education sciences

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Readiness, Roles, and Responsibilities of Stakeholders for Sustainable Mobile Learning Adoption in Higher Education

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Received: 6 February 2020; Accepted: 24 February 2020; Published: 27 February 2020

Abstract: The extant literature on mobile learning in higher education has mainly focused on students and academics. This study conducted in a Nigerian university considered a wider group of stakeholders (students, academics, IT personnel, and administrative leaders) in its investigation of stakeholders' awareness, willingness, and readiness for mobile learning adoption, using a mixed methods approach. The findings revealed that while the awareness of mobile learning amongst students was low, they were keen on adoption. Academics were more tentative, for while they were willing, it was clear that a shift in their teaching philosophy and pedagogy would be required for mobile learning to work effectively. For those in IT and administrative leadership roles, their perceptions were more resource-focused. While this study only considered the views of internal stakeholders, it also uncovered the need for the involvement of external stakeholders. Building on these findings, a strategy table which outlines the roles and responsibilities of each stakeholder group was created. The table provides a blueprint which otherwise has been missing, to guide sustainable mobile learning adoption and implementation not only in higher education in developing countries, but which may have more global appeal.

Keywords: mobile learning; adoption; sustainable implementation; stakeholders; roles and responsibilities

1. Introduction

The popularity and acceptance of mobile learning (m-learning) is gaining momentum around the world due to the increasing availability of low-cost mobile devices and supporting infrastructure for mobile technology [1]. The ubiquitous nature of such technologies makes m-learning ideal for developing countries where advanced educational technologies are scarce. Indeed, m-learning studies focused on developing countries [2–4] have shown that the mobile technology holds great potential for expanding educational opportunities in the region. Although developing countries, in particular those within the World Bank classification of low and lower-middle income economies [5], share similarities such as resource constraints and the need for improved educational systems, despite their vast sociocultural differences [6], it is sensible to focus research studies on a specific country. Nigeria is a case in point.

Several studies have reported that virtually all students in higher education in Nigeria have at least one mobile device, and they access the internet regularly using mobile internet [7–11] rather than traditional broadband connectivity, which has been hindered due to cost and infrastructural challenges [12–15]. Such findings suggest that m-learning is not only feasible in Nigeria, but the

outcomes of these investigations show that m-learning has the potential to become a reliable instructional tool in the Nigerian higher education sector and could help attain technology-enhanced teaching and learning benefits hindered by the digital divide. Indeed, the prospect has been investigated from a number of different perspectives. While some studies have considered the design of the technology [16,17], the majority of studies have focused on students' perception of m-learning, their ownership of appropriate devices, and willingness for m-learning adoption [18–23]. Acknowledging that students are key stakeholders of m-learning, there are other important and relevant stakeholders. Also, missing from these investigations are studies on the pedagogy of m-learning. This is an important oversight because, as [24] argued, the appropriate use of technology for educational advancement requires a thoughtful integration of technology and pedagogy. Therefore, the objectives of this study are to investigate: (1) the willingness and readiness of relevant stakeholder groups to adopt m-learning; and (2) the pedagogical readiness for m-learning.

2. Literature Review

2.1. The Underpinnings of M-Learning and the "Nigerian Pedagogy"

M-learning purports to bring positive change in step with 21st century pedagogy. It is consistent with and likely to promote student-centered constructivist learning, emphasizing "increased student-student, student-content, student-instructor, and student-outside resources interactions" [24] (p. 929). In keeping with constructivist learning, the balance of power where academics are owners of knowledge and students consumers shifts, as students become co-creators of knowledge and academics facilitators providing guidance [25], As a consequence, the focus shifts from the classroom and the academic to agentic students who decide how best to meet their own distinct learning needs, interests, and aspirations [25]. Taking this into consideration, on the face of it, m-learning appears to be in sharp contrast with the practices of education delivery in Nigeria. The Nigerian higher education system is "intensively teacher-centered" [26] (p. 351). The academic is the primary provider of information and makes decisions regarding the course outline, content, learning schedules, class attendance policy, and evaluation, then communicates these as directives that students must follow. Students, on the other hand, are passive recipients of knowledge and information, copying and memorizing rather than conceptualizing the content [26].

According to Torrisi-Steel [27], the effective use of technology in education should result in significant positive changes in teaching and learning. The author cautions however, that educational "technologies used inappropriately or in ways replicating traditional teacher-centered approaches contribute little to improving the quality of the learning environment" (p. 3041). Given the Nigerian pedagogical approach, if m-learning is to be successful, it would appear that access to technology is not enough. Academics would need to be willing to change their practice, which would also require students to take more responsibility for their learning [28]. The need for active student-centred m-learning pedagogy has been recognized by several studies, such as [29–32], who posit that it is essential for academics to design pedagogically sound m-learning environments to enable practical learner-centred m-learning activities that encourage student partcipation. Increased student participation in the teaching and learning process has been described as an effective strategy that leads to motivation and better learning outcomes [33,34]. It is, however, not without challenges, especially when there is a strong emphasis on individualized learning without the same consideration for teamwork, which can lead to students feeling abandoned and isolated [35]. To promote effective student-centered learning, [36,37] assert that the learning design should include collaboration amongst students in group activities during class time, without class components facilitated by technology. Furthermore, [38] argued that the ubiquitous nature of mobile devices makes them ideal tools to promote out-of-class learning. Moreover, designing m-learning activities using formats (such as voice, text, picture, and video) provides the platform for academics to deliver highly engaging, interactive, and collaborative learning environments for students within and outside the classroom and allocated lecture time [39,40].

For effective and sustainable m-learning in higher education in Nigeria, it is imperative to investigate the perceptions of students and academics regarding the possibility of a pedagogical shift. In other words, their pedagogical readiness for m-learning.

2.2. Stakeholders in the M-Learning Domain

Unlike traditional forms of pedagogy, m-learning is a composite socio-technical artefact, where harmonization and concerted actions of different stakeholders are critical for its success. As such, stakeholders in the m-learning domain are not only students and academics, as it mostly appears in literature. As a technological innovation, m-learning requires the involvement of stakeholders, such as IT personnel and administrative management [41]. According to [42], these groups of stakeholders are important because sustainable implementation of educational technologies in higher education relies on the positive interaction between academics, the IT department, and management that encourages such interaction. This also aligns with the argument of [39], who assert that effective m-learning requires an understanding of the benefits and challenges not only by academics, but also the school management in order to avoid any potential pitfalls.

A critical review of 30 studies in a book series edited by [43] showed that students and academics have been the focus of the majority of m-learning studies. The series examined the impact of m-learning solutions in the Asia-Pacific region. The studies were examined using three levels: pedagogical, technical, and organizational. The pedagogical level involved studies that were concerned with the perception of students and educators and their attitude to m-learning (academics, educators, and lecturers are used interchangeably in our study). The technical level in the book series considered studies that were based on the infrastructure to support m-learning adoption, while studies that focused on policies fell under the umbrella of organizational. A critical review of the book showed that although most of the studies fell into more than one category, the majority were based on students' perspectives. Only a few studies, for example [40,44], reported the opinions of all stakeholders (students, educators, and administrative leadership, including IT managers). Turning attention to Africa, the primacy of the student was also found in a systematic review of 25 m-learning studies, with over 70% of the reports centered on students. No study on the opinions of stakeholders such as institutional management and IT personnel was found [2]. The same trend was observed in m-learning studies from the Middle East, where only students and educators were identified as stakeholders [45–47]. Clearly, if [42] are correct, this is a significant omission in the m-learning literature. As such, this study, while investigating students and educators' attitude to the pedagogy of m-learning, also sets out to explore the opinions of IT personnel and administrative management in regard to the adoption of m-learning. Focusing on a Nigerian university, the specific questions this study aims to answer are:

1. What is the level of awareness and willingness of stakeholders to adopt m-learning?
2. What are the attitudes of students and academics to the prospects of a pedagogical shift from teacher-centered to learner-centered learning if m-learning is adopted?
3. What do stakeholders perceive to be critical success factors for sustainable m-learning?

3. Materials and Methods

3.1. Research Approach

This study used a mixed methods research approach. Useful for this study, mixed methods offers an approach to knowledge construction through theory and practice by considering different "viewpoints, perceptions, positions, and standpoints" [48] (p. 113). Cohen, Manion and Morrison [49] argued that by considering different perspectives, mixed methods research increases the authentication of the data and offers less biased and more accurate conclusions. The authors go on to assert that a strong mixed methods study begins with research questions (RQs) that require a hybrid of quantitative and qualitative data to address the research problem, and thus provide superior findings than either on their own. Furthermore, Teddlie and Tashakkori [50] outlined how collection of the hybrid data can

be categorized into six designs, ranging from a simple sequencing of approaches to a "fully integrated mixed design" that combines both approaches in all stages and levels of the research. This study used the multilevel mixed design, where quantitative and qualitative approaches are used at different levels or for different participants. In this case, the opinion of students was collected using the quantitative approach delivered as a questionnaire, while a qualitative approach using semi-structured interviews was used for all other stakeholders.

3.2. The Case Study and Participants

The research was conducted at the Ibrahim Badamasi Babangida University Lapai, Nigeria (IBBUL) in the second semester of the 2017 academic session. The study had a total of 587 participants, comprising of 566 students and 21 staff members. Stakeholders in the staff category consisted of 14 academics, 4 IT support, and 3 administrative management staff. Students and staff were randomly selected from different departments to allow for diverse representation of various stakeholder groups. The four IT personnel were representatives from each of the four units within the IT office, and the three management staff included one of the Deputy Vice Chancellors, the Director of Academic Planning, and the University ICT Director.

This study received ethical clearance from the University of Notre Dame Australia's Human Research Ethics Committee, and permission was granted by IBBUL to conduct the study at the University.

3.3. Procedure

To create awareness for the research and recruit potential survey respondents, individual classes (with permission from the lecturer) were visited by the researcher prior to distributing the questionnaire. The researcher gave a brief talk about the study, after which only those who indicated interest and willingness to respond to the survey were given the questionnaire. In addition to creating awareness, this approach was also adopted to reduce the potential number of unreturned questionnaires [49]. Participants for the interviews were recruited through direct face-to-face conversation. In line with the ethics approval conditions, participants were given sheets containing information about the research. They were also told verbally that participation in the study was voluntary and they may withdraw at any time without giving reasons for their decision. Returning a completed questionnaire confirmed student consent, while interviewees were required to sign consent forms which also confirmed permission for the interviews to be recorded.

3.4. Data Collection and Analysis

The questionnaire for this study was a paper-based questionnaire which contained both closed- and open-ended questions. The structure was adopted from [51], who conducted a similar study in a British University to investigate students' readiness for m-learning. The closed-ended questions included dichotomous questions, multiple-choice questions, and five-point Likert scale items. A total of 650 questionnaires were distributed and 566 valid responses received, representing an 87% return rate. Given that the questionnaire was paper-based, it was impossible to prevent participants skipping questions. Even so, such questionnaires were not considered invalid because the majority of questions were answered. Therefore, while the total number of valid questionnaires was 566, the number of responses to each question varied slightly. Accordingly, only the valid and cumulative percentages are reported.

The questionnaire was analyzed with SPSS statistics version 24 using descriptive statistics to report the emergent findings. Descriptive statistics were most ideal for this study because of the comparison of the quantitative and qualitative data to communicate the findings. Internal consistency for the questionnaire was measured using Cronbach's alpha reliability analysis, which showed $\alpha = 0.77$ for 11 Likert scale items, indicating that the questionnaire was a reliable instrument [52]. The open-ended questions were analyzed using both thematic analysis and SPSS. The emerging themes

were grouped into categories and coded into SPSS. The interviews were analyzed using NVivo version 11. The recordings were transcribed and imported to NVivo folders created for each of the three stakeholder categories (academics, management, and IT). Nodes were next created for every question in each category, which meant that it was possible to view the responses of all interviewees to the same question. Reading through every question, codes were identified, and emerging themes generated.

4. Results

This section provides insight into the participants' knowledge of and their willingness to adopt m-learning. Only students and academics were asked for a response in regard to a shift in pedagogy. Students were positive about the prospects of student-centered learning, while for academics, the findings suggest that even though they understand the importance of a shift, they also show concerns around the impact on their identity as educators. Findings regarding critical success factors for sustainable m-learning showed strong similarities as well as distinct differences in the opinions of each of the four stakeholder groups.

4.1. Student Demographics

Over 80% of the student participants were between the ages of 18 and 25, and two-thirds were male (n = 381; 67%). There were more respondents from students in their second year, 37%, followed by those in the fourth year at around 32%. The least represented were those in their fifth year (less than 2%). The small number of responses from students in the fifth year is likely because only one faculty in the University (Agriculture) runs five-year courses, while all other faculties run courses of four years duration. A full description of the student demographics is detailed in Table 1.

Table 1. Socio-demographics of student participants.

Items	Categories	Frequency	Valid percent	Cumulative percent
Gender	Male	381	67.3	67.3
	Female	185	32.7	100.0
	Total respondents	566	100.0	
Age	18–21	167	29.8	29.8
	22–25	285	50.8	80.6
	26–30	91	16.2	96.8
	over 30	18	3.2	100.0
	Total responses	561	100.0	
Level	100	102	18.3	18.3
	200	204	36.7	55.0
	300	66	11.9	66.9
	400	176	31.7	98.6
	500	8	1.4	100.0
	Total responses	556	100.0	

4.2. M-Learning Awareness and Willingness for Adoption

In establishing the general level of m-learning awareness amongst all participants and their willingness for adoption, the study also set out to determine if participants had experienced m-learning. The findings, as illustrated in Figure 1 show that approximately half of the student respondents were not aware of m-learning and of those who were, the majority had not engaged in its practice. Despite this, 84% of students reported that they would like m-learning incorporated into their learning.

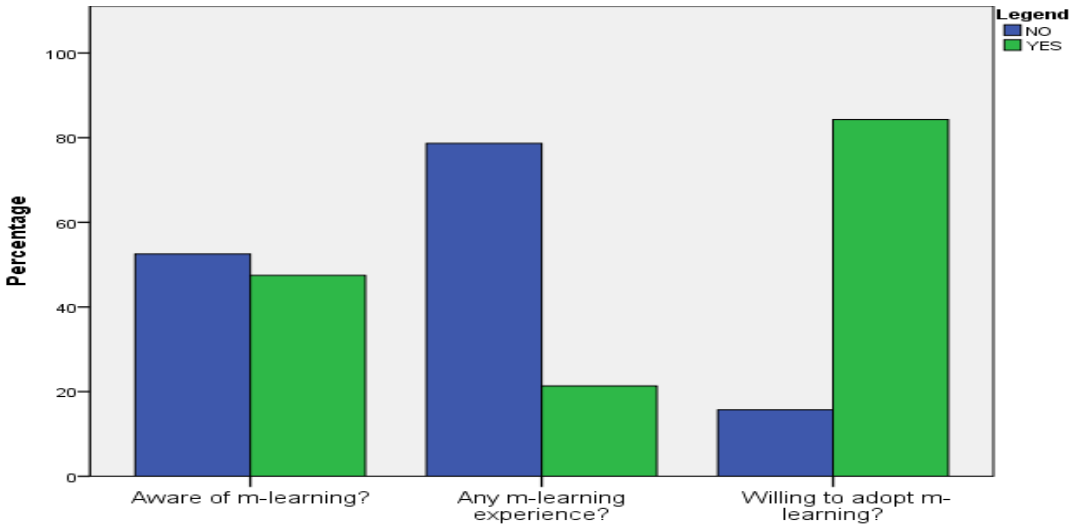

Figure 1. Students awareness of and willingness for m-learning adoption.

In contrast, 19 of the 21 stakeholders (academics, IT personnel, and administrative management) interviewed were aware of m-learning, and most of them had used m-learning platforms as part of their continuing professional learning. With respect to adoption, while the majority showed willingness to embrace m-learning, one academic was in opposition, noting that: "it may not lead to efficient teaching and learning and could make lecturers redundant" (Lecturer A).

In demonstrating willingness for m-learning, two academics told of how they had used the mobile-based social networking platforms WhatsApp and Facebook, hoping to promote learning outside of the classroom. However, they both complained they did not get the expected outcome. According to one of the academics: "it was not very different from the normal class routines, as students did not show interest" (Lecturer B). The lecturer went on to say, "if it was for social interaction, they would be willing to join". The second lecturer complained that: "my challenge is getting students to engage with the technology academically, because despite always being online for social networking they do not contribute to the class group" (Lecturer C). These comments and experiences suggest that students' use of and familiarity with mobile devices may not necessarily spur their interest in m-learning.

4.3. Perceptions Regarding the Possibility of a Pedagogical Shift

4.3.1. The Students' Perspective

As discussed in the literature review, m-learning is consistent with student-centered pedagogies, which include collaborative and independent learning. Using a five-point Likert scale from 1 (strongly agree) to 5 (strongly disagree), students were asked questions regarding their perception of and willingness to engage in collaborative and independent learning. The results, as demonstrated in Figure 2, revealed that over 80% of students showed a positive attitude towards collaborative learning and engaging with their peers both inside and outside of the classroom, and 78% thought m-learning would make them more independent learners. However, when asked about their perception regarding the potential of m-learning to impact on the collaboration between students and lecturers, fewer (60%) agreed that m-learning would lead to an improvement.

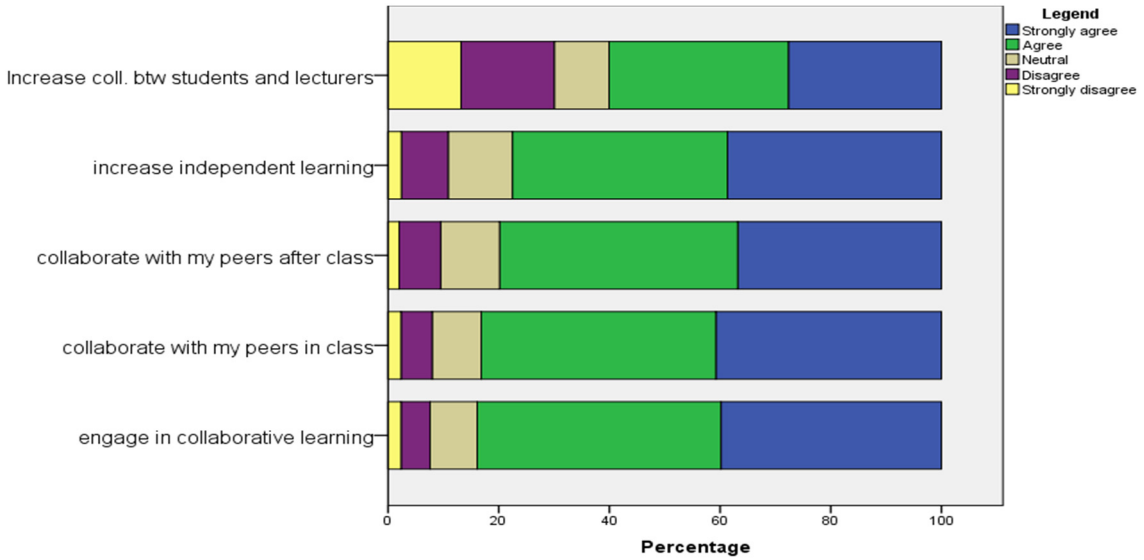

Figure 2. Students' responses to collaborative and independent learning.

Equally important in student-centered pedagogy are the learning needs and desires of students. The literature indicates that m-learning makes learning possible anytime, anywhere, and learners can learn at their own pace [53,54]. Students were asked if they agreed or disagreed with such positing. They were also asked their opinion on the likelihood that they could easily engage in m-learning given their familiarity with using mobile devices, and the impact they think m-learning would have on the learning process and outcome. The findings (Figure 3) show that the majority of students (about 90%) agreed that with m-learning, they can study anytime, anywhere. Over 80% agreed that it would be easy to engage in m-learning and that the learning process would be more engaging if m-learning was blended with the current approach (which is the traditional face-to-face approach with limited use of technology). Regarding the perceived impact of m-learning on study pace and the outcome of learning, nearly 40% did not agree that m-learning would help them study at their own pace, nor have a positive impact on their grades.

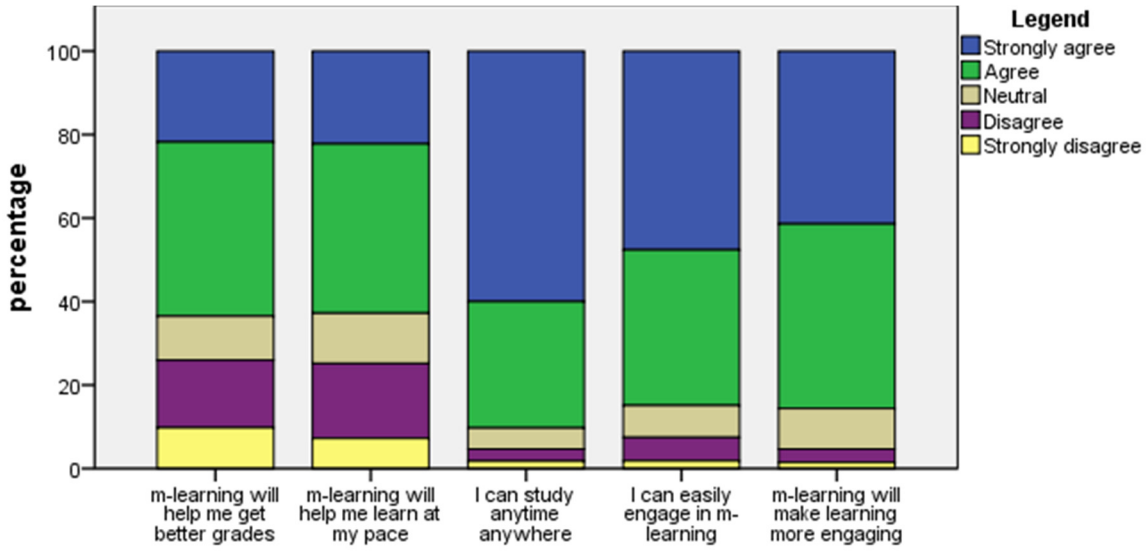

Figure 3. Students' responses to learning needs and desires.

4.3.2. The Academics' Perspective

The possibility of a pedagogical shift from teacher-centered to a learner-centered approach should m-learning be considered yielded very rich insights from academics. Analysis of the interview data from academics led to the emergence of nine clusters and 23 themes forming around the broad categories of benefits and drawbacks to the academics themselves and their students. The benefits to students, as perceived by academics, were related to the learning process and the outcome of learning, while those seen to impact on the academics included increased efficiency and opportunities for professional learning. Perceived drawbacks to students were related to the learning process and cost, while job security, increased workload, and "identity" emerged as disadvantages to academics. The data trail leading to the development of the clusters and thematic categories is unpacked in Table 2.

Table 2. Academics perception of the benefits and drawbacks of a pedagogical shift from a teacher-centered to learner-centered approach if m-learning is adopted.

	Benefits			**Drawbacks**
Students	Learning process	Students' scope will be extended and broadened	Learning process	Distractions to learning
		Improve participation in class		Students may become negligent
				Detrimental to students who do not take initiative
		Make learning faster and easier	Cost	Cost of mobile data
		Increased/improved collaboration with peers		
	Learning outcome	Bring out the best in students		
		Improve learning outcomes		
		Develop independent thinking		
		Prepare students for the future		
Academics	Improve efficiency	Ease workload	Job security	Make academics redundant
		Maximise lecture time		Reduce the number of academics employed
		Manage large classes		
	Professional learning	Encourage/enforce personal development	Increased workload	More work for academics to keep up with "serious" students
		Provide opportunities to learn new teaching and learning practices		Put pressure on academics
			Identity	Academics may lose relevance and respect if unable to answer students' questions
				Academics may lose being "in-charge"

It was not surprising that the thematic analysis uncovered both benefits and drawbacks in relation to a pedagogical shift. The unexpected, however, was the development of clusters showing a disconnect between personal teaching beliefs and m-learning practices. This is played out in the form of positive attitude towards m-learning, while at the same time having a personal concern for "saving face", as demonstrated in the comments below:

> It has both positive and negative implications. For the positive, it helps students to be independent, while for the negative I think it may reduce the respect that students have for the lecturer, because in the kind of society we have a lot of students will respect only if they think you know what you're doing, otherwise you may lose respect. You need to let your students know you're in charge, that you know what you're doing (Lecturer D).

> The advantages of such a system is that the teachers will gain more because they must be up to date with their own learning, because if a student comes to you to ask questions you cannot answer then it becomes a problem. But when you know that the students are prepared for you, as the teacher you will also be more prepared (Lecturer E).

Despite concerns about saving face, most academics still believed they will remain relevant because students rely on them for the subject content. For example, according to Lecturer F, "without me they will not get the note in the first place. This has only eased the work for me, but I am still in charge and relevant". There were a few academics, however, who were especially concerned about their relevance and job security. For instance, Lecturer G said, "If students become independent, it means they will not really need me, and every lecturer wants to remain relevant."

Evaluating the implications of student-centered learning, which requires student autonomy and responsibility, some academics were concerned about the impact such an approach would have on students who rely only on the resources from their lecturers. According to one such academic: "At the university level, you shouldn't spoon feed a student but provide guidance, but unfortunately what happens here is that students are coming here to learn only what you tell them" (Lecturer H). Another academic with similar views said: "there are lazy students who think they must do it the way it was done for them, and in that case, they may not want this openness" (Lecturer I). Some academics were more positive about the students they taught, seeing the benefits not only to students and themselves, but also the impact m-learning would have on managing the amount of content in their subject. According to one such academic:

> We have constraint with time, we have certain number of hours we must meet with our students in a semester. That constraint will be removed if we are using mobile learning because we don't have to wait for that particular period that is given to us before interaction can take place between lecturers and their students (Lecturer J).

4.4. Critical Success Factors for M-Learning Adoption

Critical success factors (CSF) are vital elements for the success of any intervention, and could have positive or negative impacts on the outcome [55]. The attitude to the requisite shift in pedagogy is only a part of the CSF picture. To improve the chances of successful m-learning implementation, the opinions of all four stakeholder groups regarding factors that could promote or hinder m-learning success were collected. The findings for this RQ are presented in three ways: perceived enablers, barriers, and how the reported barriers could be overcome. Students' responses to this RQ were collected via open-ended questions. From the thematic analysis of the responses emerged a total of 18 categories, 9 for perceived enablers, and 9 for barriers, as illustrated in Figures 4 and 5, respectively. As indicated previously, interview data from academics, IT personnel, and administrative management were thematically analyzed. The data trail leading to each of the categories is outlined below.

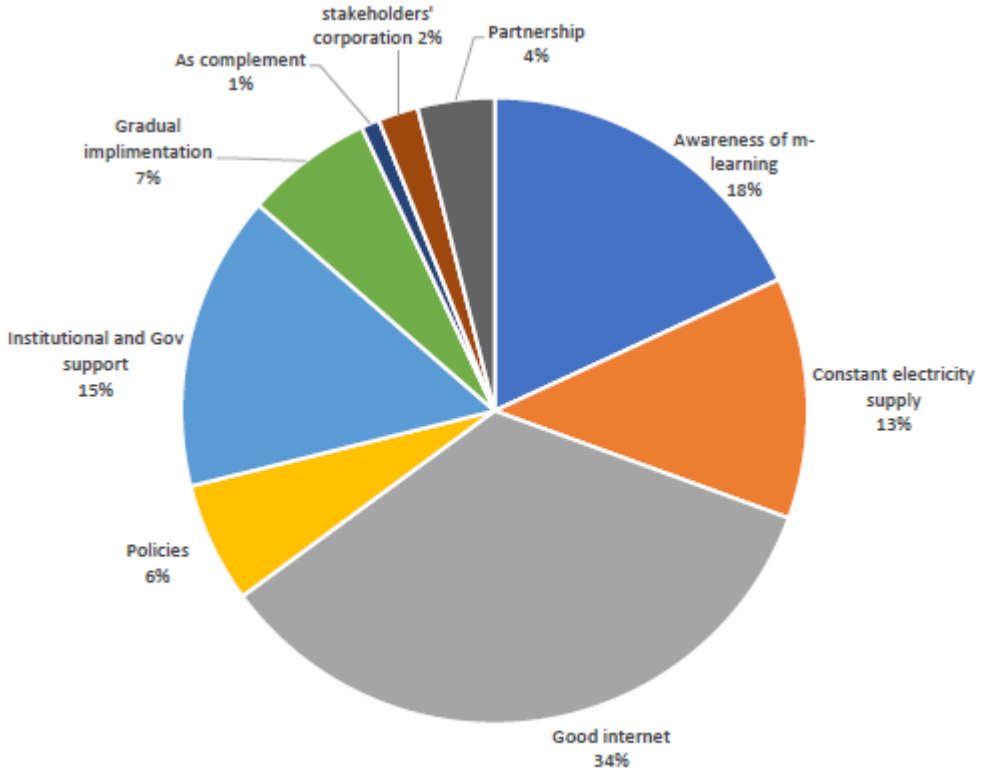

Figure 4. Students' perception of factors that will promote m-learning.

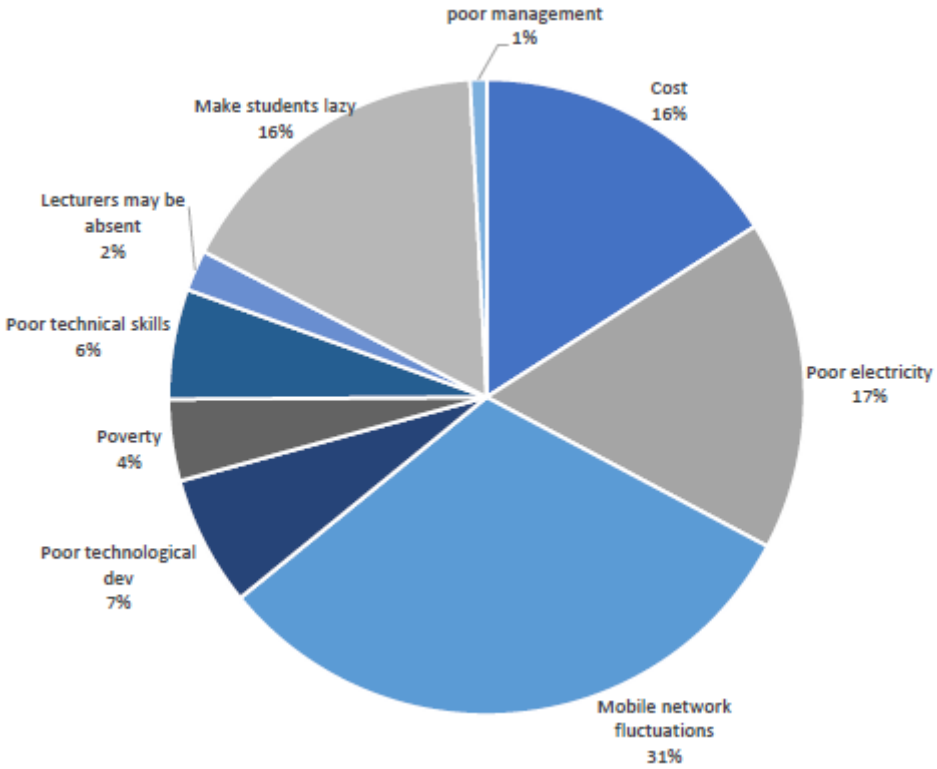

Figure 5. Students' responses to perceived barriers to m-learning.

4.4.1. Perceived Enablers of M-Learning

According to students, the top four factors that would promote m-learning are: availability of strong internet access, awareness of the benefits of m-learning, institutional and government support, and a constant electricity supply (Figure 4). Although all the factors mentioned by students were also found in the responses of the other stakeholder groups, the levels of emphasis were different. For example, the cooperation of all stakeholders, especially "management buy-in", which was one of the least emphasized enablers from the students' perspective, was considered the most critical by the IT group. Interviewees from the IT group appeared to believe that the effective participation of the University's management would bring about policies and workable solutions to manage the infrastructural challenges of the University. They were also of the view that the interest of management would propel academics and students into adopting m-learning. From the perspective of academics, in addition to the provision of basic infrastructure like electricity and internet facilities, they also emphasized the need for professional learning. The opinions of the administrative management group, who, like the other stakeholder groups, not only stressed the need for basic infrastructure, but also appeared to understand the need for academics to be engaged in professional learning. Equally stressed by the management group was the need for the learning content to be engaging and in-line with the curriculum. One of the administrative managers specifically said that for m-learning to be effective, the subject content delivered over mobile devices must be "brief, concise, and straight to the point". The interviewee went on to emphasize that:

> It must be interesting, because our students are very crazy about social media and anything that wants to compete with that interest must be equally interesting and catchy, such that while on it [the m-learning activity] they wouldn't want to leave it, to the point that despite wanting to follow an update on Facebook, for example, they will want to keep going (Interviewee K).

4.4.2. Perceived Barriers to M-Learning

The largest perceived barriers from the perspective of students were mobile network fluctuations, poor electricity supply, the potential that dependence on m-learning could make students lazy, and the cost of mobile data. As was the case with enablers, some of the barriers identified by students (Figure 5) were also emphasized by all other stakeholders, especially those relating to economic, infrastructural, and technological challenges. Despite the similarities in perceived barriers across the stakeholder groups, there were concerns unique to each group. For example, students were the only ones concerned that m-learning may lead to academics absenting themselves from class. The IT group were especially concerned that academics could be resistant to change, and similarly, reluctant to accept technology enhanced learning. Concerns shared amongst academics and the administrative leaders were that students might be distracted and would use their mobile devices for activities other than learning. Interestingly, while many respondents believed the cost of mobile data would be a problem, a minority argued that cost was not a barrier, with Interviewee L from the management group noting that "if it [instructional video, for example] will be running for only 15 mins... Personally, I think cost is not much of an issue, if you get everything right the cost will be manageable."

4.4.3. Overcoming the Barriers of M-Learning

Participants shared their views on how they thought barriers may be managed or overcome. Most of the solutions proffered by each stakeholder group were centered on the need for the Nigerian government to address the economic and infrastructural challenges in the country, especially the adequate provision of electricity and increased funding to universities. Some interviewees noted that offline m-learning solutions should be considered, given the limited availability of internet facilities on campus and the fluctuations of mobile networks. In places with poor mobile network reception and very poor or non-existent internet broadband, it was argued that the University community should consider liaising with mobile service providers to have a telecommunications mast or base station on or around the University campus to boost the quality of service. Lecturer M argued that such alliances may be a way for telecommunications companies to "carry out their corporate social responsibilities and give back to the community". Additionally, many respondents believed that partnerships with phone manufacturing companies and mobile service providers would promote the ownership of appropriate devices by all students at subsidized rates and reduce the cost of mobile data.

While the reluctance of academics to change was identified as a barrier by the IT group, they also identified a requisite solution. They posited that the University management would need to develop policies that would enforce compliance with adopting m-learning. That is, they believed that for m-learning to be successful, a university-wide strategy was required. According to one of the IT group interviewees: "policy can take care of the problem of commitment because in this country people practically have to be made to do things" (Interviewee N). Similarly, Interviewee O said: "if we don't enforce compliance in terms of usage the adoption is going to take time". Both interviewees went on to suggest that there should be incentives for academics who comply, and sanctions for those who do not. From the administrative management group, one of the stakeholders suggested that the resistance to adoption can be managed through gradual implementation following a "sensitization" program. With regard to students being distracted and engaging in non-academic activities, suggestions were geared towards having regulations to curtail individual behaviors to improve the learning process, when and where it is possible to assert control. For example, one suggestion was that in class or electronic discussion groups, anyone deviating from a focus on learning should be reprimanded.

5. Discussion

The significant gap in students' awareness of m-learning compared to the other stakeholders may be attributed to the limited number of m-learning opportunities in higher education in Nigeria [2]. Despite the relatively low level of awareness from the student cohort, the majority reported that they would like m-learning incorporated into their studies. However, the reported willingness by students needs to be read with caution. The poor experiences of the academics who had tried mobile-based social media platforms to promote learning outside of the classroom suggest that although students are actively engaged with social media, they may not necessarily transfer the same energy to learning with mobile devices. While this requires further investigation, it suggests that if m-learning is to be successful, the design of content needs to account for how students engage with their mobile devices and social media. It also suggests the potential significance of designing learning materials that keep students motivated while engaged with their mobile devices for academic activities. This follows the argument of [56,57], that given the popularity of social media, higher education administration, faculty, and IT staff should embrace these platforms and design learning opportunities that maximize student engagement. Furthermore, [58] noted that social media platforms are valuable tools within the constructivist model. Several studies, e.g., [59–61], have shown how the integration of social media to facilitate teaching and learning in higher education in developing countries has added value to traditional delivery methods, facilitating enhanced outcomes. The study by [62], while highlighting advantages such as increased interest in taking online courses, improved communication skills, and reduced dropout rates, also reported on ethical concerns, and how excessive use might result in isolation in real life, and other health-related issues, such as stress, anxiety, and depression. To find the

right balance, educational technology specialists suggest that it is necessary for institutions to have social media strategies and policies, to guide effective use and beneficial outcomes, while mitigating potential risks to students and educators [63].

Underpinning m-learning is student-centered pedagogy. The findings of this study regarding the perception of students and academics on the possibility of a pedagogical shift suggest a readiness from students and academics to engage in the necessary pedagogical requirement for m-learning. However, again, caution in accepting this at face value is advised given that despite enumerating the benefits of m-learning, academics also seemed to be concerned about the subsequent impact on their reputation, and the need to keep control. According to a report from the Teaching Excellence in Adult Literacy (TEAL), the concerns expressed by academics is not uncommon, "because despite the benefits of student-centered learning, relinquishing control of the classroom can be intimidating" [64] (p. 3). These findings are comparable with the work of [23], who found attitude and fear of change of academics as one of the barriers to m-learning in Nigeria. These concerns make sense, given the didactic approach of the Nigerian educational system, even at the level of university education [26]. Additionally, the culture is one where lecturers are highly regarded and seen as respected authorities, whom students do not question [28]. Such values may also be responsible for some of the negative responses from a small number of students who, while reporting that peer collaboration was possible, did not believe it was possible to collaborate with academics.

The fascinating finding from the student cohort that m-learning would promote laziness also reflects the current Nigerian sociocultural and learning context. Presumably, students think that even though m-learning could make them more independent learners and improve the opportunities for collaborative learning, they still desire the active involvement of their lecturers. This finding corresponds with that of [65], who investigated students' perceptions of learner-centered collaborative m-learning in a Chinese university. It was reported that while the majority of students had positive attitudes, they also expressed the need for more intervention from their lecturer. In a related study from Mozambique, students also expressed the need for more support [66]. The authors argued further that the culture of power distance between students and educators in developing countries requires a philosophical shift that increases students' confidence to take more responsibility for their own learning. This is in line with the TEAL report [64], which emphasized the need for reciprocal interaction and gradual progression to alleviate anxiety and help students and academics get accustomed with the practices of student-centered learning. These arguments suggest that while pedagogically sound m-learning, and indeed the student-centered pedagogy, is not impossible to implement in learning environments where such practices are limited, it needs to be done in a way that is sensitive to the context.

In response to the third RQ, the findings provide useful insights into factors that could promote or hinder m-learning from the perspectives of potential users. Importantly, it found that the four stakeholder groups have shared and unique responsibilities in making m-learning a successful learning and teaching strategy. The emphasis from the IT group that "management buy-in" is a key enabler for successful m-learning parallels the argument of [42], who posited that the influence of management in establishing productive relationships between the IT department and faculty is vital for a positive outcome of technology-enhanced learning in higher education. Such a strategy includes opportunities for the professional development of academics on how best to integrate m-learning into existing practices to meet the changing needs of students, while avoiding pedagogical pitfalls [67,68]. It also includes the involvement of academics in related institutional projects [69], and the need for IT professionals and academics to collaborate in the design of new instructional delivery modes [42,70]. Another potential hurdle that may be minimized if the strong view of the IT group is correct is that policy to drive compliance is necessary. This has also been recognized by other researchers [71,72]. Furthermore, according to the IT personnel in this study, the adoption of m-learning would be less challenging in comparison to other technologies, because mobile devices and subscriptions for mobile data bundles are more affordable and readily available than computers and broadband internet. This is corroborated by studies that have identified the widespread ownership of mobile devices suited for learning as a motivating factor for m-learning in developing countries [73–75]. Finally, as noted by some interviewees of this study and argued by [53], given the infrastructural challenges of developing countries, governments should develop policies that would make telecommunication companies channel their corporate social responsibilities into providing avenues for m-learning. Building on these findings, the next section outlines perceived roles and responsibilities of stakeholders for sustainable m-learning.

6. M-Learning Stakeholders' Responsibility Table

As indicated by the findings of this study, sustainable m-learning does not depend on students and educators alone, rather it requires the involvement and cooperation of a number of stakeholders. While this study considered the views of internal stakeholders, it was also able, through the responses of this group, to determine the role of external stakeholders, particularly the Government, mobile service providers, and mobile phone manufacturers, in the provision of m-learning. Such suggestions demonstrate that external stakeholders have a significant role, probably more so, in the context of developing countries, due to economic and infrastructural limitations. Reflecting on these findings and ensuring that the right stakeholders are not only at the m-learning table, but that they know what to do and when, led to the creation of a proposed strategy table (see Table 3). The table provides a blueprint which has otherwise been missing, to guide sustainable m-learning adoption and implementation not only in higher education in developing countries, but which may have more global appeal. The table outlines two phases: planning and implementation. These phases are further subdivided into activities identified as essential to the success of each phase, along with the subsequent roles and responsibilities of each stakeholder group. The expected outcomes from each activity are also identified. By establishing the roles and responsibilities of each stakeholder group at different stages of implementation, as well as the expected outcomes of each activity, the table provides an avenue for checks and balances before, during, and after an m-learning intervention. In addition to the findings of this study, a wide reading of the literature and personal insights of the authors working in this space also informed the creation of the blueprint.

Table 3. A blueprint to guide sustainable m-learning adoption and implementation.

Activities	Stakeholders' Roles and Responsibilities	Expected Outcomes
	Planning Phase	
Awareness raising	Academics 1. Promote awareness and the value of m-learning Administrative leaders 1. Recognise the importance of m-learning 2. Communicate to all relevant stakeholders the educational potentials of mobile technology and encourage adoption Government 1. Provide an enabling environment for awareness raising and encourage adoption	Stakeholders are aware of the scope and value, and have realistic expectations of m-learning
Capacity building	Students 1. Have positive attitude to independent learning and reflective practices 2. Take responsibility for own study as required for m-learning Academics 1. Have positive attitude and willingness to commit to new pedagogies required for m-learning 2. Collaborate with management to ensure appropriate resources for embarking on m-learning are in place 3. Collaborate with the IT team to develop the relevant skills to deliver m-learning IT personnel 1. Collaborate with academics and management to develop strategy for delivering m-learning 2. Provide technical advice to academics and management to ensure there is access to appropriate infrastructure 3. Provide relevant training to ensure academics and students have the requisite skills Administrative management 1. Provide appropriate and sufficient infrastructure for m-learning 2. Liaise with government and facilitate partnerships with relevant bodies to provide resources/services that can promote and enrich m-learning 3. Encourage and promote productive relationships between IT personnel and academics to facilitate pedagogical and technological change 4. Promote the safe, responsible, and ethical use of mobile technologies for learning Mobile service providers 1. Work with educational institutions to provide more bandwidth and subsidise the cost of mobile data plans for students 2. Consider having telecoms mast or base station around educational institutions with poor mobile networks and limited internet facilities to improve signal strength for seamless m-learning Mobile phone manufacturers 1. Work with educational institutions to produce devices that meet specific demands that may facilitate m-learning, e.g., longer battery life to accommodate shortage of electricity supply 2. Partner with educational institutions to subsidise cost of devices suitable for m-learning to make university-wide m-learning implementation possible Government 1. Improve economic situation of the country 2. Provide sufficient power supply 3. Increase funding to higher education 4. Provide adequate and reliable ICT infrastructure 5. Actively promote the value of technology enhanced learning and teaching in higher education 6. Provide enabling environment for ICT service providers to thrive 7. Promote the safe, responsible, and ethical use of mobile technologies in education	Practical strategies such as modalities for professional learning for staff, and support for students to allow effective engagement in m-learning A group/body with representation from all stakeholder groups for seamless flow of information is established

Table 3. *Cont.*

Activities	Stakeholders' Roles and Responsibilities	Expected Outcomes
Pedagogical design	Academics 1. Consider the principles of student-lefted learning in the design and delivery of m-learning 2. Design m-learning to be brief, concise, and interesting to keep students motivated 3. Make students co-creators of knowledge rather than consumers alone 4. Seek the preference of students on how content should be delivered (video, audio, text, etc.) IT Personnel 1. Work with academics in the design and delivery of content suitable for m-learning Administrative management 1. Encourage gradual implementation and delivery of m-learning, e.g., as a blended approach to complement existing practices to allow for acculturation 2. Encourage adherence by academics to m-learning curriculum design that leads to equitable learning opportunities across the institution Government 1. Enable reforms through relevant agencies that ensure 21st century learning and teaching practice	Decision on how m-learning will be implemented—as a standalone or blended approach Decision on choice of delivery medium—online or offline Identification of appropriate strategies, m-learning activities, and evaluation techniques to achieve desired outcomes
Policy building	Academics 1. Put in place expectations that regulate students' behaviour in class and discussion groups to prevent activities that interrupt learning Administrative management 1. Put in place policies and standards for m-learning implementation for students and staff Government 1. Put in place nationwide policies through relevant agencies to regulate adoption, encourage ethical and responsible use, as well as sustainability of mobile technologies in education	Strategy on how compliance to policies, established rules, and regulations will be achieved
	Implementation Phase	
Execution and commitment	Students 1. Take responsibility and be actively engaged in personal (independent) learning 2. Be actively engaged in collaborative learning opportunities with peers that m-learning provides 3. Collaborate and communicate with academics 4. Abide by expectations for behaviour to optimise engagement in m-learning Academics 1. Motivate and encourage students to engage in collaboration with peers and academics that m-learning provides 2. Ensure m-learning opportunities meet institutional standards to provide equitable learning opportunities across the institution 3. Comply with institutional policies to ensure equitable learning opportunities across the institution IT personnel 1. Provide technical support to students and academics to allow for full engagement in m-learning 2. Provide relevant training for seamless m-learning experience 3. Provide ongoing technical advice to academics and management regarding appropriate infrastructure 4. Collaborate with academics on joint research and development projects on m-learning 5. Where necessary, work with mobile service providers to improve the quality of service for effective m-learning experience Administrative management 1. Enforce adherence to policies and standards through reward and sanction to ensure equitable learning opportunities across the institution as a commitment to innovation Mobile service providers 1. Provide dedicated user support lefts for effective m-learning experience Mobile phone manufacturers 1. Provide dedicated support and troubleshooting expertise, especially if a device type is used in cases of university-wide implementation Government 1. Provide lasting solutions to social, economic, infrastructural, and technological challenges that allow the educational divide to be bridged 2. Enable reforms through relevant agencies that ensure 21st century learning and teaching practice 3. Provide grants and support to financially disadvantaged students to ensure equitable educational experiences	Active participation of stakeholders Documentation of the experience (positive or negative) from each stakeholder group

Table 3. *Cont.*

Activities	Stakeholders' Roles and Responsibilities	Expected Outcomes
Review, evaluation and continuous monitoring	Students 1. Give feedback on the effectiveness or concerns regarding m-learning Academics 1. Work in partnership with students to address their feedback 2. Provide feedback from students to appropriate bodies/representatives 3. Share experiences with other academics to encourage and improve m-learning adoption/experience and find solutions to common problems 4. Document and disseminate m-learning experiences and research findings widely to encourage and improve m-learning adoption Administrative management 1. Provide on-going support and opportunities for continuing professional learning to academics and IT personnel for effective integration of m-learning 2. Put in place a framework for on-going regular review and evaluation of m-learning 3. Provide regular progress reports on the state of m-learning to all stakeholder groups involved 4. Encourage academics and the IT team to document and disseminate m-learning experiences/research findings widely to encourage and improve m-learning adoption Government 1. Setup a monitoring body/agency to review and evaluate progress periodically.	Document strategies for continuous improvement

7. Conclusions

The findings of this exploratory study show that m-learning is a practical reality in higher education in Nigeria. Despite a lack of awareness from many of the student participants, there is a strong willingness for adoption amongst all stakeholders. An unanticipated outcome was that although the study set out to understand the perception of internal stakeholders, the findings suggest that if m-learning is to be sustainable in developing countries like Nigeria, it is also important to engage external stakeholders. As reflected in the strategy table, each stakeholder group has important roles to play for the overall success of m-learning. Future studies should test the validity of the blueprint, determining the degree or extent to which expected outcomes were either achieved or not, and reasons for success or failure. The voices of external stakeholders in such testing are also likely to provide new insights and valuable contributions to the blueprint presented in this paper and the m-learning literature more widely.

The potential adoption of m-learning in Nigeria is strengthened by the practical suggestions from participants. That their suggestions are possible to implement can be predicated on the success of other sectors of the Nigerian economy which also face the same social, economic, infrastructural, and technological challenges. M-banking, for example, which despite high levels of initial skepticism is on the increase due to the flexibility, ease, and convenience it offers [76–79]. However, unlike banking, m-learning faces the challenge of overcoming deeply-rooted cultural traditions where educators are revered and intellectual interchanges between lecturers and students are not encouraged. A change in strategy where the merits of m-learning are gradually introduced by blending it with traditional teaching and learning practice is one strong possibility. As such, future studies would do well to focus on how m-learning strategies using text, audio, and/or video could be incorporated in practice.

Author Contributions: S.O.-U. conceptualized the idea, conducted the research, analyzed the findings and wrote the article. K.A. and A.I. offered advice during these phases, reviewed the drafts and offered suggestions for improvements. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Acknowledgments: The first author thankfully acknowledges the support of the Australian Government Research Training Program Scholarship. Thanks also to the study participants for their time, and David Baxter whose valuable comments helped to improve the initial draft.

Conflicts of Interest: The authors declare no conflict of interest.

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