White Rose Research Online

eprints@whiterose.ac.uk
https://eprints.whiterose.ac.uk
Universities of Leeds, Sheffield and York

Deposited via The University of Leeds.

White Rose Research Online URL for this paper:
https://eprints.whiterose.ac.uk/id/eprint/88694/

Version: Accepted Version

Article:
Joynes, V and Fuller, R (2016) Legitimisation, personalisation and maturation: Using the experiences of a compulsory mobile curriculum to reconceptualise mobile learning. Medical Teacher, 38 (6). pp. 621-627. ISSN: 0142-159X

https://doi.org/10.3109/0142159X.2015.1075651

Reuse
Items deposited in White Rose Research Online are protected by copyright, with all rights reserved unless indicated otherwise. They may be downloaded and/or printed for private study, or other acts as permitted by national copyright laws. The publisher or other rights holders may allow further reproduction and re-use of the full text version. This is indicated by the licence information on the White Rose Research Online record for the item.

Takedown
If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.

UNIVERSITY OF LEEDS
University of Sheffield
UNIVERSITY of York

Legitimisation, personalisation and maturation: Using the experiences of a compulsory mobile curriculum to reconceptualise mobile learning

Viktoria Joynes and Richard Fuller, Leeds Institute of Medical Education

Background: Smartphone use is well established in society, with increasing acceptance in many professional workplaces. Despite the growth in mobile resources, how students and teachers benefit from these devices remains under-researched.

Aims: An exploration of student and educators views on the impact of mobile learning resources on placement learning experiences as part of the Leeds 'MBChB Mobile' programme.

Methods: Focus groups incorporating visual methodologies were undertaken with students from each year group; semi-structured interviews were undertaken with clinical teaching staff, including those who experienced the mobile programme as students themselves.

Results: Four key themes emerged. 'Maturity of learning', related to the way in which senior students use resources in a more nuanced way than junior colleagues. 'Learning differently', identified 'personalisation' and 'just in time' opportunities that mobile resources afforded. 'Learning legitimately' was identified by students as key to ensuring they adopted appropriate behaviours in relation to mobile learning. Using mobile resources at undergraduate level was found to 'change learning patterns for life'.

Conclusions: There is a need to further develop the educational theory behind using mobile resources for learning. The results here suggest that mobile technologies are shaping learning behaviours, and an indicator of learning maturity, reflecting the wider context of societal enculturation.

Introduction

Smartphones (enabling users to access the internet and run applications) are an increasing feature of everyday life, established as a widespread cultural norm with use in both personal and professional workplace settings. Smartphone ownership in consumer phone users in the UK has risen from 1.6% to 74% since 2005, with UK market 'saturation' predicted over the next three years. In many developed countries dual ownership of devices suggests an anticipated ownership of >100% (Arthur 2014). Accompanying this growth are increases in their use in educational institutions. Better integration and wider application of mobile technology in school age education is now a global priority (Shepherd 2011; DfE 2011; Pegrum *et al.* 2013; UNESCO 2013), with reports that 10% of US schools are already allowing students to use their own devices in the classroom for learning (Campoy and Harte 2014). From both cultural and educational perspectives, there is a consequent impact on how mobile devices and resources influence socialisation processes, both in terms of device use and educational processes. This is not a new revelation (Winters 2006) but both learner expectations and their actual use of mobile resources impact on professional development, raising questions for institutions introducing mobile resources into their curriculum.

Expanding mobile resource usage is seen in the professional healthcare workplace, with one study of 175 UK doctors finding that 82% owned a smartphone; 59% of this group reporting using their phones to access clinical information on a typical shift (Nolan 2011). Millions of applications are now available across different smartphone platforms, with large numbers of clinically-related applications available, supporting specific functions including 'teleradiology' and clinical decision making (Bullock 2014; Payne *et al.* 2012). The impact of this rise in available technology has translated slowly into a measurable impact on

education, although ‘mobile learning’ has been argued to be increasing in both visibility and significance in higher education (Ally 2009; Traxler 2009). Increasingly available technology and the acceptability of using devices for both education and working life has led commentators to suggest that the ‘mobilisation’ of resources is ‘increasingly inevitable’ and changing the face of learning (Fuller and Joynes 2014).

Nevertheless, concerns remain within the academic community that promises of “revolutions in learning processes” as a result of innovative technologies are to a greater extent “hype” (Cook and Triola 2014, p930). For e-learning to become a more effective instrument, commentators argue that educators need to be realistic about the prospects offered by technology. Clinicians express concern that using smartphones for anything more detailed than quick reference threatens the in-depth clinical reasoning skills that are reliant upon the “memorisation of intricate physiological processes” (Tobin 2014). However, both these views ignore calls for a “more nuanced view of mobile technology” that draws upon everyday social practices to shape understandings of the “relationship between mobiles and learning” (Merchant 2014, p770), and also the acknowledged need for current and future students to be “flexible” and “respond purposively to new situations and ideas” (Barnett 2014, p9). Given the increasing use of smartphones and resources in social and educational spheres, it follows that mobile learning is already well established, if not well researched. For educators, it is vital that technology is understood well enough to be introduced to enhance *rather than replace* existing resources, and that students are introduced to its use for learning within an appropriate and professional framework (Fuller and Joynes 2014; Merchant 2014).

Based upon our programme of developing mobile resources to support student learning and assessment for over six years, this work set out to investigate whether approaches to learning are changing as a result of the use of mobile resources. In moving the debate *beyond* questions concerning types of technology and devices, the discussion also considers the impact of using mobile learning on the undergraduate curriculum.

LEEDS 'MBChB Mobile' Programme

This programme supports students in the clinical workplace by provision of assessment, feedback and content applications, nested within an overarching mobile learning programme ('MBChB Mobile'). The programme spans all five years of the undergraduate curriculum, generating a broad range of activity (self and peer assessments, reflection and feedback) interfacing with a central e-portfolio. The programme builds on existing research, where student engagement with mobile learning was maximised when some mobile learning was a compulsory part of the course (Davies *et al.* 2010). This finding is central to the philosophy of MBChB Mobile, which couples clear integration within the curriculum with high faculty buy-in to ensure smartphone usage is both professional and appropriate. Students in all years are introduced to the mobile programme at the start of the course. They are encouraged to use available resources available for their year group, whilst academic and clinical teaching staff are offered CPD workshops focused on incorporating technology into teaching and making the best use of the mobile resources that students can access. Engagement with MBChB Mobile is compulsory in years 4 and 5, where the programme requires students to complete a minimum number of Work Based Assessments

(WBAs) as Assessment for Learning exercises as part of their in-course assessment portfolios.

MBChB Mobile and Phone 'Ownership'

For the first five years of MBChB Mobile, all year 4 and 5 students were loaned smartphones on which to access mobile resources. This recognised low levels of smartphone ownership at the point the programme was introduced, with students in years 4 and 5 being those away from the campus most frequently and viewed as those who would benefit the most from access to the resources. The emphasis on the loaned devices was that they should be viewed as being 'owned' by the students, as our previous work in mobile learning indicated that students would not engage with the programme if they only had access to resources for a short time (such as for one placement) (Davies *et al.* 2010). Mirroring the trends outlined in the introduction, over the last five years we have witnessed an increasing number of students using their own devices, making the loaning of devices by the school unnecessary. MBChB Mobile now sees a shift in the model of device provision, with over 75% of students using their own devices to access resources (supported by a small data bursary to ensure they incur no costs for submitting Work Based Assessments).

Methods

A two phase design was adopted to explore the complex interconnections and relationships between curriculum 'intention' and student interpretation and enaction of mobile learning within the programme.

Phase 1

Focus groups were conducted with students from all five years of the undergraduate curriculum in the academic year 2013/14. 32 students took part (6-8/group). The focus groups involved open-ended questions and some basic visual research methods in the form of 'Process Maps', whose purpose is to provide participants with a way of answering questions by making images (Rose 2012). The maps allowed participants to map out *which* electronic resources they found most useful and where they were most likely to use them. This method suited the critical nature of the research, acting as vehicle to stimulate discussion about students' interpretations of the purpose and application of the mobile learning programme and how this was enacted within their own clinical workplace experiences.

Phase 2

Complementing the first phase of the work, six semi-structured interviews were carried out with clinical teachers (four were recent Leeds graduates who had experienced the MBChB Mobile programme themselves). These interviews explored whether faculty felt mobile resources had any impact on students' work-based learning, on clinical teaching opportunities, and whether, having used these resources as students, recent graduates felt there had been impact on their continuing professional development.

All elements of the research process were approved by the University of Leeds Medicine and Dentistry Educational Research Ethics Committee.

Data analysis

The focus group and interview data were all transcribed verbatim by the lead researcher. The transcripts were then read and coded independently by each researcher using an inductive method that resulted in the coding-frame being built from the readings of the data. Reading results across data sources revealed a number of related themes which we have clustered into four key areas – *maturity* of learning, '*learning differently*', *learning legitimately* and learning patterns '*for life*'.

Results

Learning maturity

Mobile resource usage varied by both year and place, with the process maps revealing that junior students (years 1 - 3), were generally limited to using one or two key resources that they were required to use for the completion of their course (such as peer assessments within their e-portfolio). Unsurprisingly, more senior students (years 4 and 5) demonstrated maturity in their approach to trialling mobile learning materials with increased willingness to try, and likelihood to have used, a range of different resources to support their learning and assessment. This was linked to clear 'personalisation' narratives, with students adapting the available resources to suit their own needs.

When junior students accessed resources, if their use had not been immediately apparent or been promoted by staff, then they discarded these resources quickly. Often these students made no attempt to explore why and how resources might be useful or relevant. Students in later years demonstrated greater maturity in their approach to resources, typically seeking out other relevant smartphone learning materials beyond the resources

provided by the School. Students judged the 'accuracy' of the resources they had located, describing triangulating the information such resources provided; checking them from more than one source. Both year 4 and 5 students indicated that where an 'app' appeared to provide questionable information for one topic they tended to delete it, reflecting development of their critical appraisal skills. In the focus groups, there was some discussion of other resources which students had found useful:

> 5-6: I use the [app 2] for ECG because I found that really difficult as a skill…There's another one called the [app 3] Clinical Skills teachers…I think it was a website…they are producing an app, theirs is really good.
>
> 5-2: I use [app 4] it's just really good for drug interactions, how drugs work and body systems, things like that. And there's one called [app 5], they're not always the same format as the case studies we have to do but they just have hundreds and hundreds of case studies, they're really good.
>
> 5-4: You type 'medical student' in the app store and see what comes up or you see what other people have used.

Learning maturity differences were also revealed through students' use of devices as part of their formal education: one third year student (for whom the mobile programme was not yet compulsory and who therefore had chosen not to engage with the resources) suggested a perception that 'mobiles were for play and other devices were for work'. For this cohort of learners, using mobile resources for education represented a shift in expected behaviour, where previously they had been discouraged from using mobiles, particularly in their secondary school education

Learning Differently

Using technological resources for learning has long been argued to be associated with an improved ability for learners to 'personalise' their use of resources (Sampson and Karagiannidis 2002). This was evident in focus group discussions, where students discussed their preferences for performing different tasks on different sorts of devices. 'Personalisation' was also evident with students from all years indicating that access to mobile learning resources was changing how they made use of 'free' time, and more specifically that the resources enabled them to make better use of time that would otherwise be 'wasted'.

> 4-1: Yeah for instance if I turn up ten minutes early to my clinic and I know it's a…whatever clinic it is, I'm going to read up what it is.

Process maps indicated that all students were most likely to use their mobile resources while travelling and in more senior years, 'on placement with no patient present'. Another pattern of behaviour indicated that approaches to resource usage in the workplace matured *over time*. Junior students could not conceive of a situation where it would be appropriate to use a device as an 'open book' (or indeed look up anything) where a patient was present:

> 1-6: It might look unprofessional. Like they don't know what you are doing, and it might look like you don't know, you don't know what you are thinking.

This was in direct contrast to graduates, who felt that using the devices to look something up made the process 'more respectable':

> G-1: there's something slightly more respectable about looking something up on your phone where no one can really see what you're looking at than it is to getting

out a textbook and flicking through it and making it really obvious that you don't know something.

There was also recognition that using the resources could ensure consultations ran more smoothly, with a narrative that indicated both maturity and a clear patient safety focus:

> G-2: …there were a couple of time with patients when I was going through their medication lists for example if they were telling me about something that they'd had done that I wasn't familiar with I'd say "do you mind if I look it up?" so I suppose in those instances when something wasn't necessarily clear. If I was able to get the majority of information from the patient then I'd do it kind of afterwards but it was just if it was going to influence the course of the consultation I tended to do it there and then rather than going away to look it up and go back again.

Contrasting assumptions that mobile resources are useful only for quick fact-checking (Tobin 2014), the results here suggest that smartphones can actually be a transformative process in terms of clinical care, recognised by learners mature enough to appreciate the benefits to both themselves and patients. With increasing maturity towards device and resource use, further potential of mobile resources emerges to impact upon learning processes (self-directed learning 'on the job'), upon continuing professional development (as using resources to fact-check becomes a professional practice) and upon improving the delivery of safe, patient centred care. This echoes reported activity of junior doctors using smartphones in the workplace to facilitate their clinical practice. (Payne *et al.* 2012; Evans 2014; Hardyman *et al.* 2013).

'Just-in-time' learning

Earlier studies (Hardyman *et al.* 2013; Davies *et al.* 2012) identified that medical students and doctors' usage of mobile resources in clinical practice is often done for the purposes of fact-checking and consolidation. Similar patterns of behaviour were seen for senior students:

> 5-3: And reference ranges it's very useful for, because they are all up to date obviously in the BNF [British National Formulary] updates, so you can just very easily bookmark it, - you know you see doctors carrying bits of paper round – but you can just within a second have a quick look…which can be really useful.

However for students in all years, the resources facilitated the acquisition of 'new knowledge' learning, often undertaken 'just in time' using the unique benefits of mobile technologies (Koole 2009):

> 5-5: In some situations it's really useful because especially oncology or something like knowing different types of cancer drugs and cancers, when you speak to a patient, it's nice if they think that you know a bit about the medication…I can remember this really rare cancer and no-one really knew about it on the ward…but because you've got the phone you can just search it yourself so before you go and speak to them.

There was also acknowledgement from others that the 'just in time' element had helped them 'save face' with senior staff, with the benefits of this type of learning acknowledged by the more mature learners:

> 5-4: It's saved face a couple of times for me when I've been in clinic, when I've known somebody's coming in and I've not got a clue, and if I hadn't had the phone

> …I just wouldn't have known. They are always saying you know your learning is best when you can marry it with a clinical environment.

Having resources 'in their pockets' ensures that students neither forget to look up information, nor lose potential learning opportunities, as students meaningfully connect their learning to 'real time' experiences. Not only do these resources change the way in which students are able to learn 'in the moment' and tie that learning with a relevant practical case, but they also mean that students are no longer returning from the workplace with long lists of information they need to look up, enabling them to balance their time more effectively; a key skill for success in the professional workplace.

Learning 'legitimately'

One emerging theme which arose at various points throughout the focus groups was that of 'legitimacy'. All students felt that faculty support was important for the acceptability of using the mobile resources in placement settings. For this year 4 student, it is clear that the mandatory nature of the programme has been a factor in legitimizing use, and reinforces the need for the School to be active in communicating to all students that mobile learning usage is both acceptable and encouraged:

> 4-1: I think the fact that Leeds University pushes it, it kind of legitimises that you're allowed to. I think in third year when we didn't really do it there was lots of like [hides phone under table] or hiding round corners or just like, so it's useful that you are actually encouraging learning because it's quite a grey area still.

The concept of 'legitimacy' was also linked to the provision of content, where students from all years viewed that school-developed content was the most useful as it meant that the school 'wanted' students to learn it:

> 4-2: It was very useful, especially in Acute and Critical Care [module], speaking to others as well, but I myself - it's very hard to pinpoint what to learn, and…I found that [it] directed your learning a bit at least. Because you know, the University wants us to know these and how to respond to them.

School-developed, curriculum-aligned content, such as the acute and critical care resource developed to support students' capacity to recognise and respond to acute patient illness and deterioration (RRAPID) was generally viewed in the focus groups as the 'most useful' of the resources provided by the school. This finding has significant implications both for sustaining the quality of school-developed resources and for ongoing development.

Learning patterns for life

Interviews with Leeds graduates indicated that the introduction of mobile resources at undergraduate level had a lasting impact on the way in which they engaged with learning resources once qualified:

> G-3: I think it was very useful, it's definitely changed the way that I use my mobile and use technology now to learn, to have ongoing learning whilst working, and I think that the resources are endless which is what I quite like…There are still things that are out there which I know would help me in my career that I haven't found yet, so it's quite good to know that I have this sort of endless resource out there to use.

> G-2: I think the days of slogging one single textbook around that may or may not be relevant to what you are doing is almost gone now, you've got to the stage where although you are doing opportunistic learning on the ward, seeing patients and going through their notes, there's not always opportunities there to look things up, or rather you don't always have to be doing that, you can always go back to a quiet place on the ward look something up and then hit the wards again.

Further benefits for the transition into practice were supported through mandatory completion of Work Based Assessments, acknowledged to be valuable in terms of feedback opportunities, and as alignment and preparation for ongoing assessment as foundation doctors. While only two cohorts of students who have been through the entire MBChB Mobile programme have graduated, their experience of learning and assessment is changing patterns of future-learning behaviour.

Whilst not the primary focus for exploration, clinical teachers also recognised the impact on opportunities that mobile devices and resources were having on students on placement:

> I-2: I try and set not homework but you know – you should read about this and tell me more about it tomorrow, and you'll find that they don't go home and read about it because they've already looked it up so they say 'oh no we've already looked that up' a bit later and then tell you about it, it's good as a refresher for me but it's also good for them.

Such experiences represent a potentially transformative shift in how clinicians' teaching practices may be changed through greater application of mobile resources, and their own learning through indirect access to 'just in time' learning and fact checking.

Discussion

We propose that our themes of learning maturity, personalisation and legitimacy can be understood as a conceptual framework in which mobile resources shape learning behaviours, situated in the wider context of societal enculturation of smartphone use. The relationship between these elements is conceptualised in Figure 1 with a 'nucleus' of individual development through learning differently influenced by an interplay of the features of mobile learning identified here, represented by 'orbits' of personalisation, legitimacy, maturity and a developing professional identity that includes using mobile resources as part of professional practice:

INSERT FIGURE 1 HERE

In constructing our framework, we suggest that mobile learning experiences are shaped by the background of 'society', which reflects the changing 'cultural norms' of the acceptability of using mobile devices as part of working practices, and which will become more important as students are socialised into using devices as part of their education (Ally 2009). Nevertheless, this work identifies that for many current students, the learning journey can involve mixed messages, where they are encultured into using mobile devices in society but not throughout their early education (and indeed are sometimes even actively discouraged from doing so). However, the broader educational and socio-political stimuli that seek to integrate more mobile learning within the basic schooling suggest a future landscape where no such dichotomy exists, and where learners' expectations of use of mobile resources in higher education will be rather different (Fuller and Joynes 2014).

The literature highlights ongoing questions over the impact of mobile learning on socialisation processes (Winters 2006). At the centre of our students' learning experience

was a nucleus of developing professional identity in using a mobile device, contributed to through both the different learning opportunities that mobile resources afford, and the learning maturity that develops over time for learners. Consequently, we interpret that our students are socialised into their emerging identities as professionals and professional learners with the mobile resources both as an aid and a reflection of their developing maturity.

In our results this maturity manifested itself in a number of ways; notably the willingness of senior students to search for *and* triangulate further content to aid their own learning experiences demonstrated the opportunities that mobile resources can afford the mature learner. The 'personalisation' element reflects the interplay between the nucleus of learning differently and the aspects described above that are afforded by the 'legitimacy' of using the resources. The 'legitimacy' element represents a multifaceted external framework of influence which incorporates the context in which mobile resources were used, the culture of acceptability of using mobile resources promoted by the school, the level of study at which it is felt appropriate to use such resources and the appropriateness of using resources either with, or in the proximity of patients and faculty. Thus the 'legitimacy' element is crucial to both staff and students for the programme's success, and was repeatedly expressed in the enculturation of safe patient-centered practice through fact checking, open book learning and active use of mobile resources *within* consultations with patients.

The framework developed here is based upon the experiences of one School (as we are unaware of other institutions using mobile resources *programmatically* in undergraduate medical education). However the collection of longitudinal data using a two-phase

approach was deliberately employed to counter concerns about cohort effects. The innovative methodology adopted here using Process Maps not only allowed for a deeper understanding of the discussions in the focus groups, but also constructs a unique resource that has aided our understanding of the learning maturity of students and how this expressed itself through the mobile learning programme.

What are the impacts of this study for curriculum development? The philosophy of the mobile programme described in this paper has never been about replacement of paper-based resources. Admittedly, mobilisation represents opportunities to smooth out processes involved in some administrative tasks, and while potentially advantageous, the focus of a mobile *learning* programme should not simply be about replacing tasks done on paper with the equivalent on a mobile device. In developing content for a mobile programme, based upon our understanding that content needs to be both 'legitimate' and appropriate for the use of maturing learners, mobile resources should both align with, and complement, the curriculum, by adding different options to the learning experience.

The concept of 'legitimacy', we suggest, is key to the success of mobile learning. It is within the grasp of all institutions to produce relevant content, and students in this study indicated strong preferences for locally designed content mapped to both the curriculum and learning experiences in practice, which could set the scene for successful co-production between all users and recipients of mobile learning. Finally, the legitimisation and enculturation of mobile learning for learners with wider society should prompt institutions to revisit existing assumptions and expectations about the use of mobile resources. Given the increasing uptake of educators in using such resources, we now seek others interested in developing research narratives that move us beyond discussions about the choice of devices and

technology platforms and into further exploration of the impacts of resources on learning behaviours and professional development.

Acknowledgements

Thanks are due to Nancy Davies who acted as co-facilitator at all focus groups. We would also like to thank the TEL Team at LIME and particularly Gareth Frith, Dr Sue Bickerdike and Lee Gill. Our thanks also to Rebecca O'Rourke who provided comments on a draft of this article. Finally we would like to acknowledge and thank Professor Trudie Roberts for her continued support for the MBChB Mobile programme.

Declaration of interests

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

References

Ally, M. 2009. Introduction. In: Mobile learning. Transforming the delivery of education and training. Ally, M. (ed). Edmonton, Canada: AU Press. pp. 1-6.

Arthur C. 2014. The death of the featurephone in the UK – and what's next. The Guardian (online) 30 April 2014. Retrieved May 1, 2014. Available from: http://www.theguardian.com/technology/2014/apr/30/featurephone-smartphone-uk-

Barnett, R. 2014. Conditions of Flexibility. Securing a more responsive higher education system. York, The Higher Education Academy.

Bullock, A. 2014. Does technology help doctors to access, use and share knowledge? Med Educ 48: 28-33.

Campoy, A. and Harte, J. 2014. 'Mobile' Schools use technology to break free of the classroom. The Wall Street Journal. 07.09.14. Retrieved 10 December 2014. Available from: http://online.wsj.com/articles/mobile-schools-use-technology-to-break-free-of-the-classroom-1410111280

Cook, D.A. and Triola, M.M. 2014. What is the role of e-learning? Looking past the hype. Med Ed 48: 930-937.

Davies, N., Joynes, V. and Walker, T. 2010. *Assessment and Learning in Practice Settings (ALPS) – Implementing a large scale mobile learning programme. A report.* (online). Retrieved May 22 2014. Available from: http://www.alps-cetl.ac.uk/documents/ALPS%20IT%20Report.pdf

Davies, B.S., Rafique, J., Vincent, T.R., Fairclough, J., Packer, M.H., Vincent, R. and Haq, I. 2012. Mobile Medical Education (MoMEd) – how mobile information resources contribute to learning for undergraduate clinical students – a mixed methods study. BMC Med Ed; **12**(1).

Dearnley, C.A., Haigh, J. and Fairhall, J. 2008. Using mobile technologies for assessment and learning in practice settings: a case study. Nurse Educ and Prac 8: 197-204.

Department for Education. 2011. What is the evidence on technology supported learning? (online). Retrieved July 8 2013. Available from: http://webarchive.nationalarchives.gov.uk/20130123124929/http://www.education.gov.uk/a00201823/digital-technology-in-schools

Evans, R, L. 2014. Help us to engage with the text on smartphones as well as we do on textbooks. BMJ 349: g6038.

Fuller, R and Joynes, V. 2014. Should mobile learning be compulsory for preparing students for learning in the workplace? BJET: d12134.

Hardyman, W., Bullock, A., Brown, A., Carter-Ingram, S. and Stacey, M. 2013. Mobile technology supporting workplace learning and patient care: an evaluation. BMC Med Ed 13(6).

Koole, L.M. 2009. A Model for Framing Mobile Learning. In: Ally, M. Mobile Learning. Transforming the Delivery of Education and Training. Edmonton, Canada: AU Press. pp. 25-50.

Merchant, G. 2014. Mobile practices in everyday life: Popular digital technologies and schooling revisited. BJET 43:770-782.

Nolan, T. 2011. A smarter way to practise. BMJ 342: d1124.

Payne, KFB, Wharrad, H, Watts, K. 2012. Smartphone and medical related App use among medical students and junior doctors in the United Kingdom (UK): a regional survey. BMC Med Inform Decis Mak 12: 121.

Pegrum, M., Oakley, G. and Faulkner, R. 2013. Schools going mobile: A study of the adoption of mobile handheld technologies in Western Australian Independent Schools. AJET 29: 66-81.

Rose, G. 2012. *Visual Methodologies: An Introduction to Researching with Visual Materials. Third Edition.* London, Sage.

Sampson, D. and Karagiannidis, C. 2002. Personalised Learning: Educational, Technological and Standardisation Perspective. Interactive Educational Multimedia 4: 24-39.

Shepherd, J. 2011. Smartphones and handheld computers: the new battleground in UK schools. The Guardian (online) 13.12.11. Retrieved July 15, 2013. Available from: http://www.guardian.co.uk/education/2011/oct/30/smartphones-handheld-computers-battleground-schools

Traxler, J. 2009. Current State of Mobile Learning. In: Mobile learning. Transforming the delivery of education and training. Ally, M. (ed). Edmonton, Canada: AU Press. pp. 9-25.

Tobin, M.J. 2014. Put down your smartphone and pick up a book. BMJ 349: g4521.

UNESCO. 2013. Turning on Mobile Learning in Europe. Illustrative Initiatives and Policy Implications. Paris, France 2013.

Winters, N. 2006. What is mobile learning? In: Big Issues in Mobile Learning. Report of a workshop by the Kaleidoscope Network of Excellence Mobile Learning Initiative. Retrieved March 24, 2015. Available from: http://www.cin.ufpe.br/~mlearning/intranet/m-learning/Big%20Issues%20in%20Mobile%20Learning.pdf#page=5