Creating coherent incidental learning journeys on mobile devices through feedback and progress indicators

Mark Gaved, Agnes Kukulska-Hulme, Ann Jones, Eileen Scanlon
The Open University
Milton Keynes, UK
mark.gaved@open.ac.uk

Ian Dunwell, Petros Lameras
Serious Games Institute,
Coventry University
Coventry, UK
idunwell@cov.ac.uk

Oula Akiki
busuu.com
London, UK
oula@busuu.com

ABSTRACT

Timely and appropriate feedback and indicators of progress can motivate learners. Mobile learning poses a challenge to established instructional strategies with respect to delivering feedback and monitoring learner progress, particularly in informal and incidental learning occurring outside of formal structured learning environments. We argue that well-designed and managed feedback and progress indicators can offer guidance and a sense of structure to learners in the absence of a formal curriculum, accreditation or set outcomes. Furthermore, they can encourage casual users of mobile applications to move from fragmented learning episodes towards a more long term and reflective learning journey. In this paper we describe how we are developing feedback and progress indicators for the EU-funded MASELTOV project, which explores how smartphones can support language learning and social inclusion for recent immigrants to Europe. Presenting educational services and materials on mobile devices allows learning episodes to be incorporated into daily activities and schedules, to be accessed at times and in places that suit learners best. Feedback and progress indicators embedded into these services may motivate such an audience to reconceptualise fragmentary, ephemeral educational experiences into a more coherent, sustained learning journey. We describe how feedback and progress indicators have been used successfully in web-based and games-based learning, and our assessment of which types may best support incidental mobile learning and the challenges we face.

Author Keywords

Incidental learning, feedback, progress indicators, informal learning, language learning, serious games, immigrants

INTRODUCTION

Feedback and progress indicators are part of a developing research agenda in which aspects of the formal learning process are re-examined and re-designed for effectiveness in a digital and mobile age (e.g. Beetham & Sharpe, 2013). Educational research suggests that timely and appropriate feedback and indicators of progress can motivate learners (Nix & Wyllie, 2009), which may increase retention and contribute to the completion of programmes of study. However, it is also recognized that learners can take little notice of feedback from their teachers and rather than being mere recipients of performance-related information, they should be actively involved in seeking, generating and using feedback (Boud & Molloy, 2012). Therefore feedback and progress indicators are important, yet there is much scope for improvement and innovation.

Mobile learning creates new opportunities for providing feedback and assessing or reflecting on learner progress, particularly in informal learning occurring outside formal structured learning environments. In these settings, mobile participants make use of their surroundings and interactions with other people as part of an informal learning journey, which may be individual or socially constructed with other learners. We argue that well-designed and managed feedback and progress indicators can offer guidance and a sense of structure to learners in the absence of a formal curriculum, accreditation, or predicted outcomes. Furthermore, they can encourage casual users of mobile applications to move from fragmented learning episodes towards a more long term and reflective learning journey.

Our work is contributing to the EU FP7 MASELTOV project (http://www.maseltov.eu), which is exploring how incidental learning, that is, "unintentional or unplanned learning that results from other activities" (Kerka, 2000, p.1), may support language learning and social inclusion when delivered via mobile devices (specifically, Android smartphones). We are developing a number of tools and services that will be provided as smartphone apps and are intended to help with social integration and improve the quality of life of recent immigrants, who may have difficulty engaging with formal learning due to commitments to work or other personal circumstances (Kluzer, Ferrari & Centeno, 2011). These include the explicitly educational (e.g. language lessons); some more social in nature (e.g. a GeoSocial radar that will identify nearby volunteers who can help with a problem); informational resources; and a game to encourage cultural understanding.

Key to this model of learning is identifying how to encourage occasional adult users of these very different apps to engage with a more long term and coherent learning journey, moving beyond resolving immediate challenges and helping them attain broader goals (e.g. language competence sufficient to communicate with their child's school teacher,

or to independently negotiate local bureaucracy in their new host country). A key question is: **How can fragmented learning episodes be reconceived by users of educational apps as elements of a more coherent, longer term learning journey?**

We propose that feedback and progress indicators may play an instrumental role in helping learners reflect upon the individual learning episodes and conceive them as constituting elements of a longer learning journey. We define feedback as responses to a learner's performance against criteria of quality and as a means of directing and encouraging the learner; and progress indicators as responses indicating the current position of a learner within a larger activity or journey (often related to time). Drawing partly from the worlds of web-based language learning and video games, we are currently investigating which feedback and progress indicators may best support incidental mobile learning, and the major challenges faced. These will form the basis of recommendations to technical partners and field testing in 2014.

INCIDENTAL LEARNING: DEFINITION AND CHALLENGES
MASELTOV is exploring incidental learning, which has been described as "unintentional or unplanned learning" (Kerka 2000, p1). Unlike formal, classroom based learning, it is not led by a tutor, nor does it follow a structured curriculum, or result in formal certification. It can be distinguished from informal learning as it is not planned: no goal to achieve learning outcomes has previously been set. It may occur while pursuing another goal, or emerge while carrying out another task. For example, when travelling in another country, I decide to visit a relative. Arriving at the train station I become aware that there are changes to services, and have to ask for help and guidance. My goal was to visit my relative: incidental learning occurred as I had to learn enough new vocabulary to ask directions and understand responses, or I learnt some new language by listening intently to a response and observing gestures.

Smartphones are particularly suited to this type of learning, and offer specific affordances. 'Affordances' are the properties of the system which allow certain actions to be performed and which encourage specific types of behaviour (Tolmie and Boyle, 2001). For example smartphones' portability and internet connectivity enable learning to be undertaken almost anywhere, any time, and be embedded within every day activities. The sensor-based additional functionalities increasingly offered as standard on smartphones enable context aware learning. GPS receivers can identify position, cameras can gather images and video, accelerometers can detect motion: these can all provide a learning system with data that may prompt situation-specific learning activities (Scanlon, 2013). Furthermore, mobile phones are familiar personal devices, already integrated into their users' daily routines.

However, there are challenges associated with mobile *incidental* learning (the challenges of learning on mobile devices have been well described elsewhere, e.g. Kukulska-Hulme, 2005). As unplanned learning, without a specific goal in mind, it can consist of isolated, fragmentary episodes. The 'learner' may not conceive each episode as cumulative, and may not carry out any reflective or reinforcing activities. The learning episode may be considered "ephemeral learning" – learning to resolve a specific situation and not as a skill that could be applicable in the future. I might use a language app to find my rescheduled train, but not consider I will return to that country in future and so not engage in any reflective language learning practice after the event. A challenge for educational researchers is to consider how learners can be prompted to reconceptualise these fragmented learning episodes as potentially part of a larger, long term and more coherent learning journey. Feedback and progress indicators could play a significant role in providing this stimulus. They might encourage reflection on learning episodes and motivate future, planned learning with the intention of increasing knowledge, and the reconceptualisation of different tools that have been used in isolation (e.g. a vocabulary tool, the use of a navigation tool to find a local service) as part of a distributed ecology of learning tools that can be used in concert to enable more powerful learning over time, and across places and contexts.

Feedback, and progress indicators (FPIs) can motivate a learner and encourage continued learning and reflection on completed learning activities. FPIs may encourage a range of actions including: study planning and goal setting, participation, confidence building, reflective learning, generating a sense of community, and fun and enjoyment. In this paper we focus on how FPIs may encourage reflective learning and continued participation. We are keen to encourage occasional users of the individual apps to consider what they have learnt, and how they can continue to learn (by returning to the same tool or using others).

FPIs have been used extensively to encourage reflective learning and participation in formal and informal learning, for example formative and summative assessment in accredited courses (marked assignments, examinations, teacher guidance), and are often present in informal learning (tutor feedback and certification for completion in leisure classes, personal goal setting, peer feedback and recognition in social learning environments). FPIs may reflect current progress as measured against a larger journey as well as in response to an immediate action by a learner. Incidental learning, however, undertaken without prior planning, may trigger no feedback beyond a learner's own impression of the value of the knowledge gained, or only FPIs relating to a specific task. The challenge for educational designers is to provide feedback that will encourage reflection, practice, and uptake of other available learning tools and services, to encourage the reimagining of isolated incidents as part of a larger, more coherent learning journey.

FPIs can be instantiated in a range of ways across different learning environments and can be cognitive (knowledge achieved, assessment results), affective (praise, emotional reflection) and social (peer ratings of quality of participation, support). Table 1 considers how these might be expressed in a classroom based language qualification (traditional formal), online language lessons studied as a leisure activity (planned informal), and a recent immigrant improving their language skills through their daily activities in their new host country (incidental learning). It shows the scarcity of likely feedback resulting from personal, incidental learning. We can see a lack of goal planning, reflection on improving performance for specific activities, and structured feedback from peers.

Type (examples)	Traditional Formal	Planned Informal	Incidental/ unplanned
Cognitive (Quality of learning, results recognition)	Externally set curriculum (e.g. national subject guidelines), formative assessment (e.g. weekly tests), summative assessment (e.g. accredited nationally awarded certification)	Planned goals, navigation maps, structured levels of difficulty, peer ratings of exercises completed (e.g. online peer marking), self-assessment of progress, summative assessment (unaccredited college awarded certification)	Successful resolution of incident, reflection on actions
Affective (Praise, emotional reflection)	Teacher feedback (face to face or written responses in assessment), personal assessment of learning (e.g. individual learning plan) peer recognition	Mentor feedback, peer encouragement and recognition (e.g. online star rating or "likes" by fellow learners), personal assessment of learning (e.g. satisfaction survey)	Personal reflection, Instigating discussion of achievement with peers
Social (Peer support)	Reading group, study buddies	Structured feedback from peers, group forum	Ad hoc / on request feedback from peers

Table 1. Examples of types of progress and feedback indicators

Drawing from work by MASELTOV partners, we have examples of FPIs that can be tested within mobile incidental learning. Busuu.com offers a successful web based language learning tool with over 10 million signed up learners and uses FPIs to encourage both reflective learning and continued participation in their current service. Two key FPIs are feedback from fellow learners on completion of exercises (peer marking of exercises), in the form of star ratings and free text explanations and encouragements, and also email prompts when a learner has not logged in for a period of time. Busuu register approximately 30,000 individual instances of peer responses per day, and identify that when a learner posts an exercise for up to five native speakers to correct, another learner will respond with peer feedback in less than 15 minutes (depending on language being learnt, with the most popular languages recording average responses closer to 30 seconds). Learners who have not carried out a learning activity for a period of time are reminded by an email to continue, as a means of encouragement, and busuu have found that nearly 14% of learners log back in immediately after receiving a reminder email.

The Serious Games Institute at Coventry University, another MASELTOV partner, is exploring cultural learning through serious games. Three methods are being explored to provide concrete feedback to players not just within the game, but across the wider suite of MASELTOV applications. The first of these focuses on the establishment of an in-game currency, which may be increased either through playing the game, or using other components of the MASELTOV suite. The owners of these individual components are free to reward currency for tasks they themselves define. Secondly, the use of 'achievements' to recognise players' activities within the game helps to scaffold learning activities, monitor progress, and provide direct feedback. Achievements are common in entertainment games, and are often applied outside the game through platforms like XBox Live or PlayStation Network, allowing players to readily compare their own achievements to their peers and the wider gaming community. Clear overlap can be seen when considering the educational application of an achievement system (Dunwell et al., 2012) as a means to provide concrete, gamified learning objectives, and this echoes the emerging interest in "badging" within the informal learning community (e.g. Cross and Galley, 2012). Appropriate feedback is also provided through the use of levels. Support is embedded into the game primarily within easier levels which are typically played first, advancing on to more ill-defined and complex levels as mastery is achieved by the player. Vygotsky's (1978) notion of the Zone of Proximal Development (ZPD) is applied here as feedback to the player decreases (and thus there is decreasing support) as the player gains experience in playing the game. Other FPIs can be achieved through the use of graphics, such as navigation maps, which can scaffold a player's cognitive load while playing the game (O'Neil, Wainess & Baker, 2005).

With this evidence that these FPIs can motivate continued learning and reflection within a specific application, we are exploring whether feedback provided in one tool can encourage both return to the same tool to develop the users' learning, but also whether a learner can be prompted to try a complementary tool to further their learning. In the MASELTOV project we are developing an underlying recommender system that records use and progress by a participant through a profiling system across all the apps in the MASELTOV suite which can not only prompt return use of the same tool, but identify other suitable tools that will enhance learning. For example, if the recommender service recognizes that a participant is regularly playing the serious game and trying puzzles related to health, it might ask the learner if they would like to try a language lesson focusing on vocabulary and phrases for visiting a doctor.

CONCLUSION

A significant challenge for mobile incidental learning is to understand how fragmentary learning episodes carried out on phone apps by learners to solve immediate needs can be linked together to support deeper and more reflective learning journeys. A central problem is to identify how users can be encouraged to reconceptualise these isolated incidents as part of a greater overarching learning journey. We propose that timely and judiciously deployed feedback, and progress indicators can play a key role in triggering linking and reflection by learners.

There is extensive literature exploring the use of feedback and progress indicators in formal and informal learning, however incidental learning has been less well described. We identify (1) encouraging reflective learning and (2) continued participation as key objectives, and suggest that work in web based informal learning and gaming, may provide examples of practice that can be tested for effectiveness. In the MASELTOV project, we are therefore considering a range of likely cognitive, affective, and social feedback and progress indicators which we will be testing over the next two years. Testing the FPIs and aligning them to pedagogical goals is being undertaken through the ongoing iterative and participatory design processes within MASELTOV.

REFERENCES

Beetham, H. & Sharpe, H. (2013). *Rethinking pedagogy for a digital age: designing for 21st century learning* (2nd ed.) Abingdon, UK: Routledge.

Boud, D. & Molloy, E. (Eds.) (2012). *Feedback in higher and professional education: understanding it and doing it well.* Abingdon, UK: Routledge.

Cross, S. & Galley, R. (2012). *MOOC badging and the learning arc*. Retrieved from http://www.olds.ac.uk/blog/moocbadgingandthelearningarc

Dunwell, I., Petridis, P., Hendrix, M., Arnab, S., Al-Smadi, M., & Guetl, C. (2012). Guiding intuitive learning in serious games: an achievement-based approach to externalized feedback and assessment. In L. Barolli, F. Xhafa, S. Vitabile & a. M. Uehara (Eds.) *Proceedings of the 2012 Sixth International Conference on Complex, Intelligent, and Software Intensive Systems (CISIS)* (pp. 911-916). Washington, DC: Conference Publishing Services.

Kerka, S. (2000). *Incidental learning: trends and issues Alert No. 18*. Retrieved from http://www.eric.ed.gov/PDFS/ED446234.pdf

Kluzer, S., Ferrari, A., & Centeno, C. (2011). *Language learning by adult migrants: policy challenges and ICT responses.* Seville, Spain: Joint Research Centre Institute for Prospective Technological Studies.

Kukulska-Hulme, A. (2005). Mobile usability and user experience. In: A. Kukulska-Hulme & J. Traxler (Eds.) *Mobile Learning: A handbook for educators and trainers* (pp. 45–56). Abingdon, UK: Routledge.

Nix, I. & Wyllie, A. (2009). Exploring design features to enhance computer-based assessment: learners' views on using a confidence-indicator tool and computer-based feedback. *British Journal of Educational Technology* 42(1), 101-112.

O'Neil, H., Wainess, R., & Baker, E. (2005). Classification of learning outcomes: evidence from the computer games literature. *The Curriculum Journal* 16(4), 455-474.

Scanlon, E. (2013, in press). Mobile learning: location, collaboration and scaffolding inquiry. In: M. Ally & A. Tsinakos (Eds.) *Mobile learning development for flexible learning* .Edmonton, Canada: Athabasca University Press.

Tolmie, A. & Boyle, J. (2000). Factors influencing the success of computer mediated communication (CMC) environments in university teaching: a review and case study. *Computers & Education* 34, 119-140.

Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes.* Cambridge, MA: Harvard University Press.