

BAM 2023 CONFERENCE

US
UNIVERSITY
OF SUSSEX

**BUSINESS
SCHOOL**

Challenging Institutional Norms and Organizational Lack of Support: An Empirical Study on Academics' Unsanctioned Use of Mobile Technologies for Classroom Augmentation in Higher Education

Nyeneime Ibokessien

University of Westminster

Farjam Eshraghian

University of Westminster

Title: Challenging Institutional Norms and Organisational Lack of Support: An Empirical Study on Academics' Unsanctioned Use of Mobile Technologies for Classroom Augmentation in Higher Education

Authors:

Nyeneime Ibokessien (N.Ibokessien4@westminster.ac.uk)

Dr. Farjam Eshraghian (f.eshraghian@westminster.ac.uk)

Abstract:

The study examines how mobile technologies are used in teaching practices in higher education, particularly in Nigerian universities. The study highlights that despite the proliferation of mobile technologies and deployment, evidence from the literature suggests integration is lacking, leading to misuse, abandonment or use without institutional support or knowledge. Applying Affordances and sensemaking theories, the study reveals academics' perceptions of mobile technologies for teaching practice augmentation. Preliminary findings from forty interviews conducted with three University departments indicate a preference for synchronous social messaging applications due to their adaptability to particular tasks and quick availability. Using the abduction method also reveals that the lecturers are passively deconstructing traditional digital lectures and seeking quality social interactions within the subject matter.

Word count: 7,313

1 Introduction: Mobile Technology use

Mobile technology use in developing countries' higher education is still experimental and pedagogically limited (Kaliisa et al., 2019). Despite these issues, higher education in developing countries can be hubs for entrepreneurial activities (Fischer et al., 2019), mainstreaming sustainable developmental goals in solving real-world challenges (Useh, 2021). Nevertheless, students increasingly rely on their mobile devices as tools for study, assistance, and computer-supported collaborative activities in higher education (Bernacki et al., 2020). They are encouraged to think creatively, solve problems methodically, and critique logically (Al-Rahmi et al., 2022) using the capabilities of constantly connected technologies.

These capabilities have enabled a bypass of conventional fixed technologies for mobility and quick and easy accessibility of content. As a result of the rapid pace of technology development, lecturers now have the responsibility of creating a classroom setting that helps students acquire transferable skills and simulates real-world scenarios (Al-Rahmi et al., 2022). One of the capabilities of mobile technologies is assisted augmentation, meaning technology is used to its maximum potential by creating new human-computer interfaces that seem like natural extensions of our body, mind, and behaviour (Nanayakkara, 2021). In the classroom, assistive augmentation exists in the form of projectors that display information on a board. For example, Shardlow et al.'s (2022) research provide novel insight into collaboration augmentation and simplification of text (CoAST), a web-based tool created to help university students interact with conceptually complex academic text. The CoAST flags words that may be challenging for readers of varying skill levels, allowing instructors to provide brief annotations of these words to their students. Academics and students already have powerful devices in their collective pockets, which are considered disruptive because they replace, if not wholly, desktops and laptops as primary devices (Said and Adham, 2016). The capabilities of these mobile technologies, such as touchscreen displays, tracking and AI-enhanced camera systems and data collection, can augment lecturing and learning activities. However, despite the potent nature of these mobile technologies, integration with academia is still limited.

1.1 The Problem, gap and Significance

There has been much discussion on the efficacy of mobile technology for students in their studies, despite its long-standing reputation as a "favourable innovation" (Lin et al., 2021) that is meant to close the "learning divide" between students in different geographic areas, including developing countries. According to Kaliisa et al., (2019) country backgrounds, such as socioeconomic activities and culture, can influence mobile technology use. The efficacy of mobile technology for academics or lecturers can also be questioned. For instance, despite the proliferation of mobile technologies in higher education in developing nations, it has been noticed that the technology is not being utilised to its full potential in teaching and learning (Alaba et al., 2022).

The following studies show that proper integration of mobile learning technologies is lacking and hinders the transformation of teaching and learning, even after post-adoption. Without proper integration, technology use drops or is discarded. These are the findings in no particular order: (1) In the Nigerian education sector, when applying adoption phases of emerging, implementing, infusing and transformation, studies found that 90% of schools are in the emerging phase, 7% are in the application phase, 3% are in the infusion and transformation phases (Eze et al., 2013). (2) Kirkwood and Price's (2013) comparative study findings found no significant difference between the effects of various technologies used for teaching. According to Kirkwood and Price (2013), there is a focus on the wrong variables, such as instructional delivery modes rather than learner engagement, feedback, and alignment of

objectives with assessment. This means that the technological potential is not advanced, thereby illustrating that it is about "doing things better" rather than "doing better things" (Kirkwood and Price, 2013). As a result, comparative studies are ineffective for exploring the effects of technology on learning transformation (Kirkwood and Price, 2013). (3) In a recent study by Nwagwu (2020), Lecturers from the University of Ibadan expressed their views that e-learning is an add-on and cannot integrate e-learning into their current tasks because they lack time. (4) Cochrane (2012) used critical success factors identified in 35 mLearning projects to determine that there was no significant difference in pedagogical results due to attempts to shoehorn old pedagogies into innovative technologies. The initial foray into implementing m-learning projects within a new education environment concluded that the participants had a significant learning curve that resulted in failure or did not demonstrate a significant pedagogical difference. (5) The systematic review of mobile learning literature in Africa by Kaliisa and Picard (2017) suggests future studies examine existing mobile learning and other frameworks linked to education technology, which could tackle issues and accurately guide adequate policies to guide effective mobile learning practises in higher education institutions. (6) France et al. (2021) recognise the importance of creative/innovative teaching and learning and a shift from conventional perspectives. There has been some research on students' experiences with mobile devices, but the efficacy has been minimal. The real gap is from the instructor's viewpoint regarding some best practice standards or materials. So why are mobile devices being used, and why is there a need for agreement on the most appropriate approach for course design and evaluation? (6) Finally, Lumor (2019) claims that 70% of I.T. investments are unsuccessful, and those that survive post-implementation face acceptance and usage issues. In addition, Lumor (2019) claims that some I.T. is discarded, misused, or underutilised and undergoes performance dips after implementation.

Technology implementation is attractive; however, those sensitive to user perceptions tend to be the most successful applications (Terras and Ramsay, 2012). Universities now have mobile devices' computing power that can turn any space into potential flexible, wireless computing learning (France et al., 2021). These studies span eight years, and all came to the same conclusion or theme of indifference to enhancing learning. Granted, these are just a few studies that have been investigated, but it shows a pattern. Therefore, this thesis approaches the problem differently, not only about filling research gaps; it is about explaining, understanding, and articulating interactions that prevent academics from using mobile educational technologies to transform teaching and learning effectively.

This study aims to contribute to our understanding of how **academics** in Nigerian higher education institutions are deploying mobile technologies in the Management Science, Engineering and Medicine departments while instructing students and its overall impact on higher education by assessing the level of preparedness of lecturers. Mobile technology use in some cases, such as the MalMath application in a Moscow State Medicinal University, can be successful. However, other evidence from Zhang and Yu (2022) states that mobile pedagogy has innovated teaching methods but has not touched the educational system and that teachers or lecturers are overlooked in assessing mobile pedagogy. Furthermore, according to McCarthy et al. (2021), evidence suggests that dropout rates for open elearning platforms are as high as 97%. The findings of this research may help inform policymakers and governments on how best to implement mobile technologies in lecturing and learning and show where the attention is diverted to. It also contributes to digital education literature and affordance actualisation in education literature.

1.2 Objective of this study

This study aims to understand the interplay of lecturers and technological elements that have led to how mobile technology is used.

The research objectives are to explore mobile learning technology use in higher education from **academic perspectives**. This indicates how academics interact and use mobile learning technology in higher education. In addition, to identify perceptions and challenges in using mobile learning technologies.

1.3 Research questions:

The following research question has been developed to achieve the objective of this study:

- How do certain mobile technology characteristics influence how academics use them?
- How do the challenges and limitations identified in the studies impact the successful integration of mobile learning technologies in higher education?

2 Literature Review

2.1 Introduction

There is an acknowledgement that digital learning provides teaching and learning experiences that include immersion, mobility, blended learning, adaptive, collaborative, and environmentally distributed environments. This has transformed the higher education landscape, including digitisation, decentralisation, and massification of universities. Sometimes, mediation between students and teachers is carried out through digital environments (Shardlow et al., 2022).

Due to mobile technology's features, designing responsive learning management systems encourages students to perform their day-to-day learning tasks using mobile technologies. Everyday learning tasks can differ from a student to a lecturer or from a student to another student. This scenario fits the mismatch between what technology offers and how different lecturers and students use it, and, in a classroom, there should be unison of use because of the goal of learning. Furthermore, mobile technologies can be used for other types of learning, such as a language learning tool that offers a straightforward and cost-effective approach to developing listening, speaking, writing, and reading skills, vocabulary, and grammar (Almofadi, 2021).

These identified environments are embedded with artificial intelligence (A.I.) and intelligent learning environmental technologies. Therefore, even if some of these abovementioned scenarios are not advanced, it still assists in different environments. Nevertheless, the perception of the affordances of mobile technologies by lecturers, no matter how advanced or mundane, is essential for actualisation.

Mobile technologies in the context of use in higher education are defined in this study as goal actualisations using specific apps that provide synchronous social parallel and serialised content interactions that are personalised, providing outcomes such as threaded lecturing, threaded learning, and logging. Firmly planting this definition will conjure up some critique about the social aspect of digital lectures, which this narrative will explain.

2.2 Theoretical concepts

In this section, to understand the relationship between technologies (mobile) and users (academics) in an institutional setting, Gibson's (1978) ecological psychology's affordances concept and sensemaking are used as primary theories with social shaping of technology (SST), integrated into this research. This process is called theoretical integration, which is the concept of incorporating ideas from different theories. Urquhart et al. (2010) state that theoretical integration means relating the theory to other theories in the same or similar fields. This is the depth this research is exploring in getting to the goal of understanding mobile technology use in higher education.

2.2.1 Affordances

Two distinct ideas regarding Affordance from Gibson (1979) and Norman (1988) exist. Gibson's definition is about the object's fundamental characteristics to the user, utility, while Norman emphasises how an object is perceived, meaning usability and not just utility (Bower, 2008). For example, mobile technology applications may accomplish planning and coordinating synchronous and asynchronous learning activities in and out of the classroom. Mobile technology features make it possible to provide homework outside of class and address students' unique concerns during and after lessons (Xiangming and Song, 2018). The perception is that It allows for a sense of belonging and trust among learners. For lecturers, affordance perception and actualisation are necessary for how lectures are delivered, assessed, and provided feedback. For the institution, it provides data for overall academic performance and learning behaviours.

2.2.2 Sensemaking

Bansler and Havn (2006) state that when colleagues have discussions, power relations, public discourse, and institutionalised behaviour and thinking, this constitutes sensemaking. Furthermore, various technologies influence sensemaking when introduced into an organisation (Jorgen Sandberg and Tsoukas, 2015). Sensemaking in organisations can be discrete, occurring among people, where intersubjective meaning is formed when a person argues for a specific point of view and seeks to influence others' thinking (Tan et al., 2020). This point of view of point can be about mobile technologies used. Sensegiving is the primary influencing mechanism where there are attempts by individuals or groups of stakeholders to influence the way others think or act. The influenced individuals are not passive recipients of meaning but can engage in or enact sensedemanding or sensebreaking. Sensedemanding refers to proactive efforts made by a person or group of stakeholders to reduce uncertainty and enhance the quality of information available for decision-making. Sensebreaking refers to attempts by persons or stakeholders to challenge others' established understandings and instil new ways of thinking or doing. However, in collaborative sensemaking, intersubjective meaning is co-constructed when individuals participate in reciprocal engagement and jointly build shared knowledge of a problem (Tan et al., 2020). Sensemaking does not occur in isolation, but many factors implicate the sensemaking situation (Jorgen Sandberg and Tsoukas, 2015). Jorgen Sandberg and Tsoukas (2015) suggest that endless factors could influence sensemaking, but the main elements are context, language, identity, cognitive frameworks, emotion, politics, and technology.

2.2.3 Social Shaping of Technology

According to Al Lily, and Abdulrahman E. A. (2013), technological structures are depicted as results of the sensemaking process, a distinguishing characteristic of humans above other species. Al Lily, Abdulrahman E. A. (2013) also states that education institutions where technology is positioned are equally social and political. Technology and organisational relationships cannot be treated as separate categories as the social setting shapes the technology and vice versa. This is demonstrated in the empirical context later in this paper. When technologies are implemented, they react back to their environment and generate new environments. Social shaping results from affordance actualisation brought about by continuous organisational sensemaking.

2.2.4 Rationale for Concepts

Organisational sensemaking is crucial to how mobile technology is used. Sensemaking could be the central concept in this paper because of its premise that discussing with colleagues can be central to decision-making. In an institution of learning, there is sensemaking between instructors and learners when technology is introduced for collaboration, assignments, lectures and feedback. Sensemaking occurs when lecturers decide what technology to use and, if it is cloud-based or not, if it supports certain features; then, with this knowledge, it is shaped into generating new environments. Other combinations of theories did not provide this insight. The actualisation of affordances can be triggered by individual or group sensemaking: In the institutional setting, this could mean many things. For example, in academia, when students discuss what social networking app to use in communication or when management decides what video conferencing app to deploy in the institution. Sensemaking is why specific affordances are chosen and shaped and the generation of new environments. Affordances shift focus to particular material objects that pose real possibilities for action and are internally processed. There are echoes of constructivism, where it is argued that humans are not bound by the design constraints of material objects and can appropriate technology as they see fit (Robey et al., 2013). There has to be an explanation for how they are appropriating technology. There are enablers on both sides and cognitive play involved. Technology can be appropriated through perceived affordance, as Norman (1988) defined affordance. This is important in many ways, as this paper presents.

2.3 Relevant Findings from Literature

The above theories enable explanation and insight by analysing relevant literature. The first step is to scrutinise literature on the use of mobile technologies, which presents a logical step in the evolution of this paper in understanding mobile technology use in higher education. This is a step towards creating a preliminary framework for developing questions to ask academics in the empirical context using the theories.

2.3.1 Analysis: Insights from the Literature

Two studies are analysed to gain insights from their findings. The first is Mercader and Gairin (2021), an excellent example of mobile technology use in higher education from the perspective of academic staff, which shows that teaching staff do not use digital technology to

enhance their teaching methods at the university level. The second is findings from Boulton (2019). Boulton's (2019) study articulates that with the growth of diverse cultures enrolling in educational programmes, it is necessary to create an evidence-based practice using technology as part of the learning program.

In analysing the finding, the appropriation of technology, an integral part of social shaping, is lacking in both cases because of technological skills and lack of strategy by the institution leading to a slow shaping of the technology because Mackay and Gillespie (1992) argued that there could be less scope or fewer choices for the variety of forms of appropriation at work compared to personal domestic use. Another problem could be the interaction of technology with software. How open or close is the technology? Can it only perform one function or many functions?

In the Mercader and Gairin (2021) case, it is focused on and by extracted cues property of sensemaking, where the lecturer focuses on specific elements and ignores entirely others to support their interpretation of an event. In this research, there is a disruption of sensemaking in the institution because lecturers are attempting to make sense of the encountered circumstance and are sensedemanding by proactively trying to minimise ambiguity, which improves the quality of information for decision-making. Science and technology teachers face fewer barriers than teachers in the arts and humanities. There are reasons for this: (1) Technology use in higher education is shaped by the social, political, economic, and cultural environment in which it exists (Humphreys, 2005). In an online article published by Harris (2021), it is stated that the U.K. government has approved a 50% funding cut for arts and design courses and redirected towards STEM projects instead. This feeds into this study of more frequent barriers for arts and humanities lecturers. Fox (2021), in a CNBC article, listed the top courses with the most return on investment, including unemployment rates, compared to the least return on investment. Architectural engineering had a median annual income of \$90,000 with an unemployment rate of 1.3%. At the bottom of the list were Miscellaneous Fine Arts and Visual and Performing Arts, with \$38,000, an unemployment rate of 5.6% and \$35,500, an unemployment rate of 3.6%.

Hong Kong students in Boulton's (2019) case had significant sensemaking crises, making technology shaping challenging. Understanding social context is essential for technology to be understood. In this study, the social groups are the students; however, based on restructuring the learning room resources, students were directly taken to private spaces using a new widget. Thus, there is a relevant social group space, and a personal space also allows students to shape technology within the group and on their own time. The introduction of password change reminders in this study helped sustain access to the virtual learning environment, which has helped solve the abandonment of the technology by the students.

Boulton's study validates the affordances concept in different ways. Blogs allow students to develop as self-directed learners in a safe and supportive social setting (Robertson, 2011). One of the students pointed out the use of various technologies; however, there will be no co-construction of knowledge if the right technology solutions are not implemented. Leonardi (2013) suggested that the affordances concept better explains the connection between technology characteristics and how people utilise these features. The emerging pedagogy is due to the adoption of the right technological solutions (wiki); the students feel a sense of ownership of their space and are more willing to contribute, leading to improved self-

confidence. A difficult task has become easy because other students share examples that are easily accessible. By making technology less about technology and more about interaction, the students have reported a deeper knowledge and understanding of concepts.

In both cases language, cognitive framework and technology play a significant role because they contain discourse, narratives, and an individual's discursive account, all of which aid in organising thoughts and actions. The process is triggered by events that cause actors' current actions to be interrupted, requiring them to retroactively make sense of the disrupted activity to restore it (Jorgen Sandberg and Tsoukas, 2015). Both cases can be considered a minor planned event, one of the five main types of sensemaking. An example of a minor planned event is an upgrade of a software program in which, in this scenario, the Virtual Learning Environment has been updated to provide better affordances to Doctorate students in Hong Kong. Among the characteristics of minor planned events is the bringing together of individuals, each with their perspective on the particular task at hand; various perspectives prompting sensemaking efforts to overcome the uncertainty about what the activity is all about (Jorgen Sandberg and Tsoukas, 2015). Technology has influenced how doctorate students make sense of their intra and interprofessional relationships and professional identities. However, not all suggested technologies, such as discussion boards, were supported by students. According to Boulton (2019), discussion boards did not involve students in sharing learning or building new knowledge, which may be hindered by a lack of writing abilities in English.

2.3.2 Insights

The literature above showcases how mobile technologies are applied in an educational environment. One of the qualities that the theories revealed is time. The time it takes to restore sense or restore action sensemaking is crucial to everyday activities in an institution or organisation. The activities or specific sense need not be accurate but rather a plausible account helping the sensemaker create a narrative and a springboard for the actions actors take to reinstate an interrupted activity (Sandberg and Tsoukas, 2015). Creating narratives and springboards for action could depend on time delays (short, medium, and long). Restored sense, restored action, non-sense and no restored action are outcomes of sensemaking that the literature review embodies. Therefore, using the concept of abduction and based on the findings from the literature review and study, the best possible conjecture or assertion is that In technology integration and use, passive abandonment, scale-up, and long-term sustainability issues are sensemaking crises when using new technology and when there is new information questioning the efficacy of already existing technology features creating different meanings and determined by the unique social configurations (structure) of the setting that enables or disables our ability to shape the technology artefact given time. Passive abandonment can also mean accepting without resistance. People in organisations can accept new technologies without questioning anything leading to a slow death of the same technology or another technology due to new information.

3 Research Methodology and primary data collection

This study applies Miles et al.'s (2020) qualitative data analysis methods eliciting the voices of experts using mobile technologies as an assisted augmentation to understand how it can be applied better in higher education. The qualitative method is about depth rather than breadth and developing a deep understanding of a phenomenon experienced (Neuman, 2014) in a higher education setting specifically designed to expand knowledge. Aiming to understand better human behaviour and the significance that people and groups place on their daily activities, objects, and social relationships, the use of qualitative research in this study is motivated by a desire to understand better people and groups' perceptions of themselves and their lives as expressed through their beliefs and meanings (Roberts, 2014).

The population of this study is gathered from Nigerian universities, which is the empirical setting for this study using three 3 cases (management science faculty, engineering faculty and the faculty of Medicine). This is purposeful sampling, a data-gathering strategy described by Gentles et al. (2015), used to select information-rich cases for in-depth study with logic and power. Information-rich instances relevant to the inquiry's objective provide much learning about issues since they provide insights and in-depth comprehension.

The population of this study is gathered from higher education institutions, more precisely, Nigerian Universities, which is the empirical setting for this study. According to Robinson (2013), the sample universe is this study's total population of possible cases. This study's inclusion criteria are Nigerian higher learning institutions with university status. Colleges of education or Polytechnics are not included. Sampling in this multi-case qualitative study is limited to 3 cases (management science faculty, engineering faculty and Medicine). There are three reasons for this: (1) The population of Lecturers in these faculties. (2) The lack of literature studying this department's use of mobile technology, and (3) Almost all universities have these faculties. These academics will come under any of the three faculties, and 40 interviews have been conducted. The extent of mobile technology use in all departments is also factored in.

The interview with the lecturers is semi-structured because it is this scenario's logical data collection mode. According to Bryman and Bell (2015), they are best when working with multiple case studies to ensure comparability or cross-case pattern search. According to Kallio et al. (2016), semi-structured interviews are fluid and adaptable, making them a popular data-gathering approach. This study uses a mobile phone that might require internet calls or video conferencing if needed. They also allow for reciprocity between the interviewer and the participant, which results in the improvisation of follow-up questions based on responses. The extended version of this study is based on previous knowledge using theories and eight secondary case study analyses to explain digital technology abandonment in higher education, making it a focused structure for discussion during interviews. The interview questions are derived from the abduction of secondary case studies. Currently, 40 interviews have been conducted, and 34 have been transcribed. Data was collected from Professors, Senior lecturers, Lecturers and PhD students that are teaching.

The means of connecting and generating ideas applied here is abduction. Lipscomb (2012) defines abduction as how a researcher shapes or insightfully generates ideas about the meaning or relevance of data based on non-deductive and non-inductive grounds while doing data analysis. Thematic analysis is applied after data collection. Thematic analysis is an approach

for detecting patterns within data (Howitt and Cramer, 2020). It is appropriate for research questions about people's perspectives on practices, factors and social processes that underpin phenomena (Saldaña, 2021). According to Wiltshire and Ronkainen (2021), Braun and Clarke (2006) described thematic analysis as independent of theory and epistemology and can be applied through a broad range of theoretical and epistemological applications. Wiltshire and Ronkainen (2021) described two approaches to thematic analysis. The first technique was a thematic analysis that bridged qualitative and quantitative methods (codebook T.A.) by converting qualitative data to a format suitable for statistical analysis. Braun and Clarke referred to this as codebook thematic analysis with neo-positivist foundations. The second approach which is applied in this paper views qualitative methods (reflexive T.A.) as integral to the broader methodological process and as faithful to the qualitative paradigm, which is about telling stories, interpreting and creating rather than discovering and discovering the truth that is either out there in discoverable form or buried deep within data (Wiltshire and Ronkainen, 2021).

4 Preliminary Findings and Analysis

Up to this point, 40 interviews have been conducted in the faculties of management science, Medicine and engineering to understand the types of applications lecturers use to augment classroom teaching practices. The analysis uses nvivo software to code the interviews with the lecturers, and preliminary themes have emerged. The theme in the analysis of secondary case studies was based on the technology used, social configuration and time theme, all explained. This section takes it further with a within-case analysis of the interviews of the Management Science, Engineering and Medicine departments.

4.1 Within-Case Analysis

4.1.1 Management Science, Engineering and Medicine

The academics identify several mobile technologies that provide opportunities for action. Mobile phones, laptops and tablets provide opportunities for action and apps and pick up several patterns that specify affordance. For example, all of these devices have touch screens that invite behaviour. This invitation of behaviour is not due to educational affordances of mobile technology but general affordances based on experiences. These mobile technologies afford applications such as Excel, SPSS and all the other apps identified. These applications also invite behaviour. The academics involved in this study are deans of departments signifying a position of power and knowledge which can significantly influence the use of tools involved in the departments in management science. The same goes for Engineering and the Department of Medicine. In each department, there is a realisation that there is a need for domain-specific applications when interviewing academics. Still, they all fall back to using social media apps across different mobile technologies, including laptops.

Using mobile technology as an example, all departments use smartphones, but there are slight differences. The management science department uses more generic applications such as Google apps, WhatsApp, and no specific apps for management science. Sometimes they mention such applications as Excel for accounting. These apps can be found in the app store ecosystems of various smartphones. In the engineering department, generic apps such as WhatsApp, Zoom and the rest are also used. However, there is mention of specific apps for

programming languages that can be installed on mobile devices for the engineering department and other apps such as Aspen, matlab, and Polymath. The same with the Department of Medicine. The Department of Medicine has specific research apps such as Medscape, UpToDate, and Medline. The problem lies with communication around the department and with students.

Regarding communication, WhatsApp is the go-to app for communication and for sending lecture notes and group notifications. Some do when asked if they have a learning management system, but most lecturers always turn to WhatsApp for faster communication. WhatsApp affordances are the key to understanding why lecturers use them frequently. WhatsApp and video conferencing apps provide non-stop synchronous communication, and it is quick. There is quality interaction when using WhatsApp, and it is also simple to use and linear. The action possibility arises in the interaction between lecturers, students (actors) and WhatsApp, providing an immediate outcome. For example, this might not be obvious, but the fact that education's emphasis is on collaboration, group work and being socially aware plays well with the qualities of WhatsApp. Throughout 40 interviews and listening to the participants two to three times, a pattern began to occur with mobile technologies. That pattern used synchronous apps for better, faster communication and an overall appification of the classroom. Of course, there are other peripheral challenges, but the goal is to tutor and communicate with the learners. In this thesis, all departments (Management Science, Engineering and Medicine) gravitated towards the same mobile technology(ies), creating some it is not about the app but what the app signals. This signalling is what makes this paper unique.

4.2 Cross Case thematic analysis

The cross-case thematic analysis uses coding for better articulation of interviews. Below is the list of categories and themes found within the data. The central overarching theme in this paper is the passive deconstruction of traditional digital lecturing and seeking domain social quality interactions. Deconstruction in this context is the idea that traditional digital instructions and communication are challenged when instructors use mobile technologies, especially apps meant for other uses in educational activities. Every time it is used, it slowly changes how mobile learning terminologies and activities are assumed to work.

code level 1	code level 2	subtheme/Category	theme	Overarching theme
Having a Say - Hopes and believes - Thoughts on mobile technology use	perceptions around mobile technologies	discourse and filtering process	Seeking social quality interactions for digital lectures	Passively deconstructing and seeking digital domain (Engineering, Medicine and Management Science) social quality interactions
functionality - social influence - course related influence - external influence - training on mobile technology use	how the use of mobile technology is influenced			
institution provided - personal acquisition	acquisition of mobile technologies			
smartphone - tablets	types of mobile technologies in use	mobile technologies use oscillation and deconstruction of traditional digital lectures		
online technology platforms - general purpose devices	general purpose devices used			
video conferencing - social media - google apps - subject matter apps - productivity - email - LMS apps - institutional apps - professional social network	types of apps used			
covid 19 - institution non provision of mobile technology - self training - Connectivity challenges - power outages - lack of institutional funding - class size	Institutional challenges	Peripheral time challenges	Priotizing and adapting domain (medicine, engineering, management faculties) mobile technology structure based on challenges	
inclass distractions - lack of interest	Student related challenges			
strike action - economic - connectivity - higher education policy	external environment challenges			
limited functionalities - subcroption fees - minimal use of LMS	technology related challenges			
department responsibilities - academic career - previous experience - routine - teaching hierarchy - body associations - journal publishing - physical interactions	academic activities	knowledge formation, structure and transfer process		
medicine - engineering - management science	teaching discipline			

The codes will not be explained directly but will form part of the explanation of the subtheme or categories.

4.2.1 Seeking Social Quality Interactions for digital lectures.

Seeking quality interactions for digital lecturing might read simplistic. However, if you look at the implementation setbacks of mobile technologies that have been well documented in the problems and gaps, quality social interactions for digital instructions have not factored into the discussion. What is social interaction in the context of digital lectures? This stems from discussions between people digitally in an organisation and the constant oscillation of mobile technologies that are slowly deconstructing traditional digital lectures. Before proceeding, a definition of mobile technology use in education is necessary.

The subtheme or category for seeking social quality interactions for digital instructions is the discourse filtering process. This revolves around perceptions of mobile technologies, how the use of mobile technologies are influenced, and whether they are self-acquired or provided by the institution. In perceptions, when colleagues have a say about what mobile technologies to use in instructions or learning, this can influence the outcome. Here are three lecturers from different perspectives:

"No we didn't have a say, it was a platform recommended and we didn't have, we were not consulted before it was recommended." (Interview Five)

"Not quite what happens is that eh committees are formed at different levels, those committees advice the Administration at those levels. Maybe once in a while, a general opinion maybe sort from everybody but its not very common". (Interview 4)

"They do for feedback and there is a committee that is really in charge of it but they have challenges. You send message to them, each department have someone that is charged about the challenges relating to student, we have someone you can talk, if she can't assist, she will send it to higher person, so there is someone to contact when you have challenges and there is also room for feedback". (Interview ii)

The functionality of mobile technologies can influence the filtering process. Functionalities such as communication, internet facilities, access to applications or longer battery life are all affordances that can influence how mobile technology is used. Functionality of mobile technologies is essential in the filtering process, as perceived by these lecturers:

"The mobile phone unique technologies make the works so easy and limitless with space in the sense that I can be in the U.S. and still do my work in Nigeria". (Interview Eight)

Social influence is also a key factor here, including institutional culture, influence from colleagues, influence from students, and influence on students. All these discussions and filters happen day to day, weeks, months and sometimes even years before a technology or mobile technology is adopted and used.

The other subtheme for seeking social quality interactions for digital lectures is mobile technology oscillation or technology use oscillation.. Some of these institutions have learning management systems, but they choose a 3rd party app for communication. A popular 3rd party

app that was used is WhatsApp. WhatsApp in every department became a puzzle when one of the lecturers mentioned the app at the beginning of the interviews. During the first 3 interviews it was not necessarily meaningful. However, after the 8th interview, it became clear that there was a pattern with WhatsApp use. Social media use in lecturing or giving notes and for faster communication is a pattern in this research. This is what one of the lecturers said:

"I Use social media, like Facebook, WhatsApp, most easy to deliver lecture, and I use it as the natural assistance". (Interview Two)

4.2.2 Prioritising and adapting faculty mobile technology structures based on challenges.

The theme is based on the peripheral time challenges, knowledge formation, structure, and transfer process. There are challenges to mobile technologies in an institution; some can be institutional, external, student-related and technological challenges. The reason for being peripheral is that they are obstacles that are not at the core of the educational process but still have an impact in some way. These challenges include covid 19, institutional non-provision of mobile technologies, strike action, and economic or limited technology functionalities. The knowledge formation, structure, and transfer process involves the academic routines, responsibilities, experience, and structures of facilities, departments, or faculties.

The reason behind the theme: prioritising and adapting faculty structures based on challenges is that despite the challenges, academic activities and academics are striving to keep delivering lectures through certain mobile technologies. Peripheral Challenges, such as the pandemic, pushed academics online. The lecturers articulate it this way:

"Yeah, you know that during the pandemic, the mobile technology for teaching especially, was introduced, especially the Zoom, and Microsoft Meet but then, not everybody was used to it". (Interview Thirteen)

"Not everyone was used to it" can be construed as, given time, the lecturers would have assimilated the mobile technology in their respective classes. However, when lecturers start using mobile technologies, they indirectly create structures for continued use. There are also challenges, such as connectivity issues for the institution that the lecturers have expressed:

"There's the bad part is that where there poor internet network, a lot of students may be cut off the lecture and where the internet is not strong, the student will be having off and on connection so they may not follow the lecture as they should". (Interview 4)

These issues are a way to adapt and prioritise certain technologies for faster communication and low bandwidth interactions that enable a connection between the lecturers and the students.

Knowledge formation, structure, and transfer process are subthemes for prioritising and adapting domain (department) mobile technology use structures. What this means is the structure of teaching disciplines such the engineering courses, management courses and Medicine and the surrounding academic activities such as departmental responsibilities, academic careers, and experiences are all structures put in place. This is the comment from a lecturer:

"Right now I'm the Sub Dean of the College which in some cases is called faculty. I am sub Dean of the College also the acting HOD, of the department of Business Administration. So in that sense, the activities of the HOD and the sub dean will vary from lecturing and other administrative work". (Interview Three)

The structure and knowledge transfer process are meant for the learners and fellow colleagues in the institution. Technologies will always come and go, but any technology aids the structure. In this context, using mobile technologies, even if not officially sanctioned by institutional management, enables prioritising goal actualisations faster. The lecturers have mentioned that they abandon certain technologies for mobile technologies, such as social media, and there is a reason for this which is explained in the following discussion.

5. Discussion and Conclusion

One of the distinct types of affordances is collective affordance. Collective affordance is when there is a similar use of technology's features (Leonardi, 2013). According to Weichold and Thonhauser (2020), affordances as a relationship between the environment and many persons or collectives is plausible. There are genuinely collective affordances that depend on the collective. Teaching in higher education is a collective endeavour because it is collaborative learning and departmental collaboration, interdisciplinary collaborations. Leonardi (2013) articulates that employee's information movement is the engine of productivity. In this scenario, the engine of productivity is through mobile technology social quality interactions that the collective perceives.

The institutions assume that the right technology solutions are being adopted and used; however, when technologies adopted disrupt current actions, it sends lecturers to retroactively make sense of the disrupted activity (Jorgen Sandberg and Tsoukas, 2015). Retroactively making sense pushes them to choose mobile technologies because their affordances are easier to manipulate. Interpretive flexibility is the core aspect of easier manipulation. Mobile technology has enabled social groups such as lecturers to transform from passive users to active users in this thesis. Becoming active users usually occurs through the sensemaking process when colleagues have discussions, such as having a say in what mobile technologies are deployed in the institutions (Bansler and Havn, 2006). Time is needed to transform from passive users to active users. Lecturers need time and consensus to be prepared because of the nature of the task. These can be mental models founded on schemas reacting to crises (Combe and Carrington, 2015). The reactions in this study lead them to social media applications because of the affordances these mobile technologies offer for actualisation. The first argument in this research is that of abandonment. This is taken further because abandonment is not the end argument but the beginning of using another mobile technology.

Various studies, such as Mercader and Gairin (2021), discuss barriers to integrating digital technologies, and Boulton (2019), discussing appropriate use and adaptation of technologies, only highlights the need for quality social interactions around the subject matter, which is a gap not explored sufficiently. The digital structures have limited or no quality social interactions around the subject matter. The structure that allows individual lecturers and administrators to form knowledge and transfer it to learners is collaborative; therefore, lecturers or teachers will gravitate toward mobile technologies that support this collective approach even

without knowing they are doing it. They are oscillating between traditional and synchronous mobile technologies and leaning towards mobile technologies, therefore passively deconstructing how traditional digital technologies are used. Traditional digital technologies that do not offer quality social interactions between the lecturer, the subject matter, and the learner tends to slide in use. When lecturers oscillate between traditional digital and mobile technologies, that constitutes sensemaking. They are deciding what to keep and what to eliminate that does not enable them to actualise a goal. This influence can be based on several factors such as social (colleagues or students), economical, mobile technology functionality and other activities.

The overarching theme in this thesis, through evidence gathering, shows that these lecturers are passively deconstructing traditional digital lectures and seeking subject matter social quality interactions. Creating groups for classes and sending files is not new in higher education using learning management systems. However, the problem lies with the quality of social interactions around the subject matter. What affordances offered by these systems provide less sensemaking and accessible actualisation of goals. In these scenarios, there is a collective shaping of mobile technology. The possibility for certain types of action is more on the social media ecosystem than the possibilities for action in learning management systems' social interactions. This is the best possible explanation based on the data provided because the lecturers mentioned social media apps such as WhatsApp or conferencing apps such as Zoom as a communication tool with students and colleagues, which is the point of higher education. Other factors contributing to the deconstruction of traditional digital lecturing could be not having a say on what mobile technologies to implement. This sensemaking crisis could push the lecturers to adopt social media based on the best quality interaction and reach.

In conclusion, this paper is part of a more significant thesis about the use of mobile technologies in higher education in developing countries. This has been truncated by a wide margin, and the title might seem outlandish; however, the evidence is laid out. Technology use in higher education has been studied extensively, including mobile technologies. What differentiates this paper from the rest is articulating mobile technology use from the perspective of academic staff, which is under-researched in this area. The problems, gaps and significance have been clearly identified: proper mobile technology integration is lacking, and there are always new shiny technologies that distract from previous technologies that have not been fully utilised or executed in higher education.

Nevertheless, the questions remain why do educators use mobile technologies, and why are there high abandonment in some cases and misuse. Two important theories were applied to articulate the research question: the Affordances concept and sensemaking. Since this is about the use of mobile technology and why they use it, the theories present an excellent framework to understand why academics use it the way they do. Based on semi-structured interview data collected, and since higher education is about communicating knowledge, evidence points to using social media apps for communication and other apps for academic activities. It is not about the applications but the quality of social interaction they afford the user and the possibility of goal actualisation. Based on abduction principles, it can be construed that academics are seeking quality social interaction around their subject matter, which may enrich the learning process.

Based on the previous conjecture, the overarching theme in this thesis, through evidence gathering, shows that these lecturers are passively deconstructing traditional digital lectures and seeking subject matter social quality interactions. Creating groups for classes and sending

Challenging Institutional Norms and Organizational Lack of Support: An Empirical Study on Academics' Unsanctioned Use of Mobile Technologies for Classroom Augmentation in Higher Education

files is not new in higher education using learning management systems. However, the problem lies with the quality of social interactions around the subject matter. The affordances offered by these systems provide less sensemaking and accessible actualisation of goals. In these scenarios, there is a collective shaping of mobile technology. The possibility for certain types of action is more on the social media ecosystem than the possibilities for action in learning management systems' social interactions. This is the best possible explanation based on the data provided because the lecturers mentioned social media apps such as WhatsApp or conferencing apps such as Zoom as a communication tool with students and colleagues, which is the point of higher education. Other factors contributing to the deconstruction of traditional digital lecturing could be not having a say on what mobile technologies to implement. This sensemaking crisis could push the lecturers to adopt social media based on the best quality interaction and reach.

6 Bibliography

Alaba, O., Abass, O., Igwe, E. (2022). Mobile Learning via Mobile Devices in Nigeria Higher Education: Usage Analysis Based on Utaut Model. *Journal of the Southern Association for Information Systems*. 9 (1), 64-80. Available from.

Al Fakih, B., Morei, A., Mohammad, S.M. (2020). Students Impression About Using Mobile Phones in Classroom. *International Journal of Emerging Technologies in Learning*. 15 (22), 230-243. Available from.

Al Lily, A.E.A. (2013). The social shaping of educational technologies in Saudi Arabia: An examination of how the social fabric shapes the construction and use of technologies. *Technology in Society*. 35 (3), 203-222. Available from.

Almofadi, N. (2021). *Investigating the Experiences of Lecturers Using Mobile Technology to Teach English at Saudi Universities*, ProQuest Dissertations Publishing.

Al-Rahmi, A., Al-Rahmi, W., Alturki, U., Aldraiweesh, A., Almutairy, S., Al-Adwan, A. (2022a). Acceptance of mobile technologies and M-learning by university students: An empirical investigation in higher education. *Education and Information Technologies*. 27 (6), 7805-7826. Available from

Bansler, J. and Havn, E. (2006). Sensemaking in Technology-Use Mediation: Adapting Groupware Technology in Organizations. *Computer Supported Cooperative Work*. 15 (1), 55-91. Available from.

Berryman, D.R. (2012). *Augmented Reality: A Review*, Binghamton, N.Y. : Haworth Press.

Bernacki, M.L., Greene, J.A., Crompton, H. (2020). Mobile technology, learning, and achievement: Advances in understanding and measuring the role of mobile technology in education. *Contemporary Educational Psychology*. 60 101827. Available from.

Bryman, A. and Bell, E. (2015). *Business research methods* Oxford: Oxford University Press.

Boulton, H. (2019). Crossing boundaries: the affordances of new technologies in supporting a collaborative learning environment for doctoral students learning transnationally. *Technology, Pedagogy and Education*. 28 (3), 255-267. Available from.

Bower, M. (2008). *Affordance analysis – matching learning tasks with learning technologies*, London : Routledge.

Cochrane, T. (2012). Secrets of mlearning failures: confronting reality. *Research in Learning Technology*. 20 19186-12. Available from.

Eze, S.C., Awa, H.O., Okoye, J.C., Emecheta, B.C., Anazodo, R.O. (2013). Determinant factors of information communication technology (ICT) adoption by government-owned universities in Nigeria: A qualitative approach. *Journal of Enterprise Information Management*. 26 (4), 427-443. Available from.

Feyzi Behnagh, R. and Yasrebi, S. (2020). An examination of constructivist educational technologies: Key affordances and conditions. *British Journal of Educational Technology*. 51 (6), 1907-1919. Available from.

France, D., Lee, R., Maclachlan, J., McPhee, S.R. (2021). Should you be using mobile technologies in teaching? Applying a pedagogical framework. *Journal of Geography in Higher Education*. 45 (2), 221-237. Available from.

Challenging Institutional Norms and Organizational Lack of Support: An Empirical Study on Academics' Unsanctioned Use of Mobile Technologies for Classroom Augmentation in Higher Education

Fischer, B.B., Moraes, Gustavo Hermínio Salati Marcondes de, Schaeffer, P.R. (2019). Universities' institutional settings and academic entrepreneurship: Notes from a developing country. *Technological Forecasting & Social Change*. 147 243-252. Available from.

Handbook aof science and technology studies, .

Gentles, S., Charles, C., Ploeg, J., McKibbin, K.A. (2015). Sampling in Qualitative Research: Insights from an Overview of the Methods Literature. *Qualitative Report*. 20 (11), 1772. Available from.

Järvelä, S., Kirschner, P.A., Panadero, E., Malmberg, J., Phielix, C., Jaspers, J., Koivuniemi, M., Järvenoja, H. (2015). Enhancing socially shared regulation in collaborative learning groups: designing for CSCL regulation tools. *Educational Technology Research and Development*. 63 (1), 125-142. Available from.

Harris, G. (2021). *U.K. government approves 50% funding cut for arts and design courses*. *U.K. government approves 50% funding cut for arts and design courses*. Available from: <https://www.theartnewspaper.com/2021/07/22/uk-government-approves-50percent-funding-cut-for-arts-and-design-courses> [Accessed2021].

Humphreys, L. *Reframing Social Groups, Closure, and Stabilization in the Social Construction of Technology*, London] : Taylor & Francis.

Howitt, D. and Cramer, D. (2020). *Research methods in psychology* Harlow: Pearson Education Limited.

Kallio, H., Pietilä, A., Johnson, M., Kangasniemi, M. (2016). Systematic methodological review: developing a framework for a qualitative semi-structured interview guide. *Journal of Advanced Nursing; J Adv Nurs*. 72 (12), 2954-2965. Available from.

Kaliisa, R., Palmer, E., Miller, J. (2019). Mobile learning in higher education : A comparative analysis of developed and developing country contexts. *British Journal of Educational Technology*. 50 (2), 546-561. Available from.

Kirkwood, A. and Price, L. (2013). *Examining some assumptions and limitations of research on the effects of emerging technologies for teaching and learning in higher education*, London : National Council for Educational Technology.

Kirschner, P.A., Sweller, J., Kirschner, F., Zambrano, J.R. (2018). From Cognitive Load Theory to Collaborative Cognitive Load Theory. *International Journal of Computer-Supported Collaborative Learning; Int J Comput Support Collab Learn*. 13 (2), 213-233. Available from.

Leonardi, P.M., Huysman, M., Steinfield, C. (2013). Enterprise social media: Definition, history, and prospects for the study of social technologies in organisations. *Journal of Computer-Mediated Communication*. 19 (1), 1-19. Available from.

Lipscomb, M. (2012). Abductive reasoning and qualitative research. *Nursing Philosophy; Nurs Philos*. 13 (4), 244-256. Available from.

Lin, Y., Liu, Y., Fan, W., Tuunainen, V.K., Deng, S. (2021). Revisiting the relationship between smartphone use and academic performance: A large-scale study. *Computers in Human Behavior*. 122 106835. Available from.

Mackay, H. and Gillespie, G. (1992). Extending the Social Shaping of Technology Approach: Ideology and Appropriation. *Social Studies of Science*. 22 (4), 685-716. Available from.

Mercader, C. and Gairín, J. (2020). *University teachers' perception of barriers to the use of digital technologies: the importance of the academic discipline*, Chaim : SpringerOpen.

McCarthy, S., Rowan, W., Kahma, N., Lynch, L., Ertiö, T.P. (2021). Open e-learning platforms and the design–reality gap: an affordance theory perspective. *Information Technology & People (West Linn, Or.)*. 35 (8), 74-98. Available from.

Miles, M.B., Huberman, A.M., Saldaña, J. (2020). *Qualitative data analysis : a methods sourcebook* Los Angeles: SAGE.

Nwagwu, W.E. (2020). *E-learning readiness of universities in Nigeria- what are the opinions of the academic staff of Nigeria's premier university?* Andover, Hants, United Kingdom] : Chapman & Hall.

Tsang, E.W.K. (2014). Case studies and generalisation in information systems research: A critical realist perspective. *The Journal of Strategic Information Systems*. 23 (2), 174-186. Available from.

Robey, D., Anderson, C., Raymond, B. (2013). Information Technology, Materiality, and Organisational Change: A Professional Odyssey. *Journal of the Association for Information Systems*. 14 (7), 379-398. Available from.

Robertson, J. (2011). *The educational affordances of blogs for self-directed learning*, Exeter : Elsevier Science.

Robinson, O.C. (2013). *Sampling in Interview-Based Qualitative Research: A Theoretical and Practical Guide*, London] : Arnold.

Said, M.F. and Adham, K.A. (2016). Is a mobile phone a disruptive innovation in the workplace? *Gadjah Mada International Journal of Business*. 18 (2), 131-151. Available from

Sandberg, J. and Tsoukas, H. (2015). Making sense of the sensemaking perspective: Its constituents, limitations, and opportunities for further development. *Journal of Organizational Behavior; J.Organiz.Behav.* 36 S6-S32. Available from.

Selwyn, N. (2020). *Banning mobile phones from classrooms—An opportunity to advance understandings of technology addiction, distraction and cyberbullying*, London : National Council for Educational Technology.

Shardlow, M., Sellar, S., Rousell, D. (2022). Collaborative augmentation and simplification of text (CoAST): pedagogical applications of natural language processing in digital learning environments. *Learning Environments Research*. 25 (2), 399-421. Available from.

Shurygin, V., Anisimova, T., Orazbekova, R., Pronkin, N. (2023). Modern approaches to teaching future teachers of mathematics: the use of mobile applications and their impact on students' motivation and academic success in the context of STEM education. *Interactive Learning Environments*. ahead-of-print (-), 1-15. Available from.

Springer Nature (Producer), & . (2021). Assistive Augmentation. [Video/DVD] Springer Nature. Retrieved from <https://video.alexanderstreet.com/watch/assistive-augmentation>

Tan, B., Shan, L.P., Chen, W., Huang, L. (2020). Organisational Sensemaking in ERP Implementation: The Influence of Sensemaking Structure. *MIS Quarterly*. 44 (4), 1773. Available from.

Challenging Institutional Norms and Organizational Lack of Support: An Empirical Study on Academics' Unsanctioned Use of Mobile Technologies for Classroom Augmentation in Higher Education

- Terras, M.M. and Ramsay, J. (2012). The five central psychological challenges facing effective mobile learning. *British Journal of Educational Technology*. 43 (5), 820-832. Available from.
- Urquhart, C., Lehmann, H., Myers, M.D. (2010). Putting the 'theory' back into grounded theory: guidelines for grounded theory studies in information systems. *Information Systems Journal (Oxford, England)*. 20 (4), 357-381. Available from.
- Useh, U. (2021). Sustainable Development Goals as a Framework for Postgraduate Future Research Following COVID-19 Pandemic: A New Norm for Developing Countries. *Higher Education for the Future*. 8 (1), 123-132. Available from.
- Walsham, G. (1995). The Emergence of Interpretivism in I.S. Research. *Information Systems Research*. 6 (4), 376-394. Available from.
- Wagner, D., Vollmar, G., Wagner, H. (2014). The impact of information technology on knowledge creation: An affordance approach to social media. *Journal of Enterprise Information Management*. 27 (1), 31-44. Available from.
- Weichold, M. and Thonhauser, G. (2020). Collective Affordances. *Ecological Psychology*. 32 (1), 1-24. Available from.
- Wiltshire, G. and Ronkainen, N. (2021). A realist approach to thematic analysis: making sense of qualitative data through experiential, inferential and dispositional themes. *Journal of Critical Realism*. 20 (2), 159-180. Available from.
- Xiangming, L. and Song, S. (2018). Mobile technology affordance and its social implications: A case of "Rain Classroom". *British Journal of Educational Technology*. 49 (2), 276-291. Available from.
- Xue, S. (2022). A conceptual model for integrating affordances of mobile technologies into task-based language teaching. *Interactive Learning Environments*. 30 (6), 1131-1144. Available from.
- Yunusa, A.A., Sanusi, I.T., Dada, O.A., Oyelere, S.S., Agbo, F.J., Obaido, G., Aruleba, K. (2021). The Impact of the COVID-19 Pandemic on Higher Education in Nigeria: University Lecturers' Perspectives. *International Journal of Education and Development using Information and Communication Technology*. 17 (4), 43-66. Available from.
- Zhang, J. and Yu, S. (2022). Assessing the Innovation of Mobile Pedagogy from the Teacher's Perspective. *Sustainability (Basel, Switzerland)*. 14 (23), 15676. Available from.