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Waypoints along learning journeys in a mobile world

Agnes Kukulska-Hulme and Mike Sharples

Abstract

We consider how mobile and ubiquitous technologies support learning journeys with particular reference to significant landmarks that may sustain learning over long periods of time. For most people, educational advancement is largely determined by life stages and professional requirements amounting to educational episodes that have definite end points based on recognized achievements. In addition, events occurring in life and work, as well as personal interests and passions, initiate episodes of learning that may be more open-ended, but could be recognized and rewarded. In this chapter we explore elements of formal and informal learning with special consideration of significant points on a learner's journey when learning progress may be tracked and encouraged, and outcomes may be noticed, assessed or shared. The context for this is a world in which mobile devices support mobility in all its senses, but where barriers still constrain mobility in practice.

Introduction

The metaphor of a 'learning journey' evokes an abstract idea of progress or development that may also be facilitated by physical movement or travel across a terrain. This metaphor has currency in our increasingly mobile world, where travel is common and ubiquitous technologies may shape the journey, preserve it in multiple media and enable it to be widely shared. One quandary when considering a learning journey is that it may appear to be a simple linear progression from A to B, while at the same time it is a component of a larger and more complex journey that may even be equated with a life. While mobile learning approaches aspire to make learning "seamless" (Chan *et al.*, 2006; Wong and Looi, 2011), we note that specific episodes of learning with their associated travel or wayfaring still need to be recognized so that they can be investigated in research or shaped for specific educational ends. Also, effective learning involves metacognition (Bransford, Brown & Cocking, 2000) as a process of extracting meaningful episodes to reflect upon from the flow of experience.

Learning journeys evoke some familiar patterns, but there is no universal concept. A learner's journey usually includes significant points when goals are set, progress is tracked, and outcomes may be noticed, assessed or shared. In literature, education and in life, learning journeys are commonly described in terms of personal accomplishment which involves facing some challenges along the way. However, perspectives vary across different cultural settings. Chinese students learning English have been observed to portray their learning as "a bitter-sweet journey of ups and downs towards ideals and dreams of future success" (Jin and Cortazzi, p.113), while Marie Martin, in the Irish tradition of 'learning by wandering' (exploring with an open mind, without schedules or planning), depicts the learning journey as one in which "the process is its own reward" (Martin, 2010, p. 24). Learning, she submits, is a life-long commitment: "There is no end point. There is always more to learn" (*op cit.*, p. 24). In his monumental study of factors affecting learning outcomes, Hattie identifies the essential role of a teacher or mentor in offering a succession of appropriate challenges and ensuring the learner is on the right path to meet, understand and benefit from them (Hattie, 2009, p. 38).

Our contemporary societies are grappling with the issue of how to sustain lifelong learning and continuous professional development in view of economic imperatives and trends toward more frequent job and career changes over a lifetime. Current educational advancement is typically determined by life stages and professional requirements, amounting to educational episodes that have definite end points based on recognized achievements. To sustain lifelong learning, there is an emerging consensus that more diverse opportunities to learn and study should be offered that provide quicker routes to completion, “flexible schemes to accumulate credits before, during and after a traditional programme of study” (Gordon, 2013, p.3), and more varied ways of reporting on progress and certifying achievement. All this implies that learning routes and pathways need to be considered afresh, and the contributions of learning journeys need to be explored.

Learning for life may be conceived as a continuous process involving exploration, skill development through practice, conversation with peers, and reflection on experience. From a professional and career development point of view, it frequently needs to be focused, applied and perhaps evaluated as to whether it helped bring about a desirable change. Projects are one connection between the two conceptions of learning – one more open-ended and the other more focused – where the learning projects may be personally or formally initiated, and personally or formally supported. Learning projects have the characteristic of being extended over time and locations, hence leading to learning journeys that may be well supported by ubiquitous technologies helping to organize a sustained sequence of learning episodes that leverage social networks, time and space.

In this chapter we consider how mobile and ubiquitous technologies support learning journeys, with particular reference to significant landmarks along these journeys that may help sustain learning in the longer term. We set these considerations in the context of learning journeys past and present.

Learning journeys in the past

The notion of learning as a journey toward enlightenment and truth goes back at least to Confucius was adopted by humanitarian educators including Montessori, Steiner and Dewey and has been explored more recently through holistic education, where learning is seen as a quest to find identity, meaning and purpose (Cajete, 1994; Miller, 1996; Palmer, 2004). In this sense, a learning journey is an integrative process whereby a love of learning and a sense of wonder lead people to engage with ideas and environments guided by a supportive community. The formal education system of curricula, attainment targets, key stages and examinations presents a different type of learning journey in which the goals and stages are set by the institution, and the learner is required to navigate through these to attain qualifications. Lesson planners for teachers and e-portfolios for learners are tools to create and record these formalised pathways.

Linking journeys for holistic and formal education is the concept of narrative, a personal and collective story. So, individuals create life stories which they chronicle as memories, notes and images to make meaning from experience. These personal narratives link together into communities of practice (Lave & Wenger, 1991) where the experience of learning is formed through shared activity and common goals. They are situated in private and public spaces where people come together to discuss ideas and engage in mutually supportive practices. The school classroom is one such space: students are required to meet daily to access and create resources for their formal learning journeys. Non-formal spaces where learning journeys intersect include museums and heritage sites, and more liminal spaces such as town centres, festivals and sports events. How to create technology-enhanced ‘micro-sites for learning’, for example on field trips or in workplace meeting areas, is an area of current research in technology-enhanced learning (Vavoula & Sharples, 2009).

The romantic notion of learners in mutually supportive communities taking shared journeys sustained through a love of learning is at odds with the everyday lives of many schoolchildren — stuck in a classroom, disengaged from the curriculum, or revising for exams. A central issue for educational researchers to address is whether formal and informal pathways of learning can and should be bridged, and if so how. Should children be encouraged to bring their personal learning projects into classrooms? Should schools attempt to structure the learning of children outside the classroom? And should technology provide a bridge between holistic and formal education? Researchers working with adult learners including university and college students face similar questions. Connecting formal and informal learning is an elusive but important educational goal.

Another notion of learning journeys comes from research into learning trails – movements through physical or online spaces that offer opportunities to gather knowledge, engage in conversations, and interact with the world (Reynolds, Speight & Walker, 2008; Sharples, FitzGerald, Mulholland & Jones, 2013). Juliet Sprake (Sprake, 2011) has investigated learning-through-touring: how a tour is an evolving conversation between guide, visitors and the environment. Tour-enabled buildings, such as museums or heritage sites, impose limits on the journey, restricting the making of meaning to what can be seen front-of-stage in the visitors' areas. The un-toured spaces, that are off-limits for visitors, may show the museum as a work in progress, where meaning is made by curators with more uncertainty than is shown to the public. Thus, a tour is a line of tension between a displayed environment and an unfolding story of its fabrication.

The learning trail may be formalised in a museum visit or school field trip, or it may be serendipitous, as when visitors to a city stumble upon interesting sites and unexpected events. Sprake (2011) proposes three attributes of a tourist as active learner: stumbling upon, noticing, and connecting. By stumbling upon spaces in unexpected ways visitors create narratives of their experiences. They notice some parts of the environment in ways that are signed and proposed, and others in ways that create personal meaning, so that touring is an act of imaginative association between the given and the found. As they view the environment from different perspectives, visitors enter into conversations and juxtapositions that create cognitive and social connections. In that sense, learning trails create what Dewey called 'learning through occupation' where sensation and thought are combined through embodied activity (DeFalco, 2010).

On a larger scale, journeys through physical and conceptual spaces become life projects. Equipping people to be resourceful and self-determined learners in their journeys through life is a goal not only of formal education, but of successful parenting and effective professional development. This is where learning trails and holistic education meet in the notion of learning as a sustained journey towards a self-determined goal. Hattie (2009) indicates the importance of continued commitment to knowing where to go next, in relation to the gap between a learner's current knowledge and the criteria for success.

Scientists and engineers have traditionally written journals to record their learning journeys, while artists or designers compile portfolios to show their creative journey as well as showcasing their work. In formal settings, the journal can be a tool to increase student engagement and reflection on learning. For example, Park (2003) found many positive outcomes for learning journal use in geography, including increased student interest in and engagement with course material. Personal journals have long had a role in promoting personal growth and learning. In an exploration of the uses and benefits of journal writing across various spheres of life, Hiemstra (2001) concludes that they can encourage a proactive approach to the learning process. We will revisit the role of journals in our later section on 'Capturing progress and sharing achievement'. In the next section we consider how learning journeys are changing and how they might further evolve.

New learning journeys

Following in someone else's footsteps or following directions set by a teacher or a guide becomes a different experience when the learner is a more active participant and when recordings of what happened on the journey may be easily made and shared. There are various examples of how mobile technology has been used to facilitate an active experience. Museum and art gallery tours, as well as trails in natural environments or facilities such as botanical gardens, have been fertile ground for innovation in this regard. In an early research project, schoolchildren played a highly active role in Mudlarking in Deptford (Sutch, 2005) by co-producing a guided tour of a riverbed in London, the Deptford Creek. This is an area of historical interest and it is also designed to raise ecological awareness since it is home to hundreds of fresh and saltwater animals and plants. In this project, a handheld device with GPS capabilities delivered location-sensitive information when a child walked into node areas indicated on a map; the children could also create their own multimedia content and alert other users to that content. In the MyArtSpace project (Sharples *et al.*, 2007), an explicit connection between active learning in a museum or art gallery and reflection and sharing in the classroom was made through a combination of mobile technology and a website accessed on a school desktop computer. Schoolchildren used mobile phones during a visit to a museum or arts

centre to access pre-prepared information in context, take photos, make voice recordings, write notes and see who else had viewed the same exhibits. The content was transmitted to a website which stored a personal record of each child's visit, giving them access to their collected materials which were then used to create presentations back in the classroom.

Both the above projects are examples of reconceptualisations of the trail or guided tour, enabling participants to add their personal experiences for later reflection and reworking, or benefiting of future tour users. Both projects gave students opportunities to create memorable journeys and to collaborate in novel ways. An outdoor activity can also be a helpful way to track learning in terms of conceptual change. To support changes in concept formation, an interactive concept map approach for supporting outdoor mobile learning activities was proposed and evaluated by Hwang, Wu and Ke (2011). The elementary school students were asked to create concept maps about butterfly ecology, then to observe the ecology in a real-world environment and revise their concept maps if necessary. The PDAs used by the students assisted them in the field by evaluating their concept maps and giving instant feedback or learning guidance.

In the above example (Hwang, Wu and Ke, *op cit.*), a note-taking function on the PDA also allowed the students to describe what they had found or to raise questions based on their observations. Such note-taking activity could potentially lead to further research or observations. Song, Wong and Looi (2012) mention that their mobile science inquiry activities with school children explicitly evolved to give the learners more scope to determine the direction of their learning: "Though starting with a relatively structured mobile learning trail in the farm, we subsequently facilitated and even encouraged the students to show their diversity in deciding what to learn and what artifacts to produce." (p. 698). Learning outside the classroom gives opportunities for learners to conduct their own contextual inquiries and perhaps to develop more autonomy. However, this cannot be taken for granted. In the field of mobile, situated language learning, the experiences reported by Abbas Petersen, Procter-Legg and Cacchione (2014) of young adult learners using a mobile app designed to help them capture and share language elements they come across in their everyday lives, suggest that learners may not be ready for autonomous learning. The authors conclude: "We need... to teach them not to be taught, i.e. to become autonomous learners." (p.70). Tan, So and Zhang's (2012) research study investigated students' autonomy in an inquiry-based mobile learning trail, taking into account the design of the trail, interaction with teachers and collaboration with peers. They report that students' capacity for more autonomy in mobile learning was contingent on student readiness, learning design, technological mediation, and the community of learners. This suggests that while mobile inquiry-based learning may be conducive to developing autonomy, other factors also come into play. A learning journey is partly a personal experience, reminding us of the individual's relative capacity to act in self-determined ways, and partly a collective one, drawing on various resources including other learners.

The learning journey continues to fire the imaginations of educators, as cross-disciplinary thinking and technological developments foreground social interaction. The notion of co-learning has been gaining in popularity as new technologies can support collaboration in spite of physical distance and among more diverse groups of people. Thus in Canada, an integrative science university program brings together indigenous and mainstream sciences and ways of knowing through a "co-learning journey" between recognized holders of traditional ecological knowledge and others with expertise in mainstream science (Bartlett, Marshall and Marshall, 2012). Co-learning denotes an approach in which learners, educators and other stakeholders participate jointly in the learning process; Hannon, Collins and Smith (2005) applied this to education in graduate entrepreneurship, for instance, while Worswick *et al.* (2014) have used co-learning in an interprofessional quality improvement initiative in primary health care services. Worswick *et al.* describe what happens when individuals embark on a learning journey together:

By sharing their experiences and their stories they can come to share beliefs, behaviours, perceptions, understanding and goals for what they want to achieve through the project. They progress towards making and influencing changes through their shared learning experience. By sharing their stories, a new story is created and previously held beliefs might change. With a renewed understanding, learners can achieve their shared goals within the co-learning relationship. Learners can become empowered to lead the change.

(Worswick *et al.*, 2014: 3).

A co-learning journey may be facilitated through the use of social and mobile technologies that can be used across diverse settings on a continuous basis, but in other respects the success of the technology-supported co-learning journey is not guaranteed. In the above example, a physical environment was created where learners felt equal, safe and secure about being open in their discussions and disclosures, and it was suggested that this combination created opportunities for the co-learning partnership to evolve. Technological environments open up opportunities for equal collaboration, but safety and security concerns are more difficult to resolve. A related point, that “people learn from trusted networks”, is made by Tsui, Tsui & See-To (2013) who have been working on a Personal Learning Environment & Network to support peer-based lifelong learning; in these personal environments, learners can select which tools best fit their learning purposes and they can use them “to build up networks for co-learning and locating expertise” (p.49).

Co-learning journeys are an implicit concept underpinning the MASELTOV project (Kukulska-Hulme *et al.*, 2012; Gaved *et al.*, 2013) which introduces a novel approach to supporting informal learning journeys undertaken by immigrants settling down to life in a new city. Since social integration is a two-way process, natives and immigrants potentially have a great deal to learn from one another. The MASELTOV project is developing a suite of smartphone-based services and tools to enable users to explore the city and use it in a variety of ways as an informal learning environment. Along with tools for navigating, translating signs, and so on, there are social tools that enable learners to get in touch with people nearby who might help them. These people could be registered members of a community or local vetted volunteers. The technology opens up many avenues for informal, incidental learning underpinned by a recommender system that can use location tracking to suggest relevant learning resources and places to visit. At the same time, there are challenges around providing a safe and secure learning environment to a target group that may be vulnerable or fearful about their location being tracked. Although tracking is not mandatory (it can be switched off by the user), the project highlights issues surrounding potential benefits and challenges of new open learning environments such as the city.

Issues of trust and privacy pervade many contemporary discussions of emerging technologies that enable tracking and recording of learner movements and location-based interactions, as well as those that support experience capture, including wearable devices like Google Glass (Hong, 2013). The ‘life-logging’ technology employed in the Ubiquitous Learning Project reported by Ogata *et al.* (2014) aims “to capture learning experiences in daily life and reuse them for learning and education” (p.98). Life-logging can be done actively by the learner, but in passive mode a camera is worn and takes pictures automatically which can later be retrieved, reflected upon and analyzed. Life-logging encompasses collaborative learning in that the captured ‘Ubiquitous Learning Log Objects’ can also be shared.

For the future, contextual technologies could enable deeper engagement with the environment, by offering facilities to make location-based notes, to annotate objects, buildings and landscapes, and to leave virtual graffiti and stories for others to discover. As many people’s learning trails intersect in time and space, there are opportunities to mark the points of crossing, through pictures and recorded conversations. This is already starting to happen in the online environment, through sites such as TripAdvisor where people can leave their impressions of a hotel, restaurant or location to influence the journeys of others. Writing a review also provides an opportunity for the writer to create a waypoint and reflect on the journey so far. Ubiquitous technology will mean that learning journeys can now be supported and reviewed almost anywhere: in the countryside and in cities, across campuses, workplaces, heritage institutions and places for organized leisure. Collaborative learning and co-learning, facilitated by learner creation of content and content sharing, can all enhance the journey. The scope of learning is extending beyond the classroom to pathways through real and virtual worlds. But how do learners know that they are making progress and how might their progress and achievement be recognized? A challenge for schools and other institutions is to engage learners with journeys for learning, towards valued goals.

Capturing progress and sharing achievement

If we see learning through the metaphor of a journey over time, across locations, with others, then significant waypoints on that voyage can be recorded and recognised. At the most personal level, experiences of learning are captured through a person’s episodic memory, where they remember

elements of personal significance from the flow of everyday experience. The familiar technologies of notebooks, diaries, cameras, and audio recorders can help preserve those autobiographical events. Tulving (1985) refers to 'autonoetic consciousness' that is a personal ability to appreciate one's personal past and future – what Wheeler, Stuss and Tulving (1997) refer to as 'mental time travel'. Autobiographical aids such as notebooks and cameras assist that travel backward and forward in personal time not only by recording an event at a particular time and thus connecting it to an explicit timeline, but also by acting as an index back to the personal experience of the event, thereby enriching one's memory by restoring aspects of the context in which it was first experienced.

Gemmell and colleagues developed MyLifeBits as a 'surrogate memory' to store everything that could be recorded of a person's online information including articles, photos, emails, web pages, phone calls and room conversations (Gemmell, Bell and Lueder, 2006). These can be accessed through a timeline of events or a map of trips. In more recent years, the personal data that can be stored range from heartrate and EEG (brain activity) traces, to personal events captured on CCTV security cameras. The problem that arises is how to make personal meaning from this undifferentiated mass of recorded personal experience. Vavoula and Sharples (2009) discuss 'lifelong learning organisers' that enable a person to organise everyday events into activities, episodes and projects, representing increasing levels of sustained experience. Vavoula and Sharples' KLeOS system (Vavoula & Sharples, 2002) shows these on a timeline as lines and points, and also allows the user to link them to notes in a concept map, as a way to connect external depictions of a person's episodic and semantic memory. The aim of KLeOS was to enable a person to record a sustained flow of events, while creating order and meaning from the experience.

As more people capture experience, these trails and timelines interweave. Not only can the life tracks of many people be shown and shared through Facebook, Twitter and other social media, but they can also become resources for learning. Here, we should make a distinction between a sharable record of learning and a record of shared learning. A record of learning, such as an e-portfolio, which records a person's evidence of learning can be shared with a tutor or other learners. For example, the UK National Health Service provides an e-portfolio to more than 300,000 health service professionals to record learning activities and assessments which can be kept private or shared with a supervisor (www.nhseportfolios.org). The LinkedIn site (www.linkedin.com) allows users to record and share their significant learning projects and achievements. Although its premium site offers a Twitter-like feed of activities, it does not yet offer the facility to log the detail of learning episodes (for example, to indicate books being read or courses currently being taken).

A record of shared learning is a social space to collectively record and share learning experiences. An example is the iSpot site (www.ispotnature.org). This allows any registered user to observe, photograph, identify and share observations of wildlife. Others in the community confirm the identification, building up a shared record of observations of the natural world which can then be indexed by time, location or species. Like KLeOS, the site also allows observers to record meaningful links between observations to create a concept map (for example, by recording a 'visiting' link between an insect being observed and the flower that the insect was visiting).

The iSpot site also supports reputation management and badging system (Clow & Makriyannis, 2011) which is another piece in the jigsaw of capturing progress and sharing achievement. The central purpose of a reputation system, whether it is automated as in iSpot or manual as in Scout and Guide badges, is to recognise and reward legitimate achievements. Thus, it has three main components: setting appropriate goals, recording and verifying success in achieving a goal, and rewarding the achiever. The goals are typically set by an awarding organisation such as The Scout Association which set down the activities and skills required to gain badges of differing category and level. The traditional means of recording and verifying success is by a leader setting a series of tests and noting successful outcome. And the badges are visible, coveted indicators of achieving the award.

All these elements are now being automated and distributed among a community. For example, iSpot sets goals to achieve 'stars' in each category of wildlife based on the user's scientific expertise. The system automatically raises the profile of people who make many observations, who offer identifications that are confirmed by others, and who gain confirmed identifications from experts. A person who achieves a high level of expertise is not only rewarded visibly by up to five 'stars' shown on their profile, but also carries more weight when confirming other people's observations.

The Mozilla Open Badge Infrastructure enables any organization or community to define the skills and competences needed to achieve a badge. Each badge has a visible online image and a set of metadata that provides information about what the badge represents and the evidence used to support it (MozillaWiki, 2014). The Badge Backpack is a repository for each person to view a collection of badges, determine who should access them, and share them with others. A superficially similar system to record and recognise learning activities comes from the Tin Can API project. Its aim is to assist people in easy logging and storage of their learning activities wherever these occur — online or in the real world — in a standard format of “person did this” (e.g. “Sally experienced hang gliding”, “Ian completed a FutureLearn course”). Additional fields provide information about the context and result of the activity.

While both Mozilla Open Badge and Tin Can API store and display elements of learning journeys, they differ in intent: the former is a record of achievement while the latter is a record of learning activity. This raises the intriguing prospect of combining both to create a composite record of a learning journey and its achievements (e.g. “Sally experienced hang gliding and obtained an open proficiency certificate”, “Ian completed a FutureLearn course and gained an open statement of attainment”). A working group on ‘Tin Badges/Open Can’ is exploring just such a fusion of standards, to create sharable records of learning journeys. While these link activities and achievements, there still remains a need to record and share learning episodes and projects within a common framework (see Table 1).

Learning element	Record	Enhance
<i>Achievement</i>	Mozilla Open Badge	Mozilla backpack
<i>Project</i>	ePortfolios	LinkedIn
<i>Episode</i>	ePortfolios	
<i>Activity</i>	TinCanAPI	iSpot links

Table 1. Examples of recording and enhancing elements of learning.

A paper by Botički and colleagues (2014) describes a badge system for mobile learning. The SamEx application runs on devices with the Windows phone 7 and 8 mobile operating system in a Singapore primary school. The school students are encouraged to collect audio recordings, video clips and pictures on their mobile devices. They accumulate points by collecting these media, answering questions related to the location, providing comments on the work of other students and liking their work. These map onto a set of online badges that are awarded for accumulations of points in each activity. A study of 350 children using the application over one year identified three categories of student: ‘badge hunters’ who collected badges regardless of the quality of their contributions; ‘dodgers’ who were not interested in collecting badges at all; and ‘sharers’ who wanted to share with their peers. What was lacking from the application was a way to reward collaborative as well as individual learning.

Learners’ dispositions and attitudes to learning are important factors influencing whether a successful learning journey will take place. In recent research on informal learning in professional contexts, a study of commercial airline pilots highlights the role of personal characteristics that have been found to motivate their informal learning, namely: initiative, self-efficacy, love of learning, interest in their profession, and professionalism (Corns, 2014). These are qualities that many teachers would also love to see and to develop in their students, for the learners’ immediate benefit as well as in preparation for lifelong learning and work.

Conclusions

In this chapter we show how learning can be sustained through learning journeys, since these give an extended sense of continuity and progress. We have reflected upon learning journeys old and new. Mobile and ubiquitous technologies can implement a seamless continuity of learning within and

across contexts, offering additional ways of combining learning in the classroom, at home and outdoors. It would appear that, so far, the goal of recording, sharing, assessing and celebrating learning journeys has been approached piecemeal with differing methods, standards and technologies. While some individuals appear to have a natural lifelong craving for learning, others need to be encouraged, supported and rewarded. To some extent, this mirrors the fragmented nature of education into a variety of formal, non-formal and informal settings each with their own requirements and methods of validation. But there is indication that it may be possible to create a sustainable record of learning in all its varied richness that can be captured on a variety of devices, curated by individual learners, groups, or organisations, and associated with transferrable badges to record achievement.

The notion of a learning journey continues to inspire educators and researchers and commonly manifests itself in mobile learning through the creation of location-specific tours and trails. It serves the important purpose of focusing attention on the value of mobile learning experiences in terms of real-world learning, across contexts, incorporating reflection on learning and having the potential to extend and sustain the learning according to personal or shared interests and needs. The notion of a learning journey also serves to establish a more transparent and mutually supportive relationship between formal and informal learning. Learning experiences may be actively supported across a range of diverse settings and there is growing recognition that informal elements can often be valued and rewarded.

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