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Article

Adopting Mobile Learning in Tertiary Environments: Instructional, Curricular and Organizational Matters

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Abstract: This qualitative study looked at the instructional, curricular and organizational factors impacting on the adoption of mobile learning in a higher education institution. Academics expressed their views on a variety of educational issues likely to enhance or hinder the effectiveness of the innovation. Teachers requested more professional development in a number of key areas including the integration of the technology into teaching and learning. Likewise, resolving vital issues such as workload, equity to access and effective policy making were seen as key to successful adoption. Technical issues such as having good wireless connectivity, need for efficient technical support, access to mobile devices and an understanding of their operational limitations with respect to desk/laptops were also highlighted. The study revealed a number of alternative perceptions and misconceptions, about articulating effective mobile learning pedagogies. For instance, staff expressed concerns about the risk of exposing students to superficial learning when mobile learning experiences were not well designed, the prospect that the devices might distract students from learning, as well as a possible deterioration of the quality of interaction between academics and students. Recommendations to reconcile those alternative conceptions with best practice principles are outlined.

Keywords: academics; perceptions; mobile learning; curriculum; adoption

1. Introduction

The purpose of this study was to explore academics' perceptions about potentialities and constraints of mobile devices in teaching and learning within a tertiary education context. The study was carried out at an Australian university serving over 11,000 students with campuses in three different states and comprising nine academic schools. The original study consisted of a qualitative and qualitative component. The former was reported elsewhere [1,2] while the latter is the focus of this paper.

In the past ten years, the technology in higher education has changed drastically, particularly with the advent of online media. Apart from the change in technology, the learners' profile has also changed significantly. Today's university students are more on the move, working part-time and spending less time on campus [3]. They demand access to learning materials and information anytime and anywhere. Use of mobile devices to access information is widespread enabling multimedia formats to be used in more dynamic and interactive ways.

Mobile devices have made an immediate impact on university life, having the power to transform not only staff and students' interaction patterns but also teaching and learning practices. In general, research in higher education identifies two lines of mobile learning (ML) role [4]. The first aligns with possibilities and constraints, referred to as general ML affordances associated with interacting through learning management systems (LMS): electronic features such as communication, discussion forums, resource downloading, course management and file storing. The second line also looks at those potentialities and constraints but related to using mobile devices to articulate specific pedagogical experiences including educational apps, multimedia simulations and visualization.

In this context, it is important for academics to re-examine how learning materials are designed and delivered for the new generation of mobile learners [3]. Although there have been some discussions of the utilization and pedagogical effectiveness of ML there are few reports that examine the process of implementation of mobile learning at an institutional level [5], or that examine the reactions of participants, particularly the teachers themselves, in the process of making such changes. As such, the current study fills an important gap and should provide useful information to guide further implementation.

1.1. Academics' Perceptions of Educational Change

The study of academics' beliefs about the integration of technology into higher teaching education has gained impetus in the last ten years. Research on how academics think of using instructional technology shows that they hold elaborate educational opinions that in turn shape teaching and learning [6]. It shows that each educator holds a deep-seated curriculum belief system comprising a wide range of beliefs about students, colleagues, pedagogies and university processes. These personal beliefs work like a sieve through which teachers build their decisions rather than relying on theoretical knowledge, curriculum procedures or regulations [7]. Furthermore, their mindset seems to be articulated enough to either smooth the progress or hold back educational innovations.

No matter how well-intentioned and well-aligned to best practice principles these opinions may be, they still might not translate perfectly into reality. This is so because there are instructional, curricular and organizational factors within university environments mediating between beliefs and practice [8]. This conflict has serious implications for the implementation of novel education technology since academics' mindsets may not connect to proposed innovations. Even if their belief system matches an innovation, lack of facilitating elements within each tertiary institution might impede the appropriate realization of such supportive beliefs. Hence, the need to recognize and examine a range of issues contributing to the implementation of ML and other technology-based innovations is vital not only to secure final success but also to identify at each stage possible pitfalls.

1.2. Mobile Learning

Conceptualizations of mobile technology-enhanced learning are increasingly moving from the e-learning and m-learning domains to a more enculturized perspective where seamless learning is a central attribute. For example, it has been argued that mobile learning constitutes "the processes of coming to know through conversations across multiple contexts amongst people and personal interactive technologies" [9]. Similarly, it has been maintained that devices like tablets and smartphones must be considered more as learning hubs than multiple devices. This is so because these devices dynamically integrate "all the personal learning tools, resources and self-created artefacts at one place" [10]. In addition, mobile learning devices have been related to the concept of ubiquitous learning (u-learning) where "computing, communication, and sensor devices are embedded and integrated into learners' daily life to make learning immersive" [11]. This recent theorizing highlighting the seamlessness of mobile devices has re-orientated the debate about their roles, placing it with a more learner-centric perspective and taking into account users' situatedness.

Students now use mobile tablets and smartphones everywhere to engage with their studies. They access library catalogues from home or on the road [12], and they download course materials from anywhere beyond the campus [13]. For them, emails and announcements from their lecturers arrive instantaneously 24/7 to their devices [14]. Rather than meeting somewhere at the university campus with their peers to discuss a project, students use chat, SMS, emails and free videotelephony software [15]. Communication takes place outside class hours through social media and resources are shared likewise using mobile technology available at their fingertips. This is a technology that allows them to freely record lectures and play them at their own time and location [15] as well as to gain fast access to a range of online sources [16]. Alleviated from the burden of carrying heavier tools like laptops, students now travel freely, carrying with them their files, working on them while on a train or bus, the lecture room or at the park [13]. One would say that this new profile of the university student, who now is on the move, engages in more part-time paid work and looks for rapid solutions, is changing the university landscape, taking it beyond "bricks and mortar" [16,17].

Universities are responding to such quick-developing demands basically through making their online interfaces mobile friendly, adding a financial burden to their already tight budgets. Learning management systems now deliver their affordances to mobile platforms [18]. Tertiary institutions have also developed their own corporate apps to provide information to students, academics and the public [19]. They have also created their own internal consultative agencies so that

new learning technologies such as ML are accommodated efficiently within their own technical-pedagogical processes and structures [5]. The magnitude of modifying infrastructure is also challenging. Appropriate networks such as Wi-Fi are suddenly deployed, covering all campus spots in response to students' demands [12]. Furthermore, appropriate learning spaces are being built to suit an increasing number of students requiring their own flexible space and multitasking. At an increasing rate, academic staff members are requested to be able to project their smartphone or mobile tablet display onto the large lecture screen. In addition, professional development workshops, online self-learning modules and technical support are being provided to meet the call of the times. Helpdesk and technical support are under intense pressure to make themselves readily available to both students and staff.

Academic staff members are therefore being placed at the center of the scene. Impelled by the above changes in student behavior and institutional drives, they are now moved to re-examine how their learning materials and teaching strategies are designed and delivered [20]. Academics are finding that learners are looking for more interactivity and more dynamic teaching [7]. They might perhaps feel threatened that students demand a quick turnaround to their emails. A new discourse is being heard in corridors and meetings, where someone usually comes up with the wonders of a new educational app. These small programs running on a smartphone or mobile tablet are complementing and supplementing the traditional slide presentation. Far from being static, these dynamic programs can add animation, sound and image to the learning experience [15]. Their powerful multimedia affordances in the form of visualization and simulation bring a sense of real-life, linking theory content to practice [21]. Academics who are novices to the bounties of ML have found that apps can be embedded easily in a lecture to demonstrate a concept or present a new idea [22].

However, there are some limitations attributed to mobile devices. Some of these characterizations linger more in myth than in reality and have been documented as potential drawbacks. Among them is the possibility that students engage in superficial learning [23] and the perception that lecturer-student personal contact might decrease [6]. Similarly, there is the belief among academics that students will be distracted in class [24] and a concern that students could cheat in examinations using mobile devices [25]. More factually speaking, there is evidence that there are few formal opportunities provided to academics to learn about ML [26], and a lack of time to integrate it into the curriculum, adding pressure on workloads [5].

Potential ML drawbacks that relate to organizational and logistic issues include poor wireless connectivity in some areas [27], and the fact that not all students or lecturers have mobile devices or are familiar with their use [13,21]. Mobile devices, as compared to desk/laptops, appear to have limitations on screen size and resolution and a lack of a mouse and a keyboard that makes usability difficult [14]. Their data storage capacity is limited [7] and some applications do not work across main mobile platforms [28].

1.3. Background to the Study

This paper reports the qualitative responses to a mixed method design study conducted in 2013 among academic staff. The quantitative findings reported elsewhere [1] examined the degree of adoption of ML among academics. Such quantitative study also sought to characterize the direction and magnitude of academics' perceptions about possibilities and constraints in the adoption of mobile learning technologies.

The findings revealed that academic staff are modally positioned at the third of the Russell's six developmental phases of ML adoption: *Understanding and application of the process.* This continuum ranges from *Awareness* to *Creative application to new contexts* [29].

In regard to their perceptions about the potential of ML devices in teaching and learning, academics are of the opinion that ML tools are effective to promote autonomous learning. They also believe that ML devices are beneficial to generate more course engagement due to their "anywhere, anytime" capabilities as well as to promote collaboration beyond the physical campus. The portability of the device itself also allowing transporting and working with files at any location was seen as a distinctive advantage. Among the main limitations perceived by academics was the lack of time to articulate ML into their course delivery, shortage of the quantity of devices owned by academics and students as well poor familiarity with their use and navigation.

Interestingly, there were some controversial findings that warranted further qualitative exploration. For example, the perception that students cannot use mobile devices as word-processors was found to be a negative predictor of ML take-up. This suggests the existence of misconceptions about ML, since devices such as iPads can be used for such a task [1]. Similarly, academics did not commonly report articulating the use of mobile educational applications and multimedia into specific teaching and learning experiences, including real-time experiences during lectures and tutorials, online quizzes and discussion boards. These findings, along with many requests for professional development, suggested a number of mediating factors that are not allowing academics to effectively adopt ML devices in their instruction. The use of mixed methods in this research was a response to further clarify the nature of these dissonances through an additional qualitative perspective looking at instructional, curricular and organizational factors.

1.4. Mixed Methods Research

The above findings coincide in many ways with the results of the quantitative findings of the study in terms of academics adopting mobile learning tools as outlined at the beginning of the literature review. It is noteworthy that of all the studies reviewed in this paper relating to academics' adoption of mobile learning technology only one used qualitative techniques that involved seven lecturers in one university department [5]: the remainder were entirely based on statistical analysis. This highlights the methodological relevance of the present study in combining both quantitative and qualitative research approaches in order to describe a richer landscape of the issues around mobile learning across an entire university.

Mixed methods research is helpful because it makes manifest the complex interaction among variables within a particular study. Mixed methods also require the integration of different theoretical

perspectives to interpret data. A blending of both techniques is often recommended in studies about teachers' perceptions of instructional practices because of the need to elicit a broad range of responses and to secure triangulation of data [22]. In addition, qualitative methods can capture the richness of curriculum events, as opposed to quantitative approaches that focuses on the product rather than on the process of an educational event. Utilizing only Likert-type scales through questionnaires induces the respondent to choose the option that looks coherent with society's view or an ideal belief rather than letting the respondent express his or her own belief. In addition, Likert-type scales, as used in the quantitative component of this study, may not reflect the daily subjectivity of an individual's belief because they do not offer the respondent the possibility of expressing his or her own perceptions [30].

2. Methodology

The main research question was formulated as follows: How do school instructional, curricular, and organizational factors affect the adoption of mobile learning in a tertiary learning environment?

More specifically, open-ended response items were sought on the following issues:

- *Capabilities of using mobile devices in teaching and learning*
- *Constraints of using mobile devices in teaching and learning*
- *Current needs for professional development on mobile learning*
- *General comments about adopting mobile learning in their disciplines*

One hundred and seventy-seven academic staff participated in an online survey, in which three open-ended questions were posed related to (a) ML potentialities and constraints in teaching and learning; (b) their ML professional development needs; and (c) perceptions of the implementation of ML. There was almost equal representation of both genders and employment status (part/full time).

In addition, respondents were asked to state their preferred ML training delivery mode. Internal in-service appears to be the preferred option, followed by online modules, as shown in Table 1.

Table 1. Preferred training mode.

Training style	Percent
University workshops	44
Online modules	23
Self-learning	18
Peer/colleagues	10
External workshops/conferences	4
Journal/Magazine	1

The qualitative analysis examined academics' perceptions of mobile learning in three major educational areas, namely, instructional, curricular and organizational. Such an analytic agenda allowed looking at variables within a broader interpretive framework and exploring socio-cultural synergies among them, going beyond the statistical analysis. This is an arrangement commonly used in studies evaluating the quality of educational innovation programs [22].

The instructional, organizational and curricular themes represented the initial grouping for examining academics' responses. The instructional theme addressed factors directly affecting the enactment of

teaching and learning experiences related to the curriculum. It looked at how ML pedagogies associated with ML instruction are perceived by academics. The instructional theme goes further to examine whether those instructional beliefs represent misconceptions, or alternative conceptions, of ML best practice within a higher education context. The curricular theme looked at those elements within the course delivery environment that indirectly affect student experience. Within this domain, the quality of professional learning about ML practices is seen as crucial to understanding the effectiveness of mobile learning in education, as well as to providing rich teaching strategies and meaningful learning experiences. Hence, a central aspect of this theme is the appraisal of the type of professional development needed to leverage ML across the curriculum and within each particular discipline, as each of them requires a specific approach. Finally, the organizational theme focused on those technical and corporate issues that logistically influenced the effectiveness of an innovation ML program. These include the logistic factors needed to embed ML practices within the higher education curriculum.

Responses were collected, read repeatedly and analyzed thematically in terms of their instructional, curricular and organizational content. Once grouped into these three themes, responses were broken into smaller sub-themes. A sub-theme represented a single meaningful and complete idea expressed by a respondent. Sub-themes were coded into the initial categories of analysis, although some sub-themes were coded in several categories. As new sub-themes were coded, additional categories began to emerge. Simultaneous sub-themes within each category were reduced on the basis of common attributes to discover any underlying uniformity across the data. In the course of this process, some categories collapsed to give way to broader generalizations until further comparison could not be made due to saturation. When no common themes were identified for each category, the analysis focused on the nature, significance and recurrence of these more isolated opinions. Such an iterative thematic analysis is a fundamental form of qualitative analysis, aiming to identify common ideas from the ideas and concerns put forward by participants [30]. The final three-dimensional qualitative analysis resulted in the following collection of issues (Table 2):

Table 2. Issues in mobile learning (ML) implementation.

Themes	**Instructional**	**Curricular**	**Organizational**	
			Technical	**Corporate**
Issues	Educational benefits	Training delivery style	Access to technology	Policy
	Distractedness	Type of training	Cross-platform compatibility	Workload
	Student-staff communication	Disciplinary learning	Quality of wireless connection	Equity of access
	Superficial learning	Specific training	Operational limitations	
			IT support	

3. Results and Discussion

3.1. Instructional Issues

The main instructional themes that emerged from teachers' comments revolved about the perceived educational benefits of mobile learning, potential drawbacks associated with students getting distracted in class, concerns about maintaining the quality of communication between staff and students as well as apprehensions about the quality of learning to occur by using mobile devices.

3.1.1. Educational Benefits

There were very positive comments about ML pedagogical capabilities, including collaboration, curriculum development, interactivity, portability, student-centered pedagogy and distance education; for example:

> *"An essential learning tool, especially to be employed in the context of social constructivism. It's all about connection and collaboration."*
> *"We certainly need to be thinking about creating units which prescribe the use of mobile devices and how they can be used in workflows."*
> *"Many teachers and students are very keen to move into more interactive learning environment and we should be exploring that despite resource limitations."*
> *"With an iPad you can equip a person to go out in the workplace with a functioning tool that will only help them to succeed."*
> *"To keep teaching styles relevant to the students' learning styles."*
> *"There is great scope for the use of mobile devices in particular educational environments/settings (e.g., engaging with students studying via distance learning)."*

3.1.2. Distractedness

A number of staff were of the opinion that mobile devices are "a serious distraction and detraction from teaching effectiveness". A respondent went further to assert that "students who perform most strongly in my units do not use screens (phones, tablets, laptops) in class". Some made the suggestion "to create a walled garden firewall allowing only educational activities and applications to be active or to take place on campus". To alleviate classroom management concerns one respondent recommended: "Let teaching staff control when it's OK to be online and when it's not".

3.1.3. Student-Staff Communication

Fears that mobile devices can diminish the quantity and quality of communication were also expressed. A staff member wrote: "I am also concerned that the "communicate anytime, anywhere" idea that this technology embraces will encourage less considered communication, as I have already witnessed with some of my students." Another academic stated: "My biggest concern with mobile devices is that my experience with the growing presence of laptops in the classroom is that they discourage personal face/face interaction."

3.1.4. Superficial Learning

There were a few concerns that ML encourages quick, shallow learning because there is a "belief prevalent among young people that all the information (should be) available in the world on everything. What about figuring things out yourself sometimes?" There is also the belief that students might be inclined to wait for reminders and announcements arriving to their mobile devices rather than looking for such information. For example, a staff member commented:

> *"Increased connectivity I find encourages students to sometimes overtax lecturers with enquiries before doing their own research to find the answer e.g., many of my students with mobiles rush to sending enquiries via text on the go without first reading the unit information in full."*

3.2. Curricular Issues

Curricular issues were related to academics' training needs on various ML-related matters, both pedagogical and operational. Many respondents showed an interest in increasing their instructional and technical knowledge, such as the academic who commented: "I am totally unfamiliar with e-learning via mobile phone apps but see the need and value in this technology." Responses to professional development requirements that would enhance curriculum delivery were subsequently grouped in four categories: training delivery style, type of training, disciplinary and specific training.

3.2.1. Training Delivery

Academics differ in their preferred training delivery style. For some, workshops followed up with time for practical applications are relevant. Face-to-face training is preferred where small groups are allowed to "play and share expertise or lack of". Some found remote training difficult having a "lot of trouble learning new Blackboard without hands on help". However, there are some staff members who experiment themselves with their own mobile devices and "find out about how Blackboard (works) on these formats". There are therefore arguments to recommend hands-on experiential learning. One respondent called for continuous professional development "just to keep up to date with any change".

3.2.2. Type of Training

Various participants requested basic training not only "to manage the basics of turning (on) the tablet and general operating skills" or making the "smartphone/tablet the main mode of delivery" but also the "very different uses and issues for teachers and students". This should include learning to deploy Blackboard features in course delivery, particularly for remote students and how to interface with mobile devices. However, a large number of responses related to the integration of the technology into teaching and learning. Other studies have explored such integration; for example using digital libraries to support mobile learning activities [31] and effects of an inquiry-based mobile learning model on the cognitive load and learning achievement of students [32].

Respondents sought professional development "to not only learn how to use these technologies but to actually be able to apply them in everyday teaching". To become more re-assured about the ML pedagogical benefits, academics want "to see data (on) how they improve teaching and learning" and "evidence for their use". In particular, training should demonstrate "not just a way to think that we are contemporary when in fact no greater outcomes are being achieved". Further, "an introduction as to the why and how, with good case studies provided would be useful." Several studies support the benefits of professional development, showing that the students' learning outcomes are notably improved, as are their attitudes towards the usage of mobile learning [33,34].

Some academics also asked for information as to "how (mobile devices) cater for the needs of students and how they can make learning more interesting" and "creative ways of integrating the technology in meaningful ways to teaching students".

In particular, staff members discussed the need for learning how to use apps in an academic context, especially "how to identify the most appropriate apps and how to get the best out of them". Staff asked for resources and time to explore applications and "creative use of audiovisual programs to enhance learning". A lecturer indicated: "My learning needs are to be trained in apps that will assist a student to become more independent in the learning environment of the University".

3.2.3. Disciplinary Training

Disciplinary contexts are understood to pose their own requirements. For example, "sharing a device is cumbersome and due to the physical nature of Theatre Studies, breakages are a real threat/concern". An academic put in a request for "learning on various medical databases which have made the change from web based to smartphone based". In the School of Education, a respondent stated that they would like "a working knowledge of how to integrate GREAT technology into lectures and pre-service teacher programs". In Journalism, an academic asked for "more instruction, on how best to set up workflows for communication … and how we can make better use of these devices in a professional setting". In the School of Nursing, staff would like to see "application of this technology in the learning environment e.g., nursing laboratories". With greater elaboration, a staff member articulated the need for more training in scientific document production. For example, staff could engage in:

> *"Encouraging the use of apps in the professional niche areas across the uni e.g., introducing nursing staff to nursing apps, medical staff to medical apps etc and creating a culture where this is encouraged rather than discouraged."*
> *"Training staff in the use of communication skills to make videos in their niche areas to communicate concepts with colleagues via YouTube, Vimeo etc."*

3.2.4. Specific Training

Beyond the general and disciplinary training, there was a call for more specific professional development. In assessment, staff would like to be informed of "How to best design assessment frameworks e.g., for practical exams on an iPad". They want "just in time assistance" on learning resource design and production, "ensuring that learning materials are compatible with table formats", and information on "how to use mobile devices for further learning, reading unit material and doing exercise, quizzes and extra work".

Social media also aroused academics' ML curiosity and interest. They stated that they wanted "increasing skills how to adapt to the future direction of 2.0 learning and teaching" and "how to create current awareness via RSS and readers and social media apps" but at the same time "learning about the legal and public relations considerations in using mobile technologies (e.g., are some uses more risky?)".

Other professional development requests included research skills by learning about "easy remote access to databases as being a way to keep up with research effectively while travelling". There were

also requests for "indexing and searching and file maintenance", "utilization of programmes which link data between smartphones and the cloud", as well as for using mobile devices for administrative purposes. A staff member commented that "I could use an iPad to film and inform everyone from staff to students about my department". Another academic was interested in how mobile devices "can be successfully integrated with "live" lectures and tutorials (other than simply recording lectures and listening to the podcasts later)."

3.3. Organizational Factors

To facilitate in-depth analysis, organizational and logistic factors were further grouped into two categories - technical and corporate.

3.3.1. Technical Issues

Five operational factors were highlighted by the respondents as critical in the implementation of a ML institutional program. Paramount among these factors were the need for access to the technology, and the financial burden in terms of the purchase price and the cost of ongoing plan charges and software. As an academic said, "I am simply not on a wage conducive to owning such devices". Two staff further advised:

> *"It could only become useful to staff if staff were, in turn, provided with an appropriate mobile device for work-related use. The reason for this is that each device becomes personalized for the most productive use of its features, and a tablet or smart phone that is merely 'borrowed' for specific tasks will be underutilized and skills not retained by the user in the long-run."*
>
> *"Staff in the library can currently only experiment with the possibilities of mobile on their own personal devices. The library needs to have Android and Mac mobile devices on hand for staff to use to enable more efficient customer service as well as for teaching and other library services. It is not an option for us NOT to know about them, and many of the queries at the information desk centre on this kind of technology."*

Staff members wanted more information on "how to interface with the handheld tech and university better to enhance learning" A staff member commented: "I use an iPad and iPhone and cannot connect them to my desktop? I go home and work on a home iMac. Can we get Apple iMac desktops?" The issue of apps not working across the main platforms was noted once, but "anyway apps are cheap so not a huge issue".

The third technical issue was poor Wi-Fi connectivity in some places around the campuses in a "metro area". The need for increased capacity with the "already stretched IT support system" should be addressed to assist academic staff with their various ML related problems". Finally, there were mixed perceptions about the advantages and disadvantages of a desk/laptop over a ML device, such as not having Microsoft PowerPoint or Word running on them. For larger files, "they don't take the place of a laptop or PC for ease of writing, storage of large datasets or journal article collections … don't support large programs e.g., statistical software". Portability capability, however, seems unique because, as one staff member commented, a "tablet would be useful as I am mobile between campuses".

3.3.2. Corporate Issues

Policy, equity and workload issues were highlighted by the respondents as crucial to the implementation of ML. The importance of having an ML institutional plan to unfold a methodical integration across all schools was seen as crucial: "We currently do not have an e-learning strategy across the university and policy is dragging behind implementation and use". Such a document would clarify the university's stance on the technology. One member of staff feared that "the introduction of ML will become the 'only' orthodoxy", while another academic believed that the university "disallows online testing for fear of cheating". Staff wanted to "learn expectations of (the university) regarding the use of mobile learning as a teaching and learning strategy".

Workload-related entries were probably the most emotional of all. They pointed to the fact that making ML more prominent on the teaching and learning landscape will make their workload more demanding. As two academics remarked, it is about "learning to use mobile technology in a way that alleviates workload" or "learning to keep a limited range of mobile learning styles and devices in the beginning to avoid stress and overload". More detailed comments included:

> *"I am also concerned with the expectation that I will be available for consultations and emails to allow for 'student flexibility'. My work already encroaches on my private life."*
> *"I am also concerned that the "communicate anytime, anywhere" idea that this technology embraces will encourage less considered communication, as I have already witnessed with some of my students. It also encourages the expectation that staff will always be on call to answer their queries."*
> *"I have concerns that items such as an expectation of even greater access outside of class and work time starts to create extra time demands and impact on staff, their family and the work-life balance."*

That financial and economic disparities of denying less-well-off students access to a mobile device would disadvantage their participation in learning experiences was an issue raised by a number of academics. As they stated in the survey: "I do not want to exclude students from material or experiences because they do not have a device" … benefiting "primarily well-off students with easy access to these technologies". A suggestion was made that: "Every student should be given a smart device (tablet) on enrolment in a 3-year course. This could be paid for with a slight increase in fees." An alternative would be "to have a loan scheme to help students to purchase an iPad".

4. Conclusions

This study allowed unraveling instructional, curricular and organizational issues underlying the adoption of mobile learning in higher education. It sought to understand issues raised by the quantitative component of the research data. Such data suggested the existence of negative beliefs about ML, concerns about their ML professional knowledge as well as logistic matters constraining the adoption of ML in teaching and learning. The quantitative data, reported elsewhere, corroborated most of what the literature had found about factors facilitating and hindering ML adoption [1]. The responses in this study reflected a complex web of beliefs that, though they cannot be generalized, tell us much about the diversity of opinions that academics hold on various ML matters. It was certainly not the purpose

of this study to construct an average academic profile but rather, in the spirit of qualitative methodology, to explore issues that can be potentially either energizers or pitfalls in other similar tertiary settings [20]. The findings were illuminating, exposing multifaceted mindsets from a wide range of participants on misconceptions or alternative opinions about the effectiveness of ML pedagogies.

A distinctive aspect of this study was exploring further a number of those conceptions. There were beliefs that aligned well with the philosophy of ML, although less positive beliefs were also identified, directly endangering any adoption process. Misconceptions about the role of ML can certainly be addressed in any professional development program accompanying implementation. Misconceptions also arise during the process of curriculum implementation as educators *adapt* rather than *adopt* innovations [35].

As with academics' misconceptions about ML constraints, explicit clarification of their concerns should be addressed through professional development channels. For example, mobile tablet software also provides word-processing, spreadsheet and slide presentation applications. Statistical apps can certainly process complex descriptive and inferential operations, including graphical data representation. Detaching the idea of superficial learning from instruction-supported mobile devices can be achieved by explaining the pedagogical power of educational apps and new pedagogies associated with ML. The importance of providing case studies [32,33] highlighting supports, tools or strategies in mobile learning activities for teaching and learning would also help address concerns. On the basis of evidence-based learning, academics would realize that these small mobile applications (apps) can be efficiently used by students or by instructors individually or in groups for:

1. exploring and demonstrating models or concepts through manipulating objects that mimic or mirror complex physical situations,
2. representing objects or concepts in 2D/3D, collecting data, making calculations, or creating multimedia materials, or
3. practicing procedures through exercises, acquiring new skills through questions and answers, or retrieving information built from complex hypermedia nodes.

Despite some opinions brought to light in the quantitative data, it can also be argued that mobile devices actually reduce workload by increasing task efficiency. For example, these devices allow users to multitask and squeeze reading time into many formal and informal situations [36]. The same applies for their accessibility to online resources that would otherwise require engaging in physical movement working with print-based information. Mobile devices also permit automating administrative processes such as planning documents, personal agendas and calendars. They also allow easy physical carrying of digital curriculum-related files (e.g., PDF, Word, PowerPoint, course notes), facilitate educational management of marks, attendance and students records regardless of distance and time, and facilitate distant access to online teaching resources (e.g., internet browsing, podcasting, online Library catalogue, Blackboard, and virtual galleries).

Mobile technologies can also save meeting time by letting users collaborate at a distance in the same cyberspace. Information exchange can take place without personal attendance [37]. Similarly, concerns about students getting distracted can be easily alleviated through simple classroom management such as roaming around the room, randomizing tests and class discussions. Students can be explicitly educated to expect reasonable response times to email queries.

In general, there were fair demands for both general and discipline-specific ML training which must target pedagogical and operational skills alike [26]. A number of responses were correct in affirming the need for equity of access to technology for both academics and students, appropriate policy-making and close monitoring of likely increases in workload [5]. Academics also wanted to be re-assured that the IT infrastructure and technical support will be efficiently provided.

Broadly speaking, the findings suggest that in contrast to linear, vertical and static approaches to curriculum implementation, universities should encourage academics to engage into an open and critical re-appraisal of their own instructional repertoire. Such professional learning should be supported by evidence of best practice to clarify misconceptions or alternative conceptions.

It is recommended that further research should be conducted to compare and supplement this information through observational methods. Such research would shed light on how teachers are actually using mobile devices for teaching and learning from a naturalistic perspective. Finally, the contextualized nature of these findings as they related to a particular university culture, both in process and structures, does not allow for broadly generalizing the results and conclusions of the study.

Conflicts of Interest

The authors declare no conflict of interest.

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