INNOVATIVE MOBILE LEARNING:
A SCAN OF THE LITERATURE

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ABSTRACT

This paper summarises findings from an initial study completed as the first phase of the Erasmus+ KA2 research project: Designing and Evaluating Innovative Mobile Pedagogies (DEIMP). The purpose of the scoping study was to inform the design and development of a multi-purpose mobile app that will support educators and pre-service teachers in designing and evaluating creative and innovative mobile learning episodes for their students. This first component of the DEIMP study involved the conduct of a Systematic Literature Review to identify innovative and effective practices in m-Learning. A set of 57 articles were identified as reporting on innovative mobile practices and these were further assessed for their level of innovation. The study showed that innovation lies on a continuum from sustaining innovation to disruptive innovation and that disruptive innovation is infrequent.

KEYWORDS

Innovation, Mobile Learning, Systematic Literature Review, Disruption, Sustaining Innovation, Mobile Pedagogies

1. INTRODUCTION

This short paper reports on a Systematic Literature Review (SLR), which investigates whether and how mobile pedagogies are disrupting practice. It is a component of a large-scale EU Erasmus+ project, Developing and Evaluating Innovative Mobile Pedagogies (DEIMP), which aims to support school teachers and teacher educators to design and evaluate innovative, engaging and transformative mobile learning pedagogies that will improve student learning outcomes and encourage students to become effective learners in a digital age. The project involves an intensive professional learning aspect in which teachers are supported by research-based findings in their development of effective and innovative mobile pedagogies. «A starting point for this project was an analysis of the literature on mobile learning, to obtain a scan of the innovation and disruption that may already be occurring in school mobile pedagogies. This article discusses the SLR that provides this scan. Given the focus on innovation that is central to this SLR, we first discuss the understandings of innovation that underpinned this study.

1.1 What is Innovation?

The word 'innovation' is used liberally across the education literature, policies and reports (Moyle, 2010) to describe new ideas, products, approaches or processes (Fenwick, 2016). Innovations can be small or large-scale but need to go beyond superficial change to introduce new ideas or practices that are impactful and valuable to individuals or communities (Denning, 2004; Fenwick, 2016; Linfors & Hilmola, 2016). In an education context, for example, innovation could mean new curriculum, pedagogy or assessment solutions to improve student outcomes (Danaher, Gururajan & Hafeez-Baig, 2009). Interpretations of 'innovation', or the extent to which an idea or process is new or impactful will ultimately depend on one's perception and context (Caldwell, 2018). Tornatzky and Fleischer (1990) suggest that innovation needs to be impactful at least to the people or organisation carrying out the innovation.

There are two ends of the innovation 'spectrum'. At the more conservative end are 'sustaining innovations', described as an adaption of existing approaches (Christensen, Horn & Johnson, 2008; Fenwick, 2016) and a trade-off with established practices and paradigms (Christensen, 1997). Alternatively, at the radical end of the spectrum, 'disruptive' innovation is extremely different to the status quo and can initiate a paradigm shift (Christensen, 1997), transforming existing, dominant practices. In education, disruptive innovations create new practices, purposes and processes, (e.g. of learning), new relationships between students and teachers, and potentially a change in the nature of school and its relationship with the community: "…the innovation as a whole can be considered a 'disruption' to prevalent practices" (Law, 2008, p. 428). These new practices may demand reimagining of schooling.

Innovative digital pedagogical approaches, or what Law (2008) calls 'ICT-using pedagogical innovations', typically explore the use of learning technologies to support new strategies that might change or replace traditional teaching approaches. Hedberg (2006) advocates the use of innovative digital pedagogies that facilitate a shift towards constructivist pedagogical approaches adopting student-centred learning strategies. He argues that these approaches give students control over choice of learning topics and sequences and typically encompass emphasis on their creation, evaluation and synthesis processes. They support a shift from the learner as "a passive participant toward an active engaged constructor of their own experience" (p. 181). However, Law (2008) warns that innovative digital pedagogies do not depend on the technology but rather on the intended use of the technology and the educational context. More recently, a team at The Open University in UK has issued an annual report on 'new forms of teaching, learning and assessment for an interactive world' (Ferguson et al., 2017), focusing on "novel or changing theories and practices of teaching, learning and assessment for the modern technology-enabled world" (p. 6). The group defines digital pedagogical innovation as: "new pedagogies making use of technologies to go further, to open up new possibilities" (p. 8).

2. THE SYSTEMATIC LITERATURE REVIEW

With the above discussion in mind, we conducted a SLR to explore innovative mobile digital pedagogies in school education. A SLR comprises more than an ad hoc search of literature. Instead, it uses a set of criteria and a well-defined procedure to scan various databases for articles that fit the criteria. We initiated the SLR with a focus on the following overarching research question:

How does the use of mobile technologies support innovative teaching and learning practices for school-aged learners?

This then had two sub-questions:

1. What do innovative and disruptive mobile pedagogies for school-aged learners look like?
2. To what extent do innovative mobile pedagogies disrupt traditional structures and practices of teaching and learning for school-aged learners?

Three major search terms were derived for the SLR: 'mobile learning', 'innovation', and 'school-aged learners'. From these major search terms, synonyms and alternative terms were identified. For example, informed by the literature on digital pedagogical innovation, the 'innovation' component of the search string included words such as 'disrupt', 'renew', 'redefine', as well as phrases such as 'new practice', 'new teaching approach' and 'emerging learning strategy'. The search string was applied on a range of databases to ensure that relevant studies were not missed.

This initial search and selection process yielded 208 papers. A further selection process was then carried out which yielded 72 papers. This process involved pairs of researchers applying the following selection criteria to all 208 papers included in the search results: the paper had been published in English between 2010 – 2017; the SCImago journal ranking (SJR) of the paper was in the top two quartiles; the study targeted school-aged learners (5-18 years); the study adopted a rigorous methodology and compelling evidence was presented; the paper focused on innovative mobile pedagogies (as defined in the previous section) and pedagogical strategies and approaches were identified.

If these criteria were not met, the paper was excluded. Issues related to the possible exclusion of papers were resolved through inter-researcher discussion at team meetings and any remaining questions were resolved by reading the full text of papers. We then set about a more finely grained selection process to identify the range of innovation shown in the papers. We removed papers that we felt, on a second reading, were not sufficiently disruptive to be included. At the conclusion of this process there were 57 papers selected as being suitable for inclusion in this SLR.

Our next step was to decide where on a continuum from sustaining to disruptive innovation each paper would lie. To decide this we used a scoring system based on the degree to which each paper met four criteria. These criteria were identified from our understandings of innovation as articulated in the discussion above. They were 1. Nature of task/activity; 2. The context of the learning (time, place); 3. Relationship between teacher and student (didactic, democratic, involving members of community); and finally, 4. Student agency. A table of scores was set up so that each criterion could be scored from 1 (low) to 3 (high). The team first scored nine papers collaboratively to ensure there was a shared understanding of each criterion. Each team member then independently scored a selection of papers and scores were statistically analysed for outliers. After discussion of the outliers, team members reviewed their original scores to seek greater consistency in understanding.

Each article was scored on each of the four factors. Each factor was scored 1 for low innovation, 2 for medium and 3 for high innovation or disruption, using the definitions of these described in section 1 of the article. Given that these 57 articles all displayed some innovation, they all scored at least one in each criteria. Therefore, the expected total score for each article across all four factors ranged from 4 to 12. We categorised the total scores for the articles as:

- Low: 4 - 6
- Medium 7-9
- High: 10-12.

In our final scoring, only 28 papers were identified as containing medium to high levels of disruptive innovation practices in the context of m-learning, with the remaining 29 papers focused on sustaining digital pedagogical innovations. Of these 28 papers, only three papers focused on practices that were assessed by the research team as demonstrating high levels of mobile pedagogical innovation, containing pedagogical elements that could potentially disrupt traditional practices. Figure 1 shows the position of each of the 57 papers on the continuum from low to high innovation.
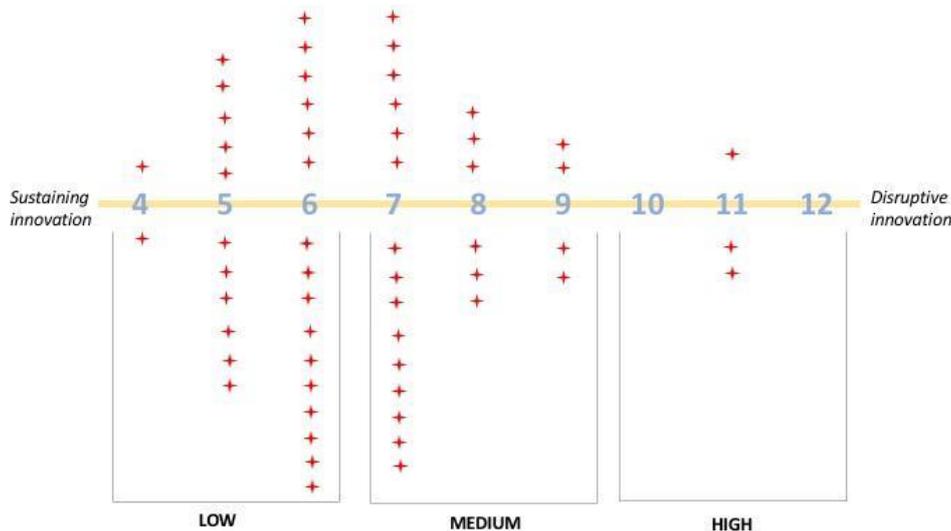

Figure 1. Innovation Spectrum - Breakdown of all 57 Papers According to Level of Disruption

The three categories can be described as follows:

- *Low level disruptions* (sustaining innovations): in these cases the innovation brought about through the mediation of mobile devices adapted existing practices or approaches to make them more effective or efficient, but not to radically change them.
- *Medium level disruption:* in these cases the innovation modified or added something new but this did not in itself fundamentally challenge or alter the underlying approaches, purposes or practices.
- *High level disruption* (disruptive innovations): in these cases the use of mobile technologies enabled learning to take place that would not otherwise be possible. It challenged and fundamentally altered existing approaches and practices such as the relationship between teachers and students or the nature of the curriculum.

The mean score for all 57 papers was just above 6 (6.3) sitting on the borderline between the low and medium innovation boundaries.

3. DISCUSSION

Of the four criteria used to rank the articles, student agency scored the highest (average 1.9 from 3) followed closely by task/activity (1.8). The other two criteria scored noticeably lower with context 1.4 and teacher/student relationship 1.3. In the most disruptive articles students had the freedom to determine the activity itself although in most cases high levels of student agency referred to how the activity was undertaken mediated by a mobile device. In many of these studies the task or activity was also designed in a deliberately flexible and thoughtful manner in order to maximise the affordances of mobile technologies such as their context aware capabilities or their ability to capture and share data spontaneously at any time or place. Despite the pervasive and ubiquitous capabilities of mobile technologies many of the 57 studies were located in relatively fixed and formal settings. Twenty five of the 57 studies were situated either in the classroom (19) alone or in the the school gardens (6) whilst 7 were located in a museum or heritage setting and 3 in an environmental setting such as an arboretum. Informal settings, such as the home or community, were rarely used as locations for these studies and relatively few of them crossed the boundaries between settings in what is often referred to as 'seamless learning'(Toh, et al, 2013). Similarly most of the studies reported traditional, hierarchical relationships between the teacher and student with few examples of sharing responsibility, co-authorship or other characteristics of a more symmetrical relationship.

As a result of the SLR and the analysis we have now completed we are set to move into a second phase of the project which will see the creation of pedagogical design principles distilled from these 57 studies, enabling teachers to design and construct their own individual innovative mobile pedagogies. Twenty-one innovative principles have been identified to date and these are currently being piloted with teachers and mobile learning experts alike using a Best/Worse scenario survey technique. The results will be used to inform the development of a mobile learning app that will enable teachers to design, evaluate and share their innovative mobile learning scenarios within a network of like minded practitioners.

4. CONCLUSION

This first component of the DEIMP study is proving significant in a number of ways. Firstly, it is providing research-based examples of innovative mobile practices that will be useful for teachers who are seeking some illustrations of effective activities with mobiles. Secondly, the SLR analysis indicates that the most likely innovations are those that are feasible, and are sustaining or incremental in nature. Given the constraints of school systems and curricula, teachers are more likely to develop, adopt and adapt feasible innovations than those innovations that disrupt practices. School executives, policy developers and teacher educators need to bear these facts in mind and adjust expectations accordingly, if they wish to see more widespread innovation in mobile pedagogies.

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