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Colloquium

A learner-centric view of mobile seamless learning

Lung-Hsiang Wong

Address for correspondence: Lung-Hsiang Wong, LSL, NIE, 1, Nanyang Walk, Singapore 637616. Email: lunghsiang.wong@nie.edu.sg

Introduction

In a major international synthesis of 1:1 (one-mobile-device-per-learner) Technology-Enhanced Learning (TEL), Chan *et al* (2006) foregrounded the notion of seamless learning. The 17 distinguished co-authors defined seamless learning as a learning style where a learner can learn in a variety of scenarios and in which they can switch from one scenario or context (such as formal and informal learning, personal and social learning, etc.) to another easily and quickly, with the personal device as a mediator. The definition is congruent with Laouris and Eteokleous' (2005) view that mobile learning is about increasing a learner's capability to physically move her personal learning environment as she moves. Such an exposition was perhaps an intention to stimulate further research and changes in practice to maximise the potential of mobile learning. In this paper, seamless learning mediated by 1:1 setting is referred to as mobile seamless learning (MSL).

Nevertheless, after 5 years of follow-up discussions and studies with varied emphases on the MSL features, MSL remains to be a loosely defined learning notion and yet-to-be established learning model. Recognising this gap, Wong and Looi (2011) conducted a literature review and distilled 10 salient features/dimensions that characterise what "seamlessness" in the MSL environment entails:

- (MSL1) Encompassing formal and informal learning
- (MSL2) Encompassing personalised and social learning
- (MSL3) Learning across time
- (MSL4) Learning across locations
- (MSL5) Ubiquitous knowledge access (a combination of context-aware learning, augmented reality learning, and ubiquitous access to online learning resources)
- (MSL6) Encompassing physical and digital worlds
- (MSL7) Combined usage of multiple device types (including "stable" technologies such as desktop computers, interactive whiteboards)
- (MSL8) Seamless and rapid switching between multiple learning tasks (such as data collection + analysis + communication)
- (MSL9) Knowledge synthesis (prior and new knowledge as well as multiple levels of thinking skills, and/or multidisciplinary learning)
- (MSL10) Encompassing multiple pedagogical or learning activity models (facilitated by the teachers).

Indeed, Wong and Looi (2011) have made attempts to consolidate almost all of the perennial design and pragmatic issues of mobile learning. However, as this was a preliminary, bottom-up effort in formalising MSL, expositional gaps were inevitable. This paper is an attempt to pick up where we left off from the earlier publication to provide a more holistic picture of MSL.

Visualising "10 Dimensions"

One particular critique on Wong and Looi's (2011) MSL typology is that whether the 10 dimensions should be further condensed or re-categorised in multiple hierarchies. Taking the view of "personal learning environment" for mobile learning, a learner-centric diagram is derived to visualise the relationships among the dimensions (see Figure 1).

This diagram is learner-centric in the sense that it represents a model of MSL ecology not from the perspective of MSL designers or facilitators (eg, teachers) but of an individual seamless learner instead. Placing the learner at the centre does not mean that she is the centre of attention of teachers, but rather, the centre of production of knowledge that occurs in various contexts within the multidimensional learning spaces (Layte & Ravet, 2006). Such a perspective implies that MSL is not just about learning anywhere, anytime, but learning perpetually and across contexts—it is hard to determine when the learning starts and ends (Sharples, 2009). There may be episodic learning efforts taking place in different contexts, either externally facilitated (eg, started from a teacher) or self-initiated. However, such isolated learning gains may later be converged as they may mediate the same learner's learning efforts in the future (Wong, Chen, & Jan, 2011).

The diagram is intended to signify a hierarchical view of the ten dimensions. Specifically, MSL3 (across time) and MSL4 (across locations) are identified as the highest-level, universal dimensions that embody all other dimensions. Within this two-dimensional space, there exist three specific continuums of learning (sub)spaces, namely, MSL1 (formal/informal learning), MSL2 (personalised/social learning) and MSL6 (physical/digital worlds), which are loosely grouped together in the parallelogram. Under the multidimensional learning spaces, a learner may use multiple devices (MSL7) to mediate all her MSL endeavours. Two external inputs, MSL5 (ubiquitous access to learning resources) and MSL10 (multiple pedagogical/learning activity models), serve for initiating or enhancing the learner's specific learning tasks, are accessed by the

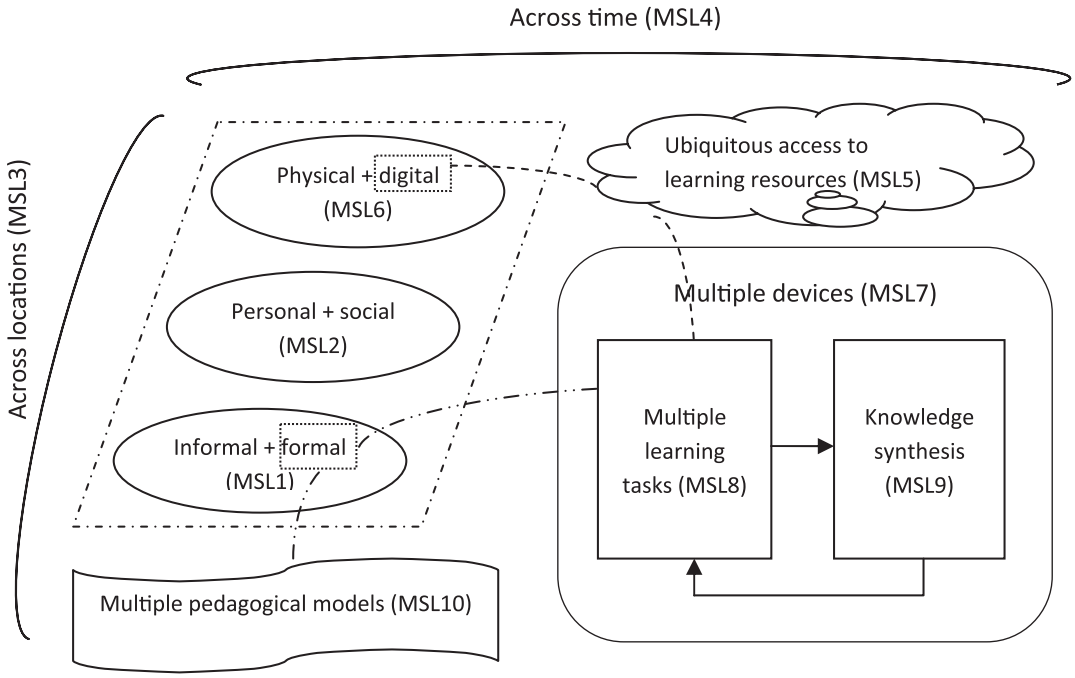

Figure 1: Visualisation of the 10 MSL dimensions

learner through the formal learning space and the digital world respectively. With the interplay of all the previously mentioned dimensions, a learner will be able to perform, and seamlessly switch between, multiple learning tasks (MSL8), which may lead to knowledge synthesis (MSL9). However, because of the perpetual nature of seamless learning, the learning outcomes of MSL9 may be fed back to MSL8, that is, another round of learning activities that takes place in the future.

Online resources versus knowledge

One particular change in the labelling of the 10 dimensions is to revise MSL5 ("ubiquitous knowledge access") to "ubiquitous access to learning resources," which better reflect the original notion of MSL5. The term "learning resources" embodies online data and information, teacher-created materials, student artefacts, students' online interactions (such as those on mobile forums), and many more, to be retrieved either or not in context-aware manner. Congruent with the perspective of Problem-Based Learning (Savery & Duffy, 1995), we advocate learning activities to be mediated by teacher-supplied or learner self-identified resources, rather than transmissions of fixed content or knowledge. Seamless learners are supposed to be knowledge builders who treat any material that they acquire from the Internet as resources to support their sense making and knowledge construction.

Learning hub view versus multiple device (MSL7) view

The SEAMLESS project (Looi *et al*, 2010) was a 3-year (2008–2011) study that aimed to develop a socio-techno-pedagogical infrastructure for sustainable 1:1, 24 × 7 (24 hours a day, 7 days a week) seamless learning within a primary school in Singapore. Arisen from their research findings, the team put forward the notion of mobile device as a "learning hub" for individual seamless learners (Looi *et al*, 2009; Wong, Chin, Tan & Liu, 2010; Wong & Looi, 2010). The underpinning concept is that the mobile device carried by a learner 24 × 7 integrates all the personal learning tools, resources and self-created artefacts at one place. Learners can foster their routine use of the learning hub to manage their own MSL (Zhang *et al*, 2010). This affords a learner to seamlessly synthesise (or: "pick-and-mix") suitable learning resources that she picked up along her ongoing learning journey to mediate the latest learning task (Wong, Song, Chai, & Zhan, 2011). Simply put, a "learning hub" should be the nucleus of: (1) a suite of affordances to support learning activities, and (2) the learner's learning history (including stored resources and self-created artefacts).

Notwithstanding the conventional notion of 1:1, which is in fact "one-device-*or-more*-per-learner" (Norris & Soloway, 2002), is also considered a "division of labour" strategy where a learner may use mobile devices of different form factors for different learning tasks or in different learning contexts. For example, smartphones are perfect tools for rapid learning tasks on the move, such as photo taking, note taking, quick communication, Internet search and map navigation. Whenever learners have the chance to sit down, notebooks or even desktop computers are plausible options for carrying out more "complex" learning tasks such as data analysis, report writing and learning in 3D virtual environments. The "learning hub" view of MSL is inadequate in terms of encompassing this flexibility.

The proliferation of cloud computing technology offers a viable solution. A personal "learning hub" need not be associated with a hardware device. Instead, it may exist as a learner account (that stores the learner history) on a cloud-based, device-independent seamless learning platform (that provides a suite of learning affordances) (eg, Wong, Chai, Chin, Hsieh, & Liu, 2011). In this regard, we advocate the combination of a cloud-based "learning hub" account, a smartphone (24 × 7 access), and additional notebook/desktop computers as an ideal technical setting for a personalised seamless learning environment.

Conclusion

Building on the expositions on MSL by Chan *et al* (2006) and Wong and Looi (2011) which were relatively researcher/instructor design-oriented, this paper departed from the two publications by foregrounding individual learners' perspective to reconceptualise MSL. Whereas one may interpret from Figure 1 that the ultimate objective of MSL is to achieve knowledge synthesis, an equally important motivation for us to promote MSL is to foster the habits of mind and skills of seamless learning among the 21st century learners. The reconceptualisations of MSL5 and "learning hub" notions highlight the significance of seamless learners' epistemological beliefs and the roles that learner history would play in their ongoing, self-directed learning journey. Indeed, learning and living are inherently integrated (Jaros & Deakin-Crick, 2007), as learning is a way of establishing one's identity in the material world, an "integrative, whole body process that consists of rational, intuitive, affective, sensory and volitional way of knowing" (Clark, 1997, p. 28). Mediated by technology, a seamless learner should be able to explore, identify and seize boundless latent opportunities that her daily living spaces may offer to her, rather than always being inhibited by externally defined learning goals and resources.

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