What Seams Do We Remove?
The 10 Dimensions of Mobile-Assisted Seamless Learning

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Introduction

• Seamless learning (SL): seamless integration of the learning experiences across various dimensions - formal and informal learning contexts, individual and social learning, physical world and cyberspace ...

• Chan, Roschelle, His, Kinshuk, Sharples, Brown et al. (2006) – 1:1 seamless learning

• A critical review of Mobile-assisted SL (MSL) papers => 10 dimensions of SL

• Is SL just a habit of mind? A potential pedagogical strategy? Must SL be mediated by m/u-devices?
Seamless Learning Before Chan et al. (2006)

• ... important to link in-class & out-of-class experiences to create SL & academic success (American College Personnel Association, 1994)

• “The word seamless suggests that what was once believed to be separate, distinct parts (e.g., in-class and out-of-class, academic and non-academic; curricular and co-curricular, or on-campus and off-campus experiences) are now of one piece, bound together so as to appear whole or continuous. ... students are asked to use their life experiences to make meaning of material introduced in classes...” (Kuh, 1996, p.136)
After Kuh (1996) ...

- ... further discussions on SL (e.g., Bell, 2000; Seifert et al., 2008)
- ... further relevant studies (e.g., Smith & Northrop, 1998)
- ... additional dimension of learning community (e.g., MacGregor, Tinto & Lindbald, 2001; Tinto, 1998)
- ... intertwining of individual & collaborative learning (e.g., Kazmer, 2005; Skop, 2008)

*Common characteristic: Higher Education!***
Three generations of m-learning (Yu, 2007):

- *Mobilise* content (transmissionism / behaviorism)
- Pedagogy (cognitivism / constructivism)
- 1:1 + context-aware (situated learning)
  - “...increasing a learner’s capability to physically move their own learning environment as they move” (Barbosa & Geyer, 2005)
  - “Nomadic Learners” (Brodersen et al., 2005)
  - The trend of stitching formal & informal learning context ... personalised learning experiences
According to Chan et al. (2006) ...

“... (The evolution) is characterized by ‘seamless learning spaces’ and marked by continuity of the learning experience across different scenarios or contexts, and emerging from the availability of one device or more per student. By enabling learners to learn whenever they are curious and seamlessly switch between different contexts, such as between formal and informal contexts and between individual and social learning, and by extending the social spaces in which learners interact with each other, these developments, supported by theories of social learning, situated learning, and knowledge-building, will influence the nature, the process and the outcomes of learning.” (p.23)
Making SL a Culture?

• M-learning should become a part of the learning culture than an adjunct to it (Leung & Chan, 2003)

• Genuine MSL could not be taken for granted by assigning each learner a mobile device or by enacting episodic m-learning activities without going beyond the planned learning hours and venues ...

• ... encourage learners to extend their learning into the informal context by picking up incidentally learned knowledge, applying knowledge in real-life, and relating back or questioning the knowledge in the formal curriculum (Wong, Chen, Looi & Zhang, 2010)

• **Enculturation**!
Post-Chan et al. (2006) ...

- Diversified & loose (re-)definition of SL
  - techno-centric (u & context-aware technologies) (e.g., Hwang, Tsai & Yang, 2008)
  - SL = u-learning??? (e.g., Ng & Nicholas, 2007)
  - Habits of mind in personal & collaborative learning (e.g., Rogers & Price, 2009)
  - Educational ecology to support SL (e.g., Looi et al., 2010)
  - 3 Dimensions of MSL scenarios: locations, scales of number of co-learners, learning activity models (Deng, Lin, Kinshuk & Chan, 2006)
Analysis of MSL Literature (52 Papers)

• **Conceptual work on 1:1 SL or u-learning (11)**
  – Chan et al. (2006); Deng et al. (2006); Ng & Nicholas (2007); Chiu, Kuo, Huang & Chen (2008); Hwang et al. (2008); **So, Kim & Looi (2008)**; W. Wang & Wang (2008); Kukulska-Hulme, Sharples, Milrad, Arnedillo-Sánchez & Vavoula (2009); Obisat & Hattab (2009); Otero, Milrad, Santos, Veríssimo & Torres (2009); Rogers & Price (2009)

• **Technologies or pedagogies to support 1:1 regular classroom-based learning (4)**
  – Chan, Chen & Chou (2006); S.-B. Chang, Ching & Chen (2006); Li, Feng, Zhou & Shi (2009); Miyata, Suzuki & Sannomiya (2009)
More Literature ...

- **Technologies or pedagogies to support episodic 1:1 context-aware ubiquitous learning (19)**
Even More ...

• **Technologies or pedagogies to support specific ongoing 1:1 learning activities (8)**
  
  – H.-J. Huang (2007); Y.-T. Huang et al. (2007); Lin, Chen & Chen (2008); Metcalf, Milrad, Cheek, Raasch, & Hamilton (2008); J. Wang & Li (2008); Pham-Nguyen & Garlatti (2008); Uosaki, Li, Hou, Ogata & Yano (2009); **Wong, Chin, Tan & Liu (2010)**

• **Longer term 1:1, 24x7 programs or development of relevant socio-technical infrastructure (10)**
  
  – Kerawalla et al. (2007); Khan & Zia (2007); Lai, Yang, Chen, Ho & Chan (2007); Vogel, Kennedy, Kuan, Kwok & Lai (2007); Yu et al. (2009); Zhang & Maesako (2009); Bentley et al. (2010); El-Bishouty, Ogata, Ayala & Yano (2010); **Looi et al. (2010)**; Zhao, Wan & Okamoto (2010)
10 Features/Dimensions of MSL

(MSL1) Encompassing formal and informal learning;
(MSL2) Encompassing personalised and social learning;
(MSL3) Across time;
(MSL4) Across locations;
(MSL5) Ubiquitous knowledge access
(MSL6) Encompassing physical and digital worlds;
(MSL7) Combined use of multiple device types
(MSL8) Seamless switching between multiple learning tasks
(MSL9) Knowledge synthesis
(MSL10) Encompassing multiple pedagogical or learning activity models.
(Rough) statistics

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- Not definite statistics; meant to give us a sense of how the research community prioritises the MSL features
- E.g., One-off field trip designs (e.g., Milrad, 2008; Sharples et al., 2009) tend to encompass MSL4, 5, 6 & 8
- E.g., Longer term 1:1, 24x7 access programs (e.g., Looi et al., 2010; Metcalf et al., 2008; Wong et al., 2010) tend to incorporate MSL1-6 & 9
Encompassing formal & informal learning

- Discrepancies ...
  - e.g., Kukulska-Hulme et al., 2009; Mann & Reimann, 2007; So, Kim & Looi, 2008; Vavoula & Sharples, 2009

- Chen, Millard & Wills (2008): Four dimensional model – objective, environment, activity & tools
  - For each dimension: student-led, teacher-led or negotiated

- How about ...
  - Formal learning in formal settings
  - Formal learning in informal settings
  - Informal learning in formal settings
  - Informal learning in informal settings

- The seam is blurring!

- “... a dialogue between two worlds of education!” (Sharples, Taylor & Vavoula, 2007, p.241)
Encompassing Personalised & Social Learning

- F2f, in-situ social learning
  - Small-group collaborative tasks (Kurti et al., 2008); Ad-hoc networked group forming (N.-S. Chen et al., 2008); Co-creation of student artefacts (Wong & Looi, 2010); Collaborative annotations (Shih & Tseng, 2009)

- Online strategies
  - Ad-hoc help seeking (El-Bishouty et al., 2010); Knowledge sharing / peer reviews (Miyata et al., 2009); Asynchronous peer discussions (H.-J. Huang, 2007)

- M-learning design to be catalyst for f2f interactions
  - Student-parent (Looi, Zhang, Seow & Chia, 2010); f2f within community (Ogata et al., 2008)

- Hybrid: “through” & “over” the devices (Maldonado & Pea, 2010)

- “We researchers should be particularly sober in this era of intensive network communication where almost every researcher overemphasizes the importance of social exchanges in learning to the extent that we might have forgotten individual needs and affects.” (Chan, Chen & Chou, 2006, p.15)

- Few papers explicitly discuss mechanism of bridging the two (e.g., Wong et al., 2010)
(MSL3) Across Time & (MSL4) Across Locations

- Anytime, anywhere? Every time, every where?
- 1:1, 24x7 ... external constraining factors, e.g., parents (Wong & Looi, 2010)
- Recognising that many reviewed papers were one-off activities or digital classroom solutions ...
  - Context-aware activities with RFID/QR-codes ... even need to take place within predefined areas (Hwang et al., 2008)
- Classroom-site-classroom (Pintus et al., 2004); bridging indoor & outdoor (e.g., Milrad, 2008)
- Extending supposedly one-off activity into “cross-time, cross-location” socio-constructivist learning
  - e.g., Wong & Looi, 2010; Maldonaldo & Pea, 2010
(MSL5) Ubiquitous Knowledge Access

- **versus MSL6: Encompassing physical & digital worlds**
  - MSL5: pushing/pulling of info from the Internet when learning
  - MSL6: Complete physical + digital learning experience/habit

- **MSL5 Type 1: context-aware learning**
  - GPS, RFID, QR-code for location info (e.g., Rogers & Price, 2008)
  - Virtual maps for site navigation (e.g., Spikol & Milrad, 2008)
  - Sensors to detect environmental contexts (Hou, Ogata et al., 2009)
  - Not just “consume” but augment contextual info (So et al., 2009)

- **MSL5 Type 2: ubiquitous info retrieval**
  - Mobile forum (Huang, 2007)
  - M-learning resource retrieval (Wang & Li, 2008)
  - 1:1, 24x7 programs allowing students to access Internet (Looi et al., 2010)
(MSL6) Encompassing physical & digital worlds

• A perspective of student learning experience?
• Through MSL design that emphasizes learners’ sensemaking & interactions with the physical reality (e.g., Rogers & Price, 2008; Wong, et al., 2010), m/u technology could be a motivator to bring them “back” to the physical world; striking a balance
• Rapid connections could be made between ideas & observations in the physical world which are transformed into digital forms for subsequent processing & sharing (Chen et al., 2010)
• Designs with MSL5 do not necessarily imply MSL6
  – Learning activities that “consume” contextualised data only but no other learning activity in the digital space
  – Learning activities taking place only in the digital space (e.g., Metcalf, et al., 2008)
Combined Use of Multiple Device Types

• 1:1 – one device or more (Norris & Soloway, 2002, 2004)
• Various models:
  – Retrieving same learning resources with different types of devices (Wang & Li, 2008)
  – Integrated environment for learners to connect with heterogeneous devices (Chang & Chen, 2007)
  – Mixed usage of mobile & stable technologies (Ng & Nicholas, 2007)
    • Technical solutions (Yang, 2006; Zhao et al., 2010)
    • Learning designs (Maldonado & Pea, 2010; So et al., 2009)
  – “Synchronous” use of multiple device types (Kurti et al., 2008; Rogers & Price, 2008)
• More than one device, 24x7? E.g., smartphone + netbook
Seamless switching between multiple learning tasks

• "... mobile computing devices tend to be used for **short bursts of times** (e.g., entering and comparing data, looking up and reviewing information, sending texts or photos to remote people) to support **foregrounded physical activities** in a particular environment ... to provide multiple opportunities for students **to step in and out** and reflect upon these transitions. In so doing, it could deepen their understanding and help **integrate their ideas, data and observations**.” (Rogers, Connelly, Hazlewood & Tedesco, 2010; p.112)

• Move beyond overemphasis on context-aware info retrieval plus relatively structured learning activities (e.g., Khan & Zia, 2007; Yang, 2006) ...

• ... by integrating a variety of personal & group inquiry tasks into the learning flow (e.g., Maldonado & Pea, 2010; Rogers & Price, 2008) ...

• ... or, differentiating in-situ & “off-line” tasks ... (e.g., So et al., 2009; Wong et al., 2010)
(MSL9) Knowledge Synthesis

• Personal mobile device as a *learning hub* (Looi et al., 2009) -> acquiring data and knowledge in different domains and forms at different time and in different contexts, and recording, organising, processing and reflecting upon the knowledge

• Three overlapping forms of knowledge synthesis:
  – Cross-subject knowledge (Kurti et al., 2008; Metcalf et al., 2008)
  – Prior & new knowledge (Lai et al., 2007; *Wong et al.*, 2010; Yang, 2006)
  – Abstract & concrete knowledge (Rogers & Price, 2008; *So et al.*, 2009)
(MSL10) Encompassing multiple pedagogical or learning activity models

- Some technical solutions: Chang & Chen (2007), Shih & Tseng (2009); Obisat & Hattab (2009)
- The learning point: design MSL to facilitate a greater variety of learning modes
- However ... excessively complex learning flow may result in cognitive overload
  - As Rogers & Price (2008) observed in their Ambient Wood study, “The students decided themselves how to manage their time and which activities to pursue, so as not to get overloaded or distracted”
Discussion

• 10 dimensions – loosely divided into:
  – *Technology*: MSL5 (u-knowledge access), MSL7 (device types)
  – *Pedagogy*: MSL8 (learning tasks), MSL10 (pedagogical models)
  – *Learner focus*: MSL1 (formal/informal), MSL2 (personalised/social), MSL3 (time), MSL4 (locations), MSL6 (physical/digital)

• Nurturing seamless learners: technology-driven -> pedagogy-orienting -> self-directed?
• Assisting in identifying gaps for individual MSL designs
By advocating MSL, it is our intention to combine ...

• the technological resources (MSL5 and MSL7), and
• pedagogical means (MSL8 and MSL10) ...
• to “ignite” (scaffold, nurture, support) our learners’ “inner fire” of sense making (relevant to MSL9).

Such dispositions are stimulated by new information (intentionally or incidentally) accessed or sensed ...

• anytime, anywhere (MSL3 and MSL4), and
• within any context (MSL1, MSL2, and MSL6)
thus enabling the learners to experience genuinely holistic learning.

Thank you!
SEAMLESS Project Team
“Move, Idioms!”
(Seamless Language Learning)