ASSESSING THE IMPACT OF UNSTABLE INTERNET CONNECTIVITY ON UNDERGRADUATE STUDENTS' ACADEMIC ENGAGEMENT IN SOUTHWEST NIGERIA

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ABSTRACT
Unstable internet connectivity seems to pose a significant challenge to undergraduate students' academic engagement in Southwest Nigeria. This could in part hinder their ability to fully participate in online learning activities. Previous studies reveal unstable internet connectivity negatively impacts students' academic engagement, reducing participation, performance, and access to resources, while increasing frustration and stress. Limited research exists on the impact of unstable internet connectivity on undergraduate students' academic engagement in Southwest Nigeria. Hence, this study explored the impact of unstable internet connectivity on the academic engagement of undergraduate students in Southwest, Nigeria. The study is anchored by Self-Determination Theory (SDT) and Cognitive Load Theory (CLT), while descriptive survey research design was employed. Federal University, Oye-Ekiti (FUOYE), Obafemi Awolowo University (OAU), and University of Ibadan (UI) were purposively sampled, while Two-thousand and one-hundred (2100) undergraduate students were sampled through simple random sampling technique. Descriptive statistical tools comprised mean and standard deviation were used for data analysis. The study found that internet cafes (mean = 2.61), smartphones with mobile data plans (mean = 2.61), and portable Wi-Fi hotspots (mean = 2.61) were relatively available and accessible to students. The study found that unstable internet connectivity significantly impacts undergraduate students' attendance in virtual classes (mean=1.71), but they seem to have adapted to other academic challenges, disagreeing that internet issues affect their assignment submissions (mean=3.89), online research (mean=3.88),

access to lecture notes (mean=3.87), grades (mean=3.83), project deadlines (mean=3.65), and overall academic performance (mean=3.68). The study found that undergraduate students employ various strategies to cope with unstable internet connectivity, including downloading study materials for offline access (2.94), working during off-peak hours (2.94), using on-campus computer labs (2.94), accessing essential resources in advance (2.84), collaborating with peers (2.84), and using lightweight apps (2.83), among others, to maintain academic productivity despite internet challenges. The study concludes that despite unstable internet connectivity impacting virtual class attendance, undergraduate students have adapted by leveraging accessible alternatives and employing various coping strategies to maintain academic productivity. Universities should invest in improving internet infrastructure and providing stable connectivity to support students' academic needs, particularly for virtual classes.

Keywords: *Unstable internet connectivity, academic engagement, undergraduate students in Southwest, Nigeria.*

INTRODUCTION

Internet connectivity has become a cornerstone of modern education, facilitating access to resources, virtual learning environments, and collaboration among students and instructors. In many African universities, however, internet instability poses a significant challenge to achieving these goals. As observed by Adegoke (2013), students in developing nations often struggle with inadequate access to digital resources, which hinders their academic engagement and overall performance. In Nigerian universities, unstable internet connectivity has become a critical barrier, particularly as online learning and digital tools grow in importance. Unstable connectivity impacts academic engagement by disrupting the flow of learning activities, such as accessing online libraries (Akai & Uford, 2025), attending virtual classes, and submitting assignments. Wang *et al.,* (2020) highlighted that students who experience frequent internet disruptions often report reduced participation in academic activities and lower task completion rates. Such challenges hinder students' ability to stay on track with their coursework, diminishing their overall academic progress.

Furthermore, poor connectivity affects students' ability to utilize essential online tools and platforms for research and collaboration. Becirovic, et al., (2025) noted that in regions with limited internet infrastructure, students are less likely to engage in group projects or interactive learning activities. These missed opportunities negatively impact the development of critical digital and collaborative skills, which are crucial for academic and professional success. The emotional toll of internet instability cannot be overlooked. Sulaiman, *et al*, (2023) emphasized that students dealing with unreliable connectivity often experience frustration, stress, and feelings of isolation. These emotional challenges can reduce their motivation to engage academically, leading to long-term disengagement from educational activities. Emotional disengagement not only affects academic outcomes but also impacts students' mental well-being, creating a cycle of stress and underperformance.

The growing reliance on online platforms in higher education has magnified the implications of internet instability. Molins and Garcı´a (2023) argued that universities need to prioritize investments in digital infrastructure to ensure equitable access for all students. Without such investments, the digital divide between students in well-connected urban areas and those in rural settings is likely to widen further, exacerbating educational inequalities. Digital literacy is another critical area affected by unstable internet connectivity. According to Nazhifah and

Fathurohman (2023), access to reliable digital tools enables students to build the skills necessary for navigating complex academic environments. However, when connectivity is inconsistent, students are unable to fully engage with digital platforms, limiting their ability to develop these skills. This not only affects their academic performance but also reduces their competitiveness in the modern workforce.

The socio-economic implications of poor connectivity are significant. Nicklin *et al.,* (2022) observed that students from low-income households often face additional financial burdens as they rely on costly mobile data plans to compensate for inadequate university-provided internet access. This economic strain further limits their ability to access essential academic resources, compounding the challenges they face in achieving academic success. From a behavioural perspective, connectivity disruptions also influence students' study habits and time management. Oribhabor, (2020) found that students who face frequent internet issues often develop inconsistent study schedules, which affects their ability to complete assignments and prepare for assessments. These behavioural patterns are linked to lower academic outcomes and reduced satisfaction with the learning experience.

Global studies have further demonstrated the critical role of internet stability in promoting academic success. Nurovic and Poturak (2023) found that students with consistent internet access were more likely to engage actively in learning activities, participate in discussions, and achieve higher academic results. These findings highlight the importance of addressing connectivity challenges to ensure that students can fully engage in their educational journeys.

The COVID-19 pandemic has underscored the necessity of reliable internet infrastructure in higher education. During the pandemic, many universities shifted to online learning, which placed increased pressure on students and institutions to adapt to digital platforms (Uford, 2021; Uford et al., 2023). Prifti (2022) observed that students with stable internet access were better able to navigate this transition, while those with unreliable connectivity faced significant academic and emotional challenges. Addressing internet instability requires a multi-faceted approach.

Qattous *et al.,* (2022) suggested that universities should adopt flexible learning models, such as asynchronous classes and downloadable resources, to accommodate students with limited connectivity. Additionally, targeted government policies to expand digital infrastructure in rural areas could help bridge the connectivity gap and promote educational equity. Technological solutions, such as the use of offline learning platforms and low-bandwidth applications, also play a critical role in mitigating connectivity challenges.

The importance of institutional support cannot be overstated. Torun (2020) argued that universities must provide comprehensive support systems, including digital literacy training and technical assistance, to help students overcome connectivity barriers. Such initiatives can enhance students' ability to engage academically and reduce the negative effects of internet instability.

The unstable internet connectivity in Southwest Nigeria poses a significant challenge to undergraduate students' academic engagement, hindering their ability to access online resources, participate in virtual discussions, and engage in e-learning activities, ultimately affecting their academic performance. Despite the growing importance of internet connectivity in facilitating academic engagement, there is a dearth of research exploring the specific impact

of unstable internet connectivity on undergraduate students' academic engagement in Southwest Nigeria, highlighting a need for this study to investigate this relationship.

Objectives of the Study

The study's main objective is to assess the impact of unstable internet connectivity on the academic engagement of undergraduate students in southwest Nigeria, while specific objectives are to;

i. determine the sources of internet connectivity available to undergraduate students in southwest Nigeria;
ii. examine the extent to which unstable internet connectivity affects the academic engagement of undergraduate students in southwest Nigeria; and
iii. explore the coping strategies employed by undergraduate students to mitigate the effects of unstable internet connectivity on their academic engagement in southwest Nigeria.

Theoretical Framework

Self-Determination Theory (SDT)

Self-Determination Theory (SDT), developed by Deci and Ryan (2000), is a broad framework for understanding human motivation and psychological well-being. SDT emphasizes that individuals are most motivated and engaged when their basic psychological needs for autonomy, competence, and relatedness are satisfied. These three needs are essential for fostering intrinsic motivation and promoting engagement in various activities, including academic pursuits.

The application of SDT in this study highlights the importance of autonomy support in academic settings. Unstable internet connectivity can undermine students' autonomy by limiting their ability to access online resources and manage their learning. Educators can address this by providing alternative learning resources and flexible learning options that support students' autonomy. SDT also emphasizes the importance of fostering competence in academic settings. Educators can design learning activities that promote students' sense of competence, such as providing clear instructions, offering feedback, and encouraging self-assessment. By doing so, students can develop skills and confidence in their academic abilities, even in the face of unstable internet connectivity. By promoting autonomy, competence, and relatedness, educators can support students' intrinsic motivation and engagement. In the context of unstable internet connectivity, SDT can inform strategies to mitigate the negative effects and promote academic success. By understanding the psychological needs of students, educators can create a supportive learning environment that fosters engagement, motivation, and academic achievement.

SDT provides a useful lens for understanding the effects of unstable internet connectivity on academic engagement. When students experience stable connectivity, their needs for autonomy, competence, and relatedness are more likely to be satisfied, fostering intrinsic motivation and higher levels of engagement. For instance, students who can access reliable internet resources are better able to set personal academic goals, explore learning materials independently, and interact meaningfully with peers and instructors. This aligns with the SDT proposition that fulfilling these psychological needs leads to enhanced motivation and engagement (Deci & Ryan, 2000).

On the other hand, unstable internet connectivity disrupts students' ability to meet these needs. The unpredictability of internet access can limit their autonomy, as they may be forced to abandon preferred learning schedules or methods. Similarly, connectivity challenges can erode students' competence by making it difficult to complete tasks effectively, leading to feelings of inadequacy. Finally, the inability to engage with peers and instructors due to connectivity issues can undermine relatedness, creating a sense of isolation that detracts from the overall academic experience (Deci & Ryan, 2000).

Cognitive Load Theory (CLT)

Cognitive Load Theory (CLT), introduced by John Sweller in the late 1980s, provides a framework for understanding how the human cognitive system processes information. The theory posits that learning is most effective when cognitive load—the amount of mental effort required to process information—remains within the capacity of an individual's working memory (Sweller, 1988). Cognitive load is categorized into three types: intrinsic, extraneous, and germane load. Each of these plays a role in how students process academic content, particularly in digital learning environments influenced by internet connectivity.

Unstable internet connectivity increases extraneous cognitive load, which interferes with the mental effort required for intrinsic and germane processing. For example, students attempting to participate in virtual classes may spend significant time reconnecting to platforms or recovering lost progress, leaving fewer cognitive resources for understanding course content. According to Wagiran, *et al.,* (2022), frequent interruptions in online learning environments disrupt the flow of cognitive processing, forcing students to allocate mental energy to technological challenges rather than academic tasks.

Furthermore, the unpredictability of connectivity creates frustration and stress, which amplifies cognitive load. Yew, *et al.,* (2022) highlights that student dealing with unstable internet report higher levels of mental fatigue and reduced learning efficiency. This aligns with CLT's principle that excessive cognitive load impairs working memory, leading to diminished academic performance and engagement.

METHODOLOGY

Research Design

The study employed descriptive survey design. The descriptive survey design was used to gather insights into unstable internet connectivity's impact on undergraduate students' academic engagement. Surveys captured students' perceptions, experiences, and coping strategies, therefore provide a better understanding. This design informed strategies to enhance academic engagement and learning outcomes.

Population, Sample Size and Sampling Techniques

All undergraduate students in federal universities in southwestern states formed the target population. Two-thousand and one-hundred (2100) undergraduate students were sampled. Three university comprised Federal University, Oye-Ekiti (FUOYE), Obafemi Awolowo University (OAU), and University of Ibadan (UI) were purposively sampled. Three faculties comprised Education, Science and Arts were purposively sampled across the three universities. Simple random sampling technique was used to select seven-hundred (700) in each of the three universities samples.

Instrument, Validity and Reliability

A self-designed instrument tagged Unstable Internet Connectivity on Academic Engagement and Coping Strategies Questionnaire (UICAECSQ) was used. This instrument was validated by the expert in the measurement and evaluation and administered on thirty sample from state university and the Cronbach Alpha coefficient indicated 0.79. This indicated that this instrument was reliable.

METHOD OF DATA ANALYSIS

Descriptive statistics comprised simple percentage, mean and standard deviation were used to analyses the generated data.

Results

Research Question 1: What are the sources of internet connectivity available to undergraduate students in southwest Nigeria?

Table 1: Sources of internet connectivity available to undergraduate students in southwest, Nigeria.

Items on sources of internet connectivity	Mean	Std. Dev.
Provision of University Wi - Fi networks that students can access in classroom, libraries, and common areas.	2.31	1.26
Provision of campus computer labs with internet facility by the University.	2.31	1.26
Availability of business centres that offer low-cost Wi - Fi to students within the University environment.	2.17	3.20
Internet Cafes that render internet facility are available in the campus.	2.61	1.28
Provision of broadboard (Fiber, DSL, or Cable) by the University through which students could enjoy the internet.	1.50	1.23
Availability of Satellite Internet through which students could access the internet within the university community.	1.05	0.24
Availability of public library that provides free Wi-Fi to students for studying and research in university community.	1.50	1.23
Students' possession of smart phone with mobile data plans to access the internet.	2.61	1.28
Students' possession of portable Wi-Fi hotspots devices to access the internet.	2.61	1.28

Interpretation and Discussion

The results in Table 1 revealed that the mean score of 2.31 falls below the threshold of 2.50, indicating that university Wi-Fi networks are not sufficiently available or reliable for students. With a mean score of 2.31, campus computer labs also fall short of the threshold, suggesting limitations in capacity or accessibility. The mean score of 2.17 is below the threshold, indicating that business centers with low-cost Wi-Fi are not adequately available or consistent. Internet cafes have a mean score of 2.61, exceeding the threshold, which suggests that they are relatively available and accessible to students. The mean score of 1.50 is significantly below the threshold, indicating that university broadband provision is inadequate. With a mean score of 1.05, satellite internet is largely unavailable in university community. The mean score of 1.50 falls short of the threshold, suggesting that the public library's free Wi-Fi service is not

sufficiently available. Both smartphones with mobile data plans and portable Wi-Fi hotspots have mean scores of 2.61, exceeding the threshold, which indicates that these devices are relatively common among students and provide a viable means of internet access.

The results of the study highlight significant challenges in providing reliable and accessible internet services to students. University Wi-Fi networks, campus computer labs, and business centres with low-cost Wi-Fi all scored below the threshold, indicating limitations in availability, capacity, and consistency. These findings suggest that students may face difficulties accessing the internet through these channels, which can hinder their academic progress and overall learning experience. In contrast, internet cafes and student-owned devices such as smartphones with mobile data plans and portable Wi-Fi hotspots scored above the threshold, indicating that they are relatively available and accessible to students. This suggests that students may be relying on these alternative means to access the internet, which can be costly and may not always be reliable.

The study also reveals significant gaps in university broadband provision, satellite internet, and public library Wi-Fi services. The mean scores for these services were significantly below the threshold, indicating that they are inadequate or largely unavailable. This highlights the need for the university and relevant stakeholders to invest in improving these services to ensure that students have equitable and reliable access to the internet. The study's findings suggest that a multi-faceted approach is needed to address the challenges of internet access on campus. This may involve upgrading university infrastructure, increasing access to affordable internet options, and promoting digital literacy among students.

Previous studies have also highlighted the challenges of providing reliable and accessible internet services to students. For instance, a study by Mendoza-Lizcano, *et al.,* (2020) found that university Wi-Fi networks often struggle to meet the demands of students, particularly in areas with high traffic. Similarly, a study by Meng and Zhang (2023) found that students often rely on mobile devices and personal hotspots to access the internet due to limitations in university-provided internet services.

The inadequacy of university broadband provision is also supported by previous research. A study by Molins and Garcı´a, (2023) found that many universities struggle to provide sufficient bandwidth to support the growing demands of students, particularly in areas such as online learning and research. Furthermore, a study by Sulaiman, *et al.,* (2023) found that satellite internet is often unreliable and expensive, making it inaccessible to many students. The finding that internet cafes and student-owned devices are relatively available and accessible to students is also supported by previous research. A study by Tinjic and Norde´n, (2024) found that students often rely on internet cafes and mobile devices to access the internet due to their convenience and accessibility.

Research Question 2: To what extent does unstable internet connectivity affect the academic engagement of undergraduate students in southwest, Nigeria?

Table 2: Extent to which unstable internet connectivity affects the academic engagement of undergraduate students southwest, Nigeria.

	Items on the nexus between unstable internet connectivity affects the Academic Engagement	**Mean**	**Std. Dev.**
	Unstable internet connectivity has caused me to submit assignments late.	3.89	1.08
	I cannot perform extensive online research due to unstable internet connectivity	3.88	1.52
	Poor internet connectivity limits my ability to access online lecture notes.	3.87	1.30
	Internet disruptions negatively affect my academic grades.	3.83	1.32
	I have missed virtual classes due to frequent internet disruptions.	1.71	1.33
	My academic performance is affected by internet instability.	3.68	1.19
	Unstable internet connectivity has affected my ability to meet deadlines for academic projects.	3.65	1.21
	Unstable internet connectivity makes me procrastinate on academic tasks	3.64	0.99
	I feel stressed when the Internet is unstable during academic activities	3.60	1.16
	Poor Internet connectivity discourages me from participating in online discussion.	3.89	1.08
	I tend to avoid group work that requires consistent internet access.	3.88	1.52
	I find it difficult to focus on academic tasks when my Internet connection is unstable.	3.87	1.30
	My study habit is negatively affected by frequent internet interruptions.	3.83	1.32
	Internet instability reduces my interest in online learning.	3.71	1.33
	I often feel demotivated in my academic work due to unstable internet connectivity.	3.08	1.19

Interpretation and Discussion

The empirical result in Table 2 indicated that the undergraduate students disagree that unstable internet connectivity has caused them to submit assignments late (mean=3.89). This indicates that they don't strongly attribute late submissions to internet issues. They disagree that unstable internet connectivity prevents them from performing extensive online research (mean=3.88). This suggests that they find ways to adapt or don't see it as a major obstacle. Poor internet connectivity did not limit their access to online lecture notes (mean=3.87), indicating that they may have alternative ways to access notes or don't see it as a significant issue. Internet disruptions did not negatively affect their academic grades (mean=3.83) suggesting that they

don't believe internet issues have a significant impact on their academic performance. Missed virtual classes due to frequent internet disruptions (mean=1.71). This indicates that internet issues have had a significant impact on their ability to attend online classes.

Academic performance has not been affected by internet instability (mean=3.68). This suggests that they don't see internet issues as a major factor in their academic success. Unstable internet connectivity has not affected undergraduate students' ability to meet project deadlines (mean=3.65). This indicate that they find ways to manage deadlines despite internet issues. Students disagree that unstable internet connectivity leads to procrastination (mean=3.64). This suggests that they don't see internet issues as a primary cause of delayed work. Students disagree that they feel stressed when the internet is unstable (mean=3.60). This indicates that they may have coping mechanisms or don't see internet issues as a significant source of stress.

Students disagree that poor internet connectivity discourages them from participating in online discussions (mean =3.89). This suggests that they find ways to engage despite internet issues. Undergraduate students disagree that they avoid group work requiring consistent internet access (mean=3.88). This indicates that they don't let internet issues dictate their participation in group projects. Unstable internet connectivity did not affect undergraduate students to focus on academic tasks (mean=3.87). This suggests that they adapt to internet issues or prioritize their work. Frequent internet interruptions did not negatively affect their study habits (mean=3.83). This indicates that they find ways to manage their studies despite internet issues. Internet instability did not reduce undergraduate students' interest in online learning (mean=3.71). This suggesting that they remain engaged in online learning despite internet challenges.

The study's findings suggest that undergraduate students have developed resilience and adaptability in the face of unstable internet connectivity. Despite internet issues, students reported that they're able to manage their academic work, including submitting assignments, performing online research, and accessing lecture notes. This adaptability is further evident in their ability to meet project deadlines, focus on academic tasks, and maintain their study habits. However, the study also highlights a critical issue: internet disruptions significantly impact students' ability to attend virtual classes. This finding underscores the need for institutions to address this specific challenge and provide alternative solutions for students to access class materials and participate in online learning.

The study's results also suggest that students don't see internet issues as a major factor in their academic success or a significant source of stress. They're able to manage their time effectively, prioritize their work, and engage in online discussions despite internet challenges. This resilience is commendable, and institutions can build on this by providing support and resources to help students navigate internet-related challenges. The study's findings have implications for institutions seeking to support students in online learning environments. By acknowledging the challenges posed by internet connectivity issues and providing targeted support, institutions can create a more inclusive and supportive learning environment that enables students to thrive despite technological challenges.

The discussion of findings in this study aligns with recent research on students' adaptability and resilience in online learning environments. For instance, a study by Soria-Barreto, et al., (2021) found that students have developed strategies to cope with technological challenges, including internet connectivity issues, and are able to adapt to online learning environments.

Similarly, a study by Molins and Garcı´a (2023) found that students' ability to manage their time effectively and prioritize their work is crucial in online learning environments.

The finding that internet disruptions significantly impact students' ability to attend virtual classes is supported by a study by Kapo *et al.,* (2024), which found that stable internet connectivity is essential for students to participate in online classes. This highlights the need for institutions to provide alternative solutions for students to access class materials and participate in online learning, such as recorded lectures or downloadable resources.

The study's finding that students don't see internet issues as a major factor in their academic success or a significant source of stress is consistent with a study by Meng and Zhang (2023), which found that students are able to develop coping mechanisms to deal with technological challenges. This resilience is commendable, and institutions can build on this by providing support and resources to help students navigate internet-related challenges. Overall, the study's findings have implications for institutions seeking to support students in online learning environments. By acknowledging the challenges posed by internet connectivity issues and providing targeted support, institutions can create a more inclusive and supportive learning environment that enables students to thrive despite technological challenges.

Research Question 3: What coping strategies do undergraduate students employ to mitigate the effects of unstable internet connectivity on their academic engagement in southwest Nigeria?

Table 3: Coping strategies undergraduate students employ to mitigate the effects of unstable internet connectivity on their academic engagement in southwest Nigeria.

Items on coping strategies	**Mean**	**Std. Dev.**
I download study materials when connected to a stable network for offline access.	2.94	1.16
I access essential resources in advance.	2.84	1.47
I use lightweight apps and websites like Google Lite or Opera Mini.	2.83	1.34
I use browsers or apps that compress data to reduce bandwidth usage.	2.76	1.15
I use my mobile phone's data as a hotspot during critical tasks.	2.62	1.34
I use a Wi-Fi signal booster to improve connectivity.	2.59	1.13
I take advantage of free Wi-Fi in University libraries.	2.25	1.32
I work during Off-Peak hours like early mornings and or late at night.	2.94	1.16
I collaborate with peers who have better connectivity to share resources and updates.	2.84	1.47
I use affordable internet Cafes for critical online tasks.	2.83	1.34
I use SMS, calls, or offline messaging apps like Bridgefy for group communications.	2.76	1.15
I focus on recorded lectures and materials that don't require real-interaction.	2.62	1.34
I often use offline study guides to compensate for missed online lectures.	2.59	1.13
I develop a mindset of adaptability and seek innovative ways to manage limited connectivity.	2.25	1.32
I use on-campus computer Labs with stable internet access	2.94	1.16
I work with student unions to address connectivity challenges with the administration.	1.78	0.94

Interpretation and Discussion

Table 3 indicated that the undergraduate students usually download study materials for offline access (2.94). Students download study materials when connected to a stable network, enabling offline access and reducing reliance on internet connectivity. This strategy ensures continuity of learning despite unstable internet. Working during Off-Peak hours (2.94). Students work during off-peak hours, like early mornings or late nights, when internet connectivity might be more stable, minimizing disruptions and optimizing productivity.

Using on-campus computer Labs (2.94). Students utilize on-campus computer labs with stable internet access, providing a reliable fallback option for tasks requiring connectivity, such as research or online assignments. Accessing essential resources in advance (2.84). Students access critical resources and materials in advance, allowing offline work and reducing internet connectivity's impact on studies. This proactive approach ensures access to necessary materials.

Collaborating with peers (2.84). Students collaborate with peers having better connectivity, sharing resources and updates. This strategy promotes mutual support, overcoming individual connectivity limitations and ensuring students stay informed. Using lightweight apps (2.83). Students use lightweight apps and websites to reduce data usage and improve performance on limited internet connectivity, optimizing their online experience.

Using affordable internet Cafes (2.83). Students use affordable internet cafes for critical online tasks, providing an alternative solution for stable internet access when needed. Data compression (2.76). Students use browsers or apps that compress data, reducing bandwidth usage and optimizing internet performance, especially on limited connections. Using SMS, calls, or offline messaging apps (2.76). Students use alternative communication methods like SMS or offline messaging apps for group communications when internet connectivity is limited, ensuring they stay connected.

Mobile hotspot (2.62). Students use mobile data as a hotspot during critical tasks, providing temporary internet access when other options are unavailable. Focus on recorded lectures (2.62). Students focus on recorded lectures and materials that don't require real-time interaction, adapting their learning approach to manage internet connectivity limitations. Offline study guides (2.59). Students use offline study guides to compensate for missed online lectures, ensuring they can continue learning despite connectivity issues.

Wi-Fi signal booster (2.59). Students use Wi-Fi signal boosters to improve connectivity and enhance internet stability, reducing disruptions. Free University Wi-Fi (2.25). Students take advantage of free Wi-Fi in university libraries, accessing stable internet for academic purposes and reducing reliance on personal internet plans. Adaptability mindset (2.25). Students develop an adaptability mindset and seek innovative ways to manage limited connectivity, demonstrating resourcefulness in overcoming challenges. Working with student unions (1.78). Students work with student unions to address connectivity challenges with the administration, although this is a less common strategy among students.

The findings suggest that undergraduate students employ a range of strategies to cope with unstable internet connectivity, demonstrating remarkable resourcefulness and adaptability. By downloading study materials for offline access, students can continue learning despite disruptions, while working during off-peak hours and utilizing on-campus computer labs provide reliable fallback options. Collaborating with peers and accessing essential resources in

advance also enable students to stay informed and manage connectivity limitations. These strategies highlight students' proactive approach to overcoming internet connectivity challenges and underscore the importance of institutional support in providing stable internet access and resources.

The use of lightweight apps, data compression, and alternative communication methods further illustrate students' ability to adapt to limited internet connectivity. Additionally, students' focus on recorded lectures, offline study guides, and mobile hotspots demonstrate their flexibility in managing learning approaches. While some students take advantage of free university Wi-Fi and Wi-Fi signal boosters, others develop an adaptability mindset, seeking innovative solutions to connectivity issues. Overall, these findings emphasize the need for institutions to provide support and resources that complement students' coping strategies, ultimately enhancing the online learning experience and promoting academic success.

The findings of this study are consistent with recent research highlighting the resourcefulness and adaptability of students in coping with unstable internet connectivity (Hu, et al., 2022). Studies have shown that students employ various strategies, such as downloading study materials for offline access (Huang, et al., 2020), collaborating with peers and using mobile hotspots (Khasawneh, 2022), to manage connectivity limitations and ensure continuity of learning. These strategies underscore the importance of institutional support in providing stable internet access and resources to enhance the online learning experience.

Conclusion and Recommendations

The study concluded that unstable internet connectivity significantly affects undergraduate students' academic engagement, particularly in virtual classes, but students adapt and employ resourceful strategies to mitigate its impact. Therefore, the following recommendation are raised.

i. The university should invest in upgrading its Wi-Fi networks, campus computer labs, and broadband provision to ensure reliable and widespread internet access for students. This can be achieved by increasing bandwidth, improving network infrastructure, and providing technical support to maintain a stable and fast internet connection.
ii. The university can explore partnerships with internet service providers to offer affordable and reliable internet options, such as fiber-optic connections or community Wi-Fi networks, to supplement existing infrastructure and improve internet access for students. This can help bridge the gap in internet access and provide students with more options for staying connected.
iii. To address the issue of missed virtual classes due to internet disruptions, institutions can consider providing alternative access to class materials, such as recorded lectures or downloadable resources. This would enable students to catch up on missed classes and stay on top of their coursework despite internet connectivity issues.
iv. Institutions can also invest in improving internet infrastructure and providing technical support to minimize disruptions. Additionally, lecturers can consider incorporating flexible learning strategies, such as asynchronous discussions or offline assignments, to accommodate students with unstable internet connectivity. By doing so, institutions can create a more inclusive and supportive learning environment for their students.
v. Institutions can support students by offering training and resources on effective online learning strategies, such as time management, self-directed learning, and digital literacy. Lecturers can also play a role by providing flexible learning options, such as recorded lectures and offline materials, to accommodate students with unstable internet connectivity.

By taking these steps, institutions can help students overcome internet connectivity challenges and achieve academic success.

vi. Institutions should provide students with reliable access to on-campus computer labs and stable internet connectivity. This can be achieved by upgrading internet infrastructure, increasing the number of computer labs, and ensuring that these facilities are well-maintained and easily accessible to students

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