are accessible and operable by adhering to Web Content Accessibility Guidelines (WCAG) and can be understood by students who use screen readers, voice recognition software, or other assistive technologies. Lecture capture with accurate captioning, document formats that are accessible, and assistive technology hubs are all part of the package. The foundational platform for academic life lies within this ecosystem of physical, sensory, and digital access (Alhusban & Almshaqbeh, 2024).

This accessible ecosystem and academic achievement have a multifaceted and profound theoretical and empirical connections. Accessibility eliminated logistical and physical barriers to attendance and participation at the most basic level. Students who unable to physically enter a class, attend a seminar, or navigate an online module could not excel (Hagan, Vanschoenwinkel, & Gamfeldt, 2021). Consistent engagement is required accessible infrastructure, which establish as a correlation to academic success. Accessibility promotes deeper cognitive and psychological conditions that conducive to learning beyond mere presence (Qi & Derakhshan, 2025). Access fatigue, which disability scholars describe as the constant exertion required to navigate an inaccessible environment, consumes cognitive resources that can be used for learning, problem-solving, and critical thinking. By having an accessible campus, students concentrate their intellectual energies on their studies, which reduces their cognitive load (Tao, Meng, Gao, & Yang, 2022).

In addition, the campus' infrastructure refers a significant symbols of belonging and institutional commitment. Students with disabilities implicitly told that they do not consider important, that their presence limited, and that they must constantly adapt to a world that is not made for them in an inaccessible environment (Lozano, 2023). The psychological determinants of achievement, such as self-efficacy, motivation, and academic identity, can be eroded by this. Conversely, a campus that thoughtfully designed and made universally accessible conveys a message of welcome, value, and foresightedness. The development of legitimacy and belonging, which crucial for academic persistence, risk-taking in learning, and overall well-being, is facilitated by it (Chen, 2024). The social dimension holds equal importance. Full participation in the co-curricular and social life of the university achieve through the accessibility of common areas, student unions, and recreational facilities. Building networks, support systems, and a sense of community through social integration is vital to the holistic educational experience, which buffer against attrition and promote resilience (Song & Hu, 2024).

The broader quality agenda underpinning SDG 4 directly linked to the pursuit of inclusive education and accessible infrastructure (Song & Hu, 2024). The entire student population benefited by the design of an accessible campus. All learners, whether they temporarily injured, parents with strollers, international students, or simply those with diverse learning preferences, benefit from clear signage, ergonomic furniture, well-organized digital content, captioned videos, and flexible learning spaces (Tonegawa, 2022). By adopting this universal design approach, we could change the paradigm from retrofitting for a minority to designing for human diversity from the outset, which enrich the educational environment for all. The concept of 'education for all' aligned with it, not as an exclusive ideal, but as a common standard of excellence (Harris, Franz, & O'Hara, 2023).

The journey towards achieving this vision teem with obstacles. Legacy infrastructure that expensive and complex to retrofit a challenge for many universities, particularly those in older institutions or regions with limited resources (Panakaduwa, Coates, & Munir, 2024). The preservation of historic buildings and making them fully accessible pose a conflict. Accessibility do not merely a one-time construction project; it involves an ongoing process of assessment, adaptation, and training (Bilgin & Hyraj, 2025). To achieve this, to have dedicated funding, expertise in universal design, and a meaningful involvement of students with disabilities in planning and decision-making processes. Accessible pedagogy, which involves training faculty in inclusive teaching methods and designing flexible curricula, crucial for matching physical and digital accessibility. An exclusive classroom only be housed in the most accessible building if this is not present (Kunwar & Adhikari, 2023).

The purpose of this article is to investigate this crucial link. The focus of examination is the conceptual frameworks that connect environmental accessibility to learning outcomes, utilizing theories from environmental psychology,

universal design for learning (UDL), and disability studies (Ahmed, 2024). The aim is to gather empirical evidence from global research to examine how specific infrastructure interventions, such as tactile paving and speech-to-text software, affect metrics of academic achievement, such as grade point averages, course completion rates, and retention (Rawas, 2024). There is a chance for students with disabilities to earn their degree. The analysis also take into account indirect paths, which include enhancing student engagement, psychological well-being, and social integration (Shen, Ye, Zhang, & Huang, 2024). Additionally, the conversation situate these conclusions within the operational and strategic context of university management, addressing the obstacles of implementation, cost-benefit evaluations, and the importance of shifting from compliance to a culture of inclusion. At the end, the article argue that it is not just a legal or ethical duty to invest in accessible campus infrastructure; It is a strategic imperative to achieve quality education (SDG4) and a tangible and measurable action towards fulfilling target 4.a. Universities go beyond just accommodating differences by creating learning environments that are truly inclusive and effective for all (Passeggia et al., 2023). They actively utilize diversity to promote academic excellence, encourage innovation, and equip all graduates, regardless of their ability, to contribute to a more sustainable and equitable world (Karabchuk & Roshchina, 2023). The journey towards SDG 4.a involves transforming the university from a secluded knowledge fortress into a truly accessible and empowering platform for human potential(Ng, 2026).

**Review**

Sustainable Development Goal 4's emphasis on inclusive and equitable quality education as a fundamental requirement for global development. Target 4.a demands that all learners access safe, non-violent, inclusive, and effective learning environments with a clear emphasis on building and upgrading educational facilities that sensitive to children, disabilities, and gender. At the tertiary level, the realization of this objective strongly coincides with the principles of inclusive education, a paradigm that demands that all students, especially those with disabilities, participate fully, have access, and achieve academic success in mainstream settings (Akinyelu, 2024). The relationship between accessible campus infrastructure, both the physical and digital environment, examined in this literature review through the scholarly discourse (Union, 2025). Furthermore, the academic success of university students in inclusive educational environments and its contribution to achieving SDG 4.a. The synthesis shows a strong theoretical and legal basis, empirical research evolved, consistently stating that accessibility a non-negotiable enabler instead of just a mere accommodation with significant implications for the cognitive, psychological, and social dimensions of student success (Dsane, 2021).

The several interconnected frameworks that form the theoretical underpinnings of this relationship (Robinson, 2022). Disability studies founded on the social model of disability, which distinguishes between impairment and the social, attitudinal, and environmental barriers that cause disability (Pineo, 2022). From this viewpoint, a campus is not accessible nor merely a neutral space but an active agent that disables students and directly impairs their educational trajectory. Systemic transformation require due to this model, which shifts the responsibility of change from the individual to the environment (Voulvoulis et al., 2022). UD theory, that educational, and its derivative Universal Design for Learning (UDL) are complementary (Sewell, Kennett, & Pugh, 2022). The creation of environments and products accessible to all people without any need for adaptation of UD principles advocate for. UD envisions features such as barrier-free pathways, flexible classrooms, and digital platforms inclusive for campus infrastructure from the beginning (Mackey, Drew, Nicoll-Senft, & Jacobson, 2023). UDL extends this to education, advocating for multiple ways of representing, engaging, and expressing. Together, these frameworks demonstrate that an accessible environment designed with human diversity in mind decreases unnecessary cognitive load (Cumming & Rose, 2022). This area requires a critical understanding of the concept of 'access fatigue' or 'disability-related effort'. It claimed by scholars that traversing an inaccessible environment demands constant, exhausting problem-solving and self-advocacy, which squander mental energy that used for learning, critical thinking, and academic engagement (Hunt, 2025). Accessible infrastructure, on the other hand, frees up cognitive resources, allowing students to concentrate on their studies (McVicar, 2025).

Accessibility legally mandated by international instruments and national legislation (Sabev, 2024). Article 9 of the UNCRPD, in particular, focuses on accessibility and Article 24 on education which states parties obligated to ensure that individuals with disabilities lead independent lives and fully participate in education (Sabev, 2024). Non-discrimination and accessibility standards for educational institutions establish by laws like the Americans with Disabilities Act (ADA) in the United States, the Equality Act in the United Kingdom, and similar statutes worldwide at the national level. The compulsory backbone for accessibility provide by these legal frameworks, which translate moral and theoretical imperatives into enforceable standards. Legal compliance and meaningful, holistic accessibility, consistently identified in literature, with literature consistently highlighting the gap between meeting minimum standards and creating a truly inclusive and effective learning environment as envisioned by SDG 4.a (Anil & Maithily, 2022).

While empirical research on the direct effect of physical campus infrastructure on academic outcomes grow and presents a complex picture. Studies frequently concentrate on specific barriers and solutions. According to research, course selection, attendance, and participation directly influenced by inaccessible classrooms, libraries, laboratories, and housing. If the laboratory benches do not adjustable in height, a student may be prevented from enrolling in a science course or arriving late and fatigued to classes due to circuitous or obstructed routes (Shafik, 2025). Although

quantitative studies that correlate environmental accessibility with metrics like the Grade Point Average (GPA) are challenging due to confounding variables, qualitative and mixed-method research is compelling. Interviews and surveys consistently show that students with mobility, visual, or hearing impairments consistently experience stress, anxiety, and academic disadvantage due to physical barriers. Their description involves spending too much time and energy on arranging for accommodations, finding alternative routes, or missing out on group work conducted in inaccessible spaces. In contrast, measures like installing automatic doors, tactile guidance systems, and hearing loop systems in lecture halls, case studies have indicated that accessible transportation leads to self-reported improvements in attendance, punctuality, classroom engagement, and overall academic confidence. According to the literature, the impact particularly felt in the realm of time poverty, where inaccessible infrastructure extends the time required for all academic and daily living tasks devoting a smaller amount of time to studying, revising, and intellectual exploration (Omodan, 2024).

In the post-pandemic era of blended and online learning, the digital dimension of accessibility become a key concern for scholars. The design of websites, learning management systems (LMS), online course materials, and software for users with diverse abilities is called digital accessibility, which involves making them perceptible, operable, and understandable (Allioui & Mourdi, 2023). According to research, a digital campus that accessible just as exclusionary as one that not accessible physically. The use of digital tools takes a significant correlation with academic performance, as demonstrate by empirical studies. A significant amount of literature suggests that higher education digital ecosystems do not fully comply with Web Content Accessibility Guidelines (WCAG). The prevalence of accessibility barriers found in university websites and LMS platforms across various countries regularly found in studies auditing them, which some scholars refer to as a 'digital divide within a digital divide'. There are barriers for students to access core learning resources, submit assignments, participate in online discussions, and complete assessments, which directly undermining their achievement and contravening the 'effective learning environment' mandate of SDG 4.a (Winn, 2002).

In addition to the direct logistical and cognitive impacts, the literature strongly emphasizes the psychological and symbolic significance of accessible infrastructure. The campus environment much more functional space; it also conveys powerful messages about belonging, value, and institutional identity (Cooper, 2009). Inaccessible campuses perceive by students with disabilities as a signal that do not valued members of the academic community and seen as an afterthought. Feelings of belonging, academic self-efficacy, and motivation, which well-established predictors of persistence and achievement, weakened by this chilly climate. A sense of legitimacy, welcome, and psychological safety foster when a campus design with universal access in mind. Environmental psychology research indicated that environments that well-designed, navigable, and predictable reduce stress and promote well-being. Students who feel connected and supported by their surroundings more inclined to engage deeply, seek help when necessary, and persist through academic challenges (Cuyjet & Meriwether, 2023). Accessible social and co-curricular spaces, like student unions, cafeterias, sports facilities, and common rooms, essential for social integration. Social integration is strongly linked to persistence in the literature on student retention. Accessible infrastructure facilitates the development of social networks, friendships, and support systems that are crucial for academic resilience and success, contributing to the 'inclusive' aspect of SDG 4.a (Hunkins, Kelly, & D'Mello, 2022).

Critical examination provided in the literature for the challenges and complexities involved in implementing accessible infrastructure. The conflict between historic preservation and modern accessibility requirements one of the primary themes, especially in older, prestigious universities (Wells, 2021). The cost and difficulty of retrofitting listed buildings can result in piecemeal solutions that not provide equitable access. Financial limitations a problem that universal, especially for public institutions in low- and middle-income countries, where competing priorities for scarce resources can impede accessibility. According to scholars, rethinking accessibility an investment in human capital and institutional quality, which can lead to long-term benefits for retention, diversity, and reputation (Greco, Giacometti, Rota, Senaldi, & Penna, 2021). The pedagogical practices and physical/digital accessibility consume a frequent disconnect, which have significant gap. Despite having access to a classroom, students may encounter a professor who uses inaccessible teaching methods or refuses to offer materials in alternative formats. An integrated approach increasingly being called for in literature, where infrastructure accessibility combine with faculty development in inclusive pedagogy and UDL. The absence of meaningful involvement of students with disabilities in accessibility project planning, design, and evaluation a constant critique. The importance of participatory design processes emphasized in identifying real-world barriers that architects and administrators may overlook, as well as ensuring that investments are effective and truly meet student needs (Otero, 2022).

The academic achievement of university students in inclusive settings dependent on accessible campus infrastructure, as it becomes apparent when synthesizing this body of work, providing the foundation for equitable education (Amoah et al., 2023). Participation directly enabled through accessibility, which indirectly enhances cognitive capacity by reducing extraneous load, and symbolically fosters a culture of belonging that conducive to learning and persistence. Large-scale studies are challenging to isolate direct causal links to GPA, but the cumulative evidence from qualitative, case study, and correlational research overwhelm. The material conditions of the learning environment crucial for achieving SDG 4.a. A learning environment that is truly inclusive and effective do not exist if students have to contend with barriers every day that their peers do not have to deal with (Maldonado-Garcés, Sánchez-García, Hernández-

Sánchez, Acosta-Vargas, & Araujo, 2025). The literature shifts away from a compliance-based model and advocates for a transformative one, where accessibility incorporated into the institutional culture and strategic planning as a factor in achieving educational quality for the entire community. The scholarly consensus holds that investing in accessible infrastructure do not just an act of compliance or charity. The promise of inclusive, equitable, and quality higher education for all only fulfill by a fundamental academic imperative and a concrete and measurable step (Beyene, Mekonnen, & Giannoumis, 2023).

## METHOD

The study was descriptive and survey type in nature. Population of this study was all students of Khwaja Fareed UEIT Rahim Yar Khan Pakistan (KFUEIT). Stratified and simple random sampling techniques were applied. We collected data from students of all faculties (total 8) of KFUEIT. About 400 questionnaire was distributed in students of each department from each faculty. Near 357 students return their survey. We rejected 37 because of incomplete information provided by respondents. Thus, the final sample contained 320 usable responses (response rate = 80%).

### Measurement Scale

The Practice of ACI and its impact on students' academic achievement in inclusive education setting were measured by using a self-developed scale. The scale was consisted of 6 items of ACI and 5 items of Academic achievement with five point likert scale ranging from 1 Never, 2 rarely, 3 sometimes, 4 often, and 5 always. We conducted a confirmatory factor analysis (CFA) to ensure the validity of the questionnaire. The finding supported the single dimensional structure, the significance of the KMO measure of sampling adequacy was.867, and Bartlett's Test of Sphericity was df (1035) = 10496.898, $p < .000$. The factors of IE&AA produced by EFA were ACI (ACI1, ACI2, ACI3, ACI4, ACI5, ACI6, Cronbach's $\alpha = .882$), ACA (ACA1, ACA2, ACA3, ACA4, ACA5, Cronbach's $\alpha = .813$). Factor loadings of two dimensions range from 0.543 to 0.785. Overall Cronbach's alpha coefficient of reliability scale was .92.

Confirmatory factor analysis

| Sr. No. | Item | Accessible Campus Infrastructures | Academic Achievement |
|---|---|---|---|
| ACI1 | | .643 | |
| ACI2 | | .718 | |
| ACI.3 | | .695 | |
| ACI4 | | .741 | |
| ACI5 | | .705 | |
| ACI6 | | .686 | |
| ACA1 | | | .747 |
| ACA2 | | | .785 |
| ACA3 | | | .742 |
| ACA4 | | | .678 |
| ACA5 | | | .751 |
| | Eigen Value | 5.677 | 1.081 |
| | Total Variance Explained % (51.61) | 51.610 | 9.82 |
| | Sig. | .000 | .000 |

### Data Analysis

We used SPSS-23 for descriptive statistics and ANOVA results. The data screening stage incorporated missing value analysis, multivariate outliers, normality, descriptive statistics, CFA, and ANOVA.

## RESULTS

**Table 2** presents descriptive statistics of each statement regarding respondents' views on accessible campus infrastructure for inclusive education. The data reveal that (18.8+31.9) 51% of respondents agreed that students with disabilities can navigate facilities easily, with ramps, elevators, and tactile pathways for mobility or visual impairments. About (26.3+28.7) 55% of respondents agreed that assistive technologies, such as hearing loops and screen readers, help students with hearing or visual disabilities participate fully in learning. Nearly (25.0+31.3) 56% of respondents agreed that universities provide barrier-free restrooms, wide doorways, adjustable desks, and

wheelchairs or mobility aids for students. Around (25.9+31.6) 58% of respondents reported that accessible digital platforms and e-learning tools allow students to access course materials, submit assignments, and engage in virtual discussions without barriers. Similarly, (21.9+33.1) 55% of respondents agreed that well-designed outdoor spaces, including smooth pathways, shaded rest areas, and accessible transport stops, promote inclusivity for students, staff, and visitors with diverse needs. Finally, (21.9+31.9) 54% of respondents agreed that universities prioritizing universal design in infrastructure demonstrate a strong commitment to equity and inclusive education.

**Table 2 Accessible Campus infrastructures in IE**

| S.No | Statements | Level of Agreement | Never | Rarely | Sometimes | Often | Always | Std. Deviation | Mean |
|---|---|---|---|---|---|---|---|---|---|
| ACI1 | Students with disabilities can navigate facilities easily, featuring ramps, elevators, and tactile pathways for those with mobility or visual impairments. | F | 38 | 47 | 73 | 60 | 10 | 1.37 | 3.44 |
| | | % | 11.9 | 14.7 | 22.8 | 18.8 | 31.9 | | |
| ACI2 | Assistive Technologies, such as hearing loops and screen readers, helps students with hearing or visual disabilities participate fully in learning. | F | 50 | 18 | 76 | 84 | 92 | 1.37 | 3.46 |
| | | % | 15.6 | 5.6 | 23.8 | 26.3 | 28.7 | | |
| ACI3 | University provides Barrier-free restrooms, wide doorways, and adjustable desks and wheelchairs or other mobility aids for students. | F | 49 | 50 | 59 | 71 | 91 | 1.45 | 3.51 |
| | | % | 12.4 | 13.8 | 18.4 | 25.0 | 31.3 | | |
| ACI4 | Accessible digital platforms and e-learning tools allow students to access course materials, submit assignments, and engage in virtual discussions without barriers. | F | 50 | 22 | 64 | 83 | 101 | 1.40 | 3.50 |
| | | % | 15.6 | 6.9 | 20.0 | 25.9 | 31.6 | | |
| ACI5 | Well-designed outdoor spaces, including smooth pathways, shaped rest areas, and accessible transport stops, promote inclusivity for students, staff, and visitors with diverse needs | F | 43 | 44 | 57 | 70 | 106 | 1.41 | 3.47 |
| | | % | 13.4 | 13.8 | 17.8 | 21.9 | 33.1 | | |
| ACI6 | Universities that prioritize universal design in infrastructure demonstrate a commitment ton equity, ensuring that education. | F | 32 | 38 | 78 | 70 | 102 | 1.31 | 3.53 |
| | | % | 10.0 | 11.9 | 24.4 | 21.9 | 31.9 | | |
| | Total | | | | | | | | |

**Table 3** shows that the results for academic achievements based on the level of accessible campus infrastructure. The analysis indicates that students with rare access to campus infrastructure had a mean of 1.44, while those with medium access reported a mean of 2.35, and students with high access achieved the highest mean of 2.77. The F-value of 105.70 with a significance level of $p = .000$ **(<** 0.05) confirms that there are statistically significant differences among the groups. This suggests that better accessibility in campus infrastructure—such as ramps, elevators, digital platforms, and barrier-free facilities—positively impacts students' academic achievements, with higher levels of access associated with stronger performance.

**Table 3 Academics Achievements by Access campus**

| Statements | N | Mean | Std deviation | Std error | Sum of squares | Df | Mean Square | F | Sig |
|---|---|---|---|---|---|---|---|---|---|
| Rare usage | 43 | 1.441 | .628 | .095 | 61.16 | 2 | 30.58 | 105.70 | .000 |
| Medium Usage | 114 | 2.350 | .579 | .054 | 91.71 | 317 | .28 | | |
| High Usage | 163 | 2.766 | .478 | .037 | | | | | |
| Total | 320 | 2.440 | .692 | .038 | | | | | |

**Findings**

**Table 2 (Perceptions of Accessible Campus Infrastructure):**

The overall perception of campus infrastructure moderately positive, with mean scores ranging from 3.44 to 3.53. Across dimensions, agreement significantly different. The highest approval stood given to digital accessibility (ACI4: 58% agreement) and universal design commitment (ACI6: 54% agreement). Although approval levels remained lower, the core physical amenities (ACI3: 56% agreement) and navigation aids (ACI1: 51% agreement) still significant. The middle range where assistive technologies (ACI2: 55%) and outdoor accessibility (ACI5: 55%) fall. The findings indicate progress in some areas, but also show gaps in fully implementing physically and learning environments that accessible to all.

**Table 3 (Impact on Academic Achievement):**

Accessible campus infrastructure and academic achievement consume a clear and statistically significant relationship. The mean academic achievement for students with rare access is 1.44. A higher mean of 2.35 reported by students who had medium access. The highest mean (2.77) reported by students who access to more resources. The F-value of 105.70 (p =.000) proved that these differences do not due to chance, highlighting the connection between greater accessibility and improve academic performance.

## DISCUSSION

The creation and upgrading of inclusive, safe, and effective learning environments for all stands the key to understanding these findings in light of SDG 4.a. This objective shown to have both alignment and divergence in the data.

SDG 4.a's mandate recognized by the growing recognition of digital accessibility (ACI4) and perceived institutional commitment to universal design (ACI6). Universities make it a priority to use digital tools and policy frameworks that support inclusive education, particularly in light of the global shift towards e-learning. The advancement of the 'effective learning environment' envisioned by SDG 4.a in the virtual space indicated by this.

Even though there progress still critical shortcomings. Physical amenities (ACI3) and navigation aids (ACI1) devour a moderate approval rating. The fact that only about half of respondents in agreement indicates that many campuses still lacking basic, disability-sensitive features such as barrier-free restrooms, adjustable furniture, and reliable mobility aids. SDG 4.a's call for facilities that sensitive to children, disabilities, and gender directly contradicted by an implementation gap between institutional intent and on-the-ground reality.

SDG 4.a's underlying premise that inclusive infrastructure fundamental to educational quality, and the results in Table 3 provide strong empirical support for it. The dose-dependent correlation between greater access and higher achievement showed that accessible design removes barriers to learning, enabling students to focus on academic engagement instead of navigating inaccessible spaces. This evidence indicated that SDG 4.a do not solely a facility-related objective but also a vital academic strategy for advancing equity and excellence in education.

Accessibility efforts often incomplete due to the variability in perceptions across different infrastructure dimensions. Institutions must develop digital advances, outdoor spaces, assistive technologies, and core physical amenities in tandem to fully realize SDG 4.a. The current inequity poses a threat to creating environments where certain needs met while others not, which would undermine the aim of universal inclusiveness.

## CONCLUSION AND RECOMMENDATION

The significance of SDG 4.a in higher education settings underline in this study, but the goal's incomplete realization also highlighted. Despite positive progress in digital inclusion and institutional commitment to universal design, still significant gaps in the provision of basic physical accessibility features. The research convince in show that accessible infrastructure is a crucial factor in academic success. SDG 4.a must be fulfilled to deliver equitable, quality education, as evidenced by the strong positive association between accessibility and achievement.

To fully align with SDG 4.a, universities need to do the following:

Accelerate physical facility upgrade by prioritize essential amenities such as restrooms, furniture, and mobility aids to ensure that all campus spaces fully accessible for people with disabilities.
Close the implementation gap by ensuring consistent, campus-wide execution of policy commitments, which involves retrofitting older buildings and maintaining existing features.
Advocate for investments in universal design to directly contribute to student performance and retention, using evidence like that in Table 3 to promote accessibility as an academic priority.
Institutions can achieve SDG 4, a vision of inclusive learning environments that not only in principle, by taking these steps. Nevertheless, it is practical and fair, ensuring that every student participate fully and succeed academically, regardless of their ability.

**Declaration of generative AI and AI-assisted technologies in the manuscript preparation process**
During the preparation of this work the authors used DeepSeek in order to [most relevant literature]. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

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