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The Landscape of Mobile Learning in Brazil: From Distance Learning to On- and Offline Mobile Learning

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Abstract: Funding from the government has a significant effect on the use of distance learning in Brazil. When funding is cut, distance learning is used less, and vice versa. Most Brazilians own a mobile phone and students are willing to study by mobile learning. However, teachers generally either do not allow the use of mobile devices or do not instruct students about how to take advantage of them. Typically, phones are used for searching further information or for reading articles but not for active participation such as collaboration or creation. Despite the infrastructure challenges that exist, offline mobile learning also has potential in Brazil. Teachers need to be trained in the design of learning situations where mobile devices can be used for students to have an active role in their education.

Introduction

The world is currently in an unprecedented situation due to the coronavirus which has locked down schools and universities across the globe for weeks and months. A major question is how to continue teaching and guiding students in this new situation when face-to-face lessons and opportunities for any other contact meetings are not possible. What can be done? Teachers all over the world are having to reorganize teaching and guidance without contact sessions or any other face-to-face activities. At the same time, technological infrastructure, Internet penetration and teacher competence in utilizing digital, distance and mobile learning techniques all vary in different parts of the world. Teachers in developed countries are likely to have access to effective infrastructure, the Internet and learning management systems, digital tools and devices, as well as to have experience of designing and implementing digital learning. In addition, their students are likely to be competent in studying via distance, mobile or online modes. In the current situation, it may therefore be easier for students in developed countries to continue their work at home than for those in developing nations, although learning will undoubtedly require more effort than before the coronavirus outbreak. In developing countries, however, teachers are facing a different reality. For example, if they have a reliable Internet connection at home, it is not certain that their students do since it is typical in many such countries that students only have Internet access via their mobile phones, although the use of mobile devices is itself usually expensive. Moreover, schools and universities in developing countries do not always have learning management systems in place or any other digital learning tools and materials that could be used in this new situation. Because many teachers have not designed or implemented distance, digital or mobile learning before, they may not have the ability to start now. This is the reality that many Brazilian teachers are currently facing.

Distance and Mobile Education in Brazil

Brazil has a long tradition of using distance education (DE), especially in radio and television broadcasting, with Roquete Pinto promoting a range of projects that resulted to the creation of state educational television networks in the late 1960s and early 1970s (UNESCO, 2001). The use of DE in Brazil expanded significantly at the time, but when its funding was cut a decade or so later, this form of teaching and learning fell away considerably. In 1996, the importance of DE was recognized in national education law that set out requirements for the Brazilian authorities to develop and spread distance programmes across all levels and models of teaching (Pretti 2005 in da Cruz Duran & da Costa 2016), and government investment in DE increased again. Additionally, the value of DE was formally recognized by the Ministry of Education with the establishment of the Secretariat of Distance Education which has since developed numerous programmes, for example school television by satellite; the *Proformação* teacher training

initiative; and a national programme for informatics in education (*ProInfo*) which brought computers into public elementary schools (UNESCO 2001). *Telecurso 2000*, a DE television platform primarily designed for working young people who lacked basic knowledge or who had dropped out of formal education, was the largest pre-tertiary DE programme in the world (UNESCO 2001).

During recent years, the Brazilian government and schools have invested heavily in technology. However, challenges do exist, for example in changing teachers' attitudes about DE into positive perspectives and training them in actively utilizing technology in their teaching. Another challenge exists in the limited access to the Internet in Brazil; there are some areas where Internet penetration is high but there are others where access is poor, unreliable or non-existent.

A 2017 legislation change pushed the creation of distance learning institutions in Brazil and the number of DE hubs and students enrolled at them has consequently increased. The *Associação Brasileira de Educação a Distância* (ABED) collects information on distance learning in the country and the number of institutions participating in their survey increased last year, although participation is still voluntary. According to the 2017 ABED survey, the number of DE students rose from 5,722,466 in 2012 to 7,773,828 in 2017, and DE institutions became increasingly concentrated in the southeast and especially in the state of São Paulo (ABED 2018). There was a total of 281 institutions that offered on-site courses with partial DE provision and 196 institutions that offered accredited fully DE courses with 153 blended-learning courses, 150 non-corporate open courses and 72 corporate open courses.

Mobile Learning in Brazil

In 2017, 86% of adult Brazilians owned a mobile phone although the sale of specifically Internet-enabled smart devices has only grown significantly in the last few years; in 2013, 15% of adults in Brazil had a smartphone but this jumped to 54% in 2017 (Pew Research Centre, 2018). Future trends in Brazilian higher education will increasingly include the concept of bring your own device (BYOD) and the use of mobile apps, changes which have been estimated to be adopted over the next two years (NMC 2015).

When mobile devices are utilized in learning, they can play different roles in each educational context. For example, smartphones can be used as one of several available devices or can substitute totally all other technologies. The use of mobile devices can also be optional, meaning that students decide whether they want to use a phone, a laptop, or a PC in either classroom or blended-learning scenarios. In such cases, all activities are accessed and studied according to the student's own preferences.

Methodology

This study employs an educational design research methodology. According to, for example, Barab and Squire (2004) and Plomp (2013), design-based research in education is not so much an approach as a series of approaches, with the intention of producing new theories, artefacts, models and practices that account for and potentially impact learning and teaching in naturalistic settings. It is appropriate to develop research-based solutions to complex problems in educational practice (Plomp, 2013), and an important reason for this study's methods stems from the complex nature of educational reforms worldwide (van den Akker, 1999). The necessary shift from traditional teacher-centred contact learning to learner-oriented digital delivery is a huge practical educational reform which cannot be tackled by traditional laboratory research; it requires the development of an optimal solution to complex problems in practical terms. Design research is a holistic approach which does not emphasize isolated variables (Plomp, 2013). Rather, as van den Akker (2006) states, "while design researchers do focus on specific objects and processes (interventions) in specific contexts, they try to study those as integral and meaningful phenomena. This context bound nature of much design research also explains why it usually does not strive towards context-free generalizations."

The Study

This study is part of a larger programme of research with two primary goals: 1) The development of a research-based intervention to solve a complex problem, namely how to utilize mobile learning in the varying circumstances in different parts of Brazil; and 2) The construction of reusable design principles, namely guidelines for designing mobile learning solutions in Brazil. The starting point for the research is educational problems for which few or no validated principles (that is 'how to' guidelines or heuristics) are available to structure and support design and development activities. In this narrower study, the initial problem is understanding the current state of mobile learning across Brazil by exploring the skills and expectations held by students and teachers in relation to these potential educational solutions.

The research question in this study is: What are the characteristics of a mobile learning intervention that will best support education in Brazil? The two sub questions are: What is the current state of distance and mobile learning in Brazil? and What are students' expectations of mobile learning solutions? A cyclic process model for the study is shown below.

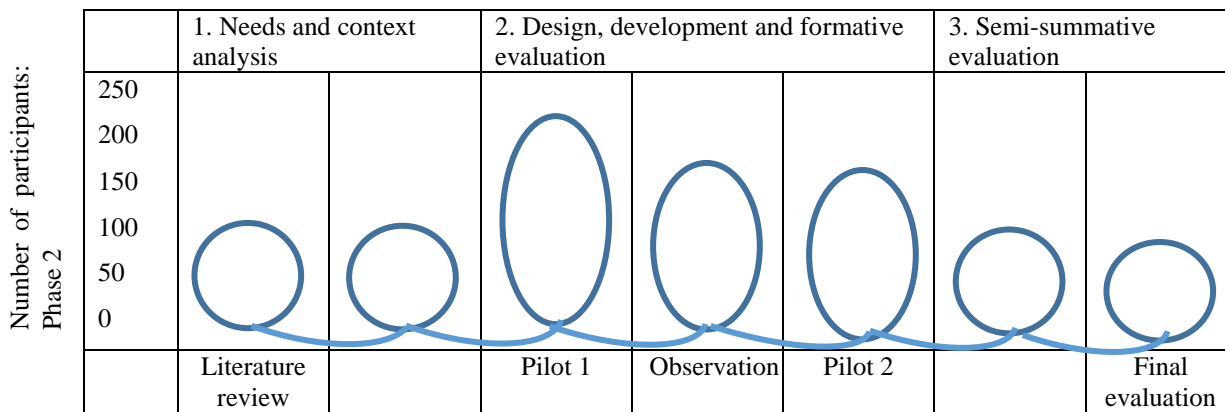


Figure 1: Cyclic process model (adapted from McKenney 2001)

Two pilot studies and observations were organized. Four institutions were involved in the first pilot study: *Escola Estadual Professora Brisabella de Almeida Nobre* (Brisabella); *Colégio da Fundação Santo André* (FSA); *EME Professora Alcina Dantas Feijão* (Alcina); and the municipal university of São Caetano do Sul (USCS). In total, 207 students aged between 12 and 34 took part and tested mobile applications for either English or math; the results of this pilot have been previously published (Aarreniemi-Jokipelto & Goulart 2017). In the second pilot study, six educational establishments were involved: FSA, Fundação Santo Andre, FSA, Fundação Santo Andre, Col., Brisabella, Escola Estadual Professora, Brisabella de Almeida Nobre, Alcina, EME "Profª Alcina Dantas Feijão" and ETEC, Escola Técnica-Mauá. There were 144 participants in this study and their age varied from 13 to 52. All institutions are located in the relatively rich São Paulo area.

At the beginning of each pilot study, the student participants completed questionnaires about their use of social media and digital devices and their preferred technologies. Students were also asked whether or not their teachers allowed or enabled the use of mobile phones in the classroom, as shown in Fig. 2 below.

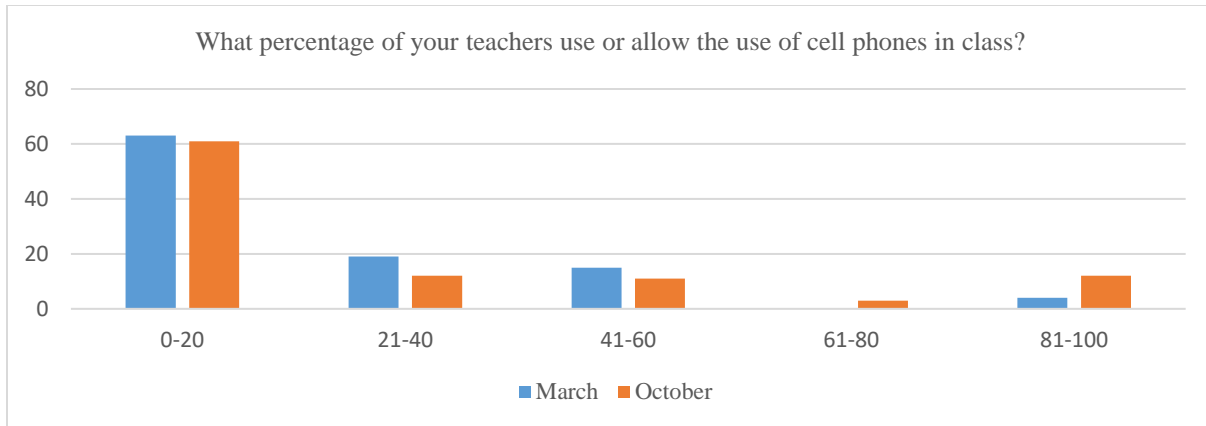


Figure 2: Percentage of teachers allowing or enabling mobile phone use in class

According to the results, 54% of students stated that 0-20% of their teachers allow the use of phones in their classrooms, and only 9% have teachers that all allow mobile phone use in classroom. Students were also asked what activities they undertake with mobile phones in classroom settings, where teachers allow their use, and the results are presented in Fig. 3 below.

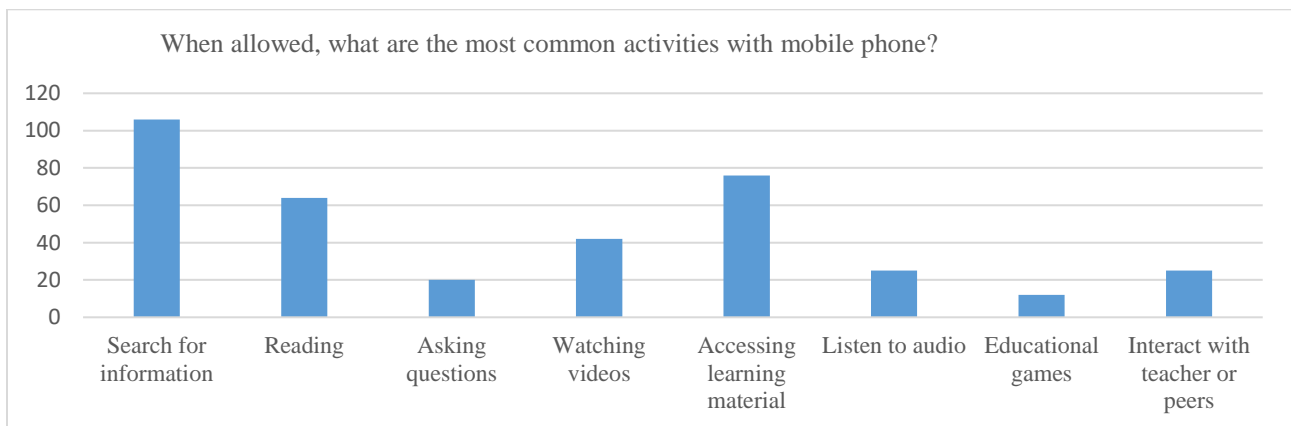


Figure 3: The most common activities with mobile devices in class

The activities were analysed using Bloom’s taxonomy (Bloom et al. 1956) and found to mostly be low-level activities in which the goal is remembering or understanding, including the students searching for information, reading and accessing learning materials. Although playing educational games and interacting with others could also include also higher goals, the questionnaires do not reveal detailed information about the depth of each activity.

The students’ willingness to use mobile devices for learning solutions was high in the pilot studies, and the classroom atmosphere in the pilot studies can be described as enthusiastic. The students had a very positive attitude towards testing mobile technologies for educational purposes and some commented that this is how they would like to study in the future.

Mobile Learning in Piauí, Brazil

Following these pilots, the use of mobile learning at the *Campus Teresina Zona Sul* of the *Instituto Federal do Piauí* (IFPI) was observed. Piauí is located in Brazil’s northeast region and is one of the poorest states in the country. This area was chosen to broaden the study’s view of mobile learning from the large metropolis of São Paulo to a poorer region in another part of Brazil.

The IFPI campus is in an area which is considered unsafe; students cannot take their mobile phones to school because there is a risk that they will be robbed on their journey. As a result, IFPI provides devices for teachers to bring to class when they are planning to use them. During observation, the teacher brought a bag full of devices and tools. Internet access was available in some of the classrooms across campus, but it was not reliable. The use of the mobile devices was therefore organized so that teachers had different plans; depending on the functionality of the technology, the teacher would implement a different plan.

In an observed English class, the teacher had prepared yellow and green cards that included QR codes, and each student received either a yellow or a green card. When the QR code was scanned, one colour included a question and the other had an answer, both in textual format. The students' task was to pair up so that their questions and answers matched. This is an example of how mobile learning can still be implemented when there is no Internet access since QR codes do not need to link to a website. By using simple text format, mobile devices can still easily support learning and make it fun. Creating this type of offline mobile solution requires creativity from teachers and an interest in designing novel learning tasks. Teachers and students do not need to have particularly sophisticated technical skills to be able to use this kind of offline learning.

The observed teacher also used audio recordings in the class. Because it was unclear whether the Internet would be working or not, the teacher uploaded the relevant audio to the mobile devices beforehand. Most of the students used the provided devices to listen to the files, but there were a few who had brought their own phones to campus, despite the unsafe situation, and they were able to download the files from the devices provided. Typically, one device was shared by two students, each with one earphone. In this exercise, the students listened to the recordings and then worked individually on their assignments. This type of offline learning has great potential if educational institutions are able to provide mobile devices uploaded with files.

Discussion

Funding from the Brazilian government has had a marked effect on the implementation of DE in Brazil; when funding has been cut, distance learning has decreased, and vice versa. Mobile phone and app use is increasing in Brazil; the number of smartphones has gone up, but it seems as though they are used for purposes other than learning (NMC 2015).

The concept of BYOD was forecast to take off in Brazil, but this has not happened in practice for several reasons: infrastructure; cost; security; and teachers' limited experience of mobile learning. The unreliable technological infrastructure is a challenge although it varies in different parts of Brazil; it works in some areas and students' devices can be used, but there are other areas which do not have roads to villages let alone Internet access. The number of mobile phones, and particularly Internet-enabled phones has increased, but it is very expensive to use the mobile Internet, and students cannot be expected to use their own access in class. Educational institutions should therefore have Wi-Fi connections or provide devices to enable mobile learning; if these are unavailable or unreliable, BYOD is not an option. In addition, BYOD is not an option when it is too risky to bring mobile phones into school.

Conclusions

According to the results of this study, students are generally willing to use mobile learning modes, but most teachers either do not allow the use of mobile devices or do not tell students how to take advantage of them. Where mobile phone use is not restricted, students typically employ them for the same purposes as in their free time. In particular, the activities of searching for further information or reading articles have low-level objectives in Bloom's taxonomy meaning that students are passively receiving information instead of engaging in an active learning mode which could move towards communicating and creating something by themselves.

Despite the infrastructure challenges, offline mobile learning has potential in Brazil. First, it requires teachers with a positive attitude to mobile learning who are creative and passionate about designing educational solutions to fit local circumstances. Second, if students cannot bring their own phones to class, institutions need to provide suitable devices. Third, if a reliable Wi-Fi connection is available, students will be able to use their own phones and teachers will not need to upload files beforehand. However, infrastructure alone cannot guarantee effective mobile learning in which students are actively working, and so teachers also need to be trained in the design of learning solutions that allow students to play an active role.

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