Chapter 2
The Changing Landscape of E-Portfolios: Reflections on 5 Years of Implementing E-Portfolios in Pre-Service Teacher Education

Mark Pegrum and Grace Oakley

Abstract E-portfolios are becoming an increasingly common component of higher education programmes, serving as constructivist learning spaces where students can reflect on their learning journeys, as centralised collections of work on which students can be assessed, and as integrated showcases where students can demonstrate their accomplishments to potential employers. At the same time, many working professionals are currently being required or encouraged to build e-portfolios which demonstrate continuing learning for the purposes of maintaining employment, seeking promotion, and applying for new positions. Pre-service teacher education courses are among the higher education programmes where participants are now commonly asked to build e-portfolios which they will be able to continue to expand and develop once they have obtained employment as teachers. This chapter is based on the reflections of two teacher educators in a pre-service teacher education programme in Australia, looking back on the first five years of an e-portfolio initiative, covering the period 2011–2015. They reflect on key lessons learned about engaging students, engaging staff, and integrating technology. They outline changes which have occurred in the e-portfolio space over the past half-decade, due both to the changing nature of technology users and the changing nature of technology itself. It is suggested that e-portfolios may have a role to play in supporting a shift away from today's administratively oriented, pedagogically limited learning management systems (LMSs), and towards personal learning environments (PLEs) where students can engage in more individualised, autonomous learning practices.

Keywords E-portfolios · Pre-service teacher education · Assessment · Reflection · Personal learning environments · Web 2.0 · Multimedia

M. Pegrum (✉) · G. Oakley
The Graduate School of Education,
The University of Western Australia, Perth, Australia
e-mail: mark.pegrum@uwa.edu.au

Introduction

With e-portfolios becoming ever more common in higher education as well as in many of the professions into which tertiary students later progress (e.g., Andrews and Cole 2015, on nursing; Winberg and Pallitt 2016, on university teaching), it is timely to reflect on how these have evolved over the past half-decade. E-portfolios are digital collections of artefacts, often assembled to demonstrate competence in a given area or areas. They typically incorporate multimedia resources (Chatham-Carpenter et al. 2009/10; Hallam et al. 2012), allow for flexible organisation and reorganisation (Bartlett 2008; Lin 2008), and facilitate wider networking (ibid.), with considerable scope for supporting reflection on learning (Haverkamp and Vogt 2015; Samaras and Fox 2013; Shroff et al. 2013; Tzeng and Chen 2012).

As such, it has been suggested that e-portfolios may offer a way to balance two competing agendas found within higher education worldwide, namely a completion agenda focused on speed and efficiency, and a quality agenda focused on depth, understanding and complexity:

> thoughtful e-portfolio practice can help build student success (as measured in "hard outcomes" such as retention and graduation) while also advancing reflection, integration, and "deep learning." (Eynon, Gambino & Török, 2014, n.p.)

Building on the notion of deep learning, Haverkamp and Vogt (2015) point out that:

> e-Portfolios provide a constructivist pedagogical approach to learning that allows students to link developed digital content to a framework that illustrates achieved competencies but, more importantly, reflects a contextual understanding of their learning (Ehiyazaryan-White, 2012). This implies a "deep" learning versus a more superficial learning through the integration of new information into prior existing knowledge (Dalal, Hakel, Sliter, & Kirkendall, 2012). (p. 284)

By fostering connections across learning areas and learning experiences, e-portfolios may help students build a more holistic sense of their learning journeys (Martin 2013), while helping higher education institutions to transform themselves into more adaptive organisations which are responsive to today's changing needs (Eynon et al. 2014). Moreover, as will be discussed below, e-portfolios can simultaneously support personalisation of learning and student autonomy, linked to the development of twenty-first century skills. Their implementation is however not unproblematic, and their use may often be fragmented due to a combination of challenges relating to students, staff and technology (Andrews and Cole 2015).

In this chapter, two teacher educators in a pre-service teacher education programme in Australia look back on the first five years of an e-portfolio initiative which commenced in 2011. They reflect on key lessons learned about engaging students, engaging programme staff, and integrating technology into everyday learning practices. They go on to give their perspective on key changes which have occurred in the e-portfolio space over this period, due both to the changing nature of technology users, who are often more comfortable and skilful in the use of

technology than they were five years ago, and the changing nature of technology itself, which has become more user-friendly and much more mobile-centric. Finally, it is suggested that e-portfolios, as they have evolved over recent years, may have a role to play in supporting a shift away from today's administratively oriented, pedagogically limited learning management systems (LMSs, also known as virtual learning environments, or VLEs), and towards personal learning environments (PLEs) where students can engage in more individualised, autonomous learning practices.

The Role of E-Portfolios in Pre-Service Teacher Education

In higher education, e-portfolios may serve as constructivist learning spaces where students can reflect on their own learning journeys; as centralised collections of work on which students can be assessed; and as integrated showcases where students can demonstrate their accomplishments to potential employers. At the same time, many working professionals are currently being required or encouraged to build e-portfolios which demonstrate continuing academic and practical learning for the purposes of maintaining employment, seeking promotion, and applying for new positions. Thus, when higher education students are asked to produce e-portfolios, these can serve immediate learning and assessment purposes, a medium-term job-seeking purpose, and the long-term purpose of preparing graduates for an increasingly common professional practice.

Pre-service teacher education programmes are among those where participants are now commonly asked to build e-portfolios (Oakley et al. 2014), which they will be able to continue to expand and develop once they have obtained employment as teachers. Indeed, in the context of teacher education in Australia, there have been recent moves to mandate the use of portfolios (TEMAG 2014). In the programme in question, a Master of Teaching qualification running at an Australian university since 2009, e-portfolios were first introduced in 2011. In the first three semesters of this four-semester programme, the pre-service teachers are invited to work on *developmental e-portfolios,* which are treated much like individualised, student-centred PLEs (Dudeney et al. 2013; Pegrum 2014) where they can assemble multimedia records of their work (including from their teaching practicum placements), reflect on their learning, receive targeted feedback from lecturers and peers, and network both within and beyond their cohort. In the fourth semester, in a unit entitled *Teaching and Learning with ICTs* (Information and Communication Technologies), the pre-service teachers are supported in transforming their developmental e-portfolios into *showcase e-portfolios* where they demonstrate their achievements relative to selected focus areas in the *Australian Professional Standards for Teachers* (AITSL 2014); these e-portfolios are then presented for assessment, and may also be used to accompany job applications in the manner of expanded digital curricula vitae (CVs). The terminological and conceptual division into developmental and showcase stages was instituted to deal with the widely

acknowledged tension between e-portfolios' formative/process/constructivist learning aims, and their summative/product/assessment/marketing aims (Farrell and Rushby 2016; Lim and Lee 2014; Trevitt et al. 2014; Yang et al. 2016).

From 2011 to 2014, the e-portfolios were assessed from the perspective of ICTs by the unit lecturer, as well as from a broader employment perspective by a panel composed largely of school principals and deputy principals. By 2015, student numbers had grown too large for it to be feasible to identify enough principals and deputies who could commit the time required to staff the assessment panels, so a more streamlined assessment system was introduced involving only an ICTs-focused assessment by the unit lecturer. However, the pre-service teachers were, and are, encouraged to continue to view their e-portfolios as digital CVs, and anecdotal evidence indicates that many are still using them to support job applications.

Engaging Students

From the very first year, 2011, it was found that in order to engage students in the e-portfolio implementation, it was necessary to provide them with extensive support. First, it became apparent that they were confused about the multiple purposes of the e-portfolios, despite our attempt to introduce more clarity by distinguishing the *developmental* and *showcase* stages, accompanied by an explanation of the intended evolution of the e-portfolios from the former to the latter in a nine-page *E-portfolio Guide*. This corresponds to widespread findings in the literature about confusion over e-portfolios (Chatham-Carpenter et al. 2009/10; Strudler and Wetzel 2011/12). In 2012, this led us to create a flow diagram (see Fig. 1) to be incorporated into the *E-portfolio Guide*. Over the years, the guide grew in size and detail to eventually reach 19 pages in 2015.
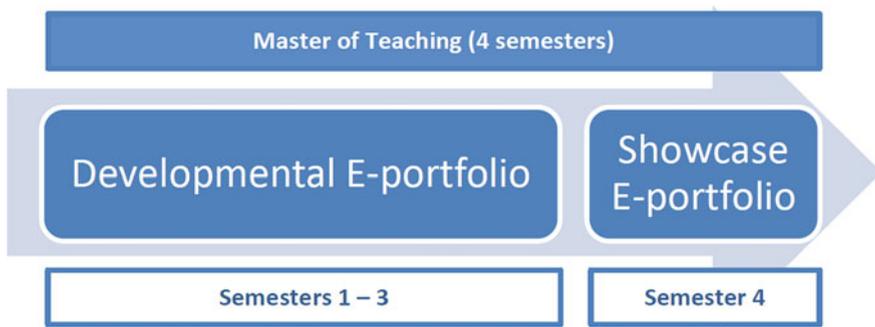

Fig. 1 Flow diagram of e-portfolio evolution over four semesters

Related to this, it has been noted in the research literature that students must perceive the value of e-portfolios for learning and/or career development in order to be motivated to use them (Chen et al. 2012). One of the reasons for the doubling in length of the *E-portfolio Guide* was the gradual expansion of the written rationale for the use of e-portfolios. By 2015, e-portfolios had become more normalised—to borrow a term from Stephen Bax (2011)—for our pre-service teachers, partly because of the embedding of more extensive explanations of their purposes in our programme; partly because of greater staff engagement with the e-portfolios, as detailed below; and partly because of a more widespread familiarity with e-portfolios in educational institutions and in the broader professional teaching community.

Second, our observations echoed findings in the research literature that pre-service teachers may not reflect deeply without adequate learner training (Bartlett 2008; Sung et al. 2009), and that in general guidelines and scaffolding are needed to support students' reflections in e-portfolios (Rafeldt et al. 2014; Yang et al. 2016). More support for pre-service teachers' reflections was provided in a number of ways, including through the use of a structure for reflective thinking based on the work of Bain et al. (2002), introduced both in the *E-portfolio Guide* and in a core first semester unit. Over a number of years, there has been an increasingly strong focus on students using their reflections to link theory with their own practice. This kind of reflecting has many advantages for pre-service teachers: it helps them develop into reflective practitioners who can be more effective teachers (Larrivee 2000; Rodman 2010); it helps them "link academic learning to personal development" (Eynon et al. 2014, n.p., with reference to Rodgers 2002); and it helps them identify their strengths and weaknesses in a way that will stand them in good stead in future job interviews (Andrews and Cole 2015). By the end of the process, while some pre-service teachers still struggle to reach a deeper level of reflection, others' writing clearly shows that they have begun to develop and rehearse a "professional voice" (Rafeldt et al. 2014, n.p.)—partly through peer interactions, as discussed below—which they can take with them into their careers.

Although from the start most pre-service teachers saw the value of reflecting on their learning, some found it tedious (Oakley et al. 2014). It became evident that one issue was the volume of writing and accompanying artefacts needed to demonstrate achievement of the expected graduate level of two to three focus areas for each of the seven professional standards required of Australian teachers. In 2015, we reduced the number of focus areas the pre-service teachers were required to cover. The ensuing drop in quantity correlated with a small but noticeable rise in quality, with an overall improvement in the depth of reflection as pre-service teachers were able to concentrate more closely on their chosen focus areas.

Engaging Staff

In addition to engaging students, it was equally important to engage staff in the e-portfolio implementation. In keeping with broader conversations about the need for educators to see themselves as designers of learning environments and learning experiences for their students (Hockly 2013; Laurillard 2012), one way to view e-portfolio initiatives is as educational design projects (Trevitt et al. 2014; Tur and Marín 2015). This entails a move into more pedagogically creative territory than is typically facilitated in LMSs, as well as a consideration of how best to integrate e-portfolios into programme assessment design (Yang et al. 2016). In the early years, however, we experienced some staff reluctance to get involved, as has been reported in other e-portfolio studies (Andrews and Cole 2015).

At the outset, many staff, much like our students, lacked clarity about the multiple purposes of the e-portfolios. While some made extensive use of them—requiring students to regularly upload work, with a few even providing feedback and conducting assessments within the e-portfolio space—others ignored them almost completely, thus exacerbating the pre-service teachers' confusion about their purposes, relevance and value. This issue was addressed in several ways.

The initial 2011 staff professional development (PD) programme was extended into 2012 in an effort to further upskill those academics who lacked confidence or familiarity with the technology. It was vital, however, for this PD to focus not only on the technology, but on the larger educational value of the e-portfolios, including their link to assessment, in order to ensure the pedagogical 'buy in' of staff (Andrews and Cole 2015). Staff, like students, must see the point of e-portfolios if they are to be motivated to use them (ibid.). Indeed, it has become abundantly clear over the past five years that it is necessary to aim for a point where "learners and teaching staff make the opportunity to acquire an adequately shared understanding of the concept and expectations of an [e] portfolio" (Trevitt et al. 2014, p. 75).

The availability of individualised support for staff, going beyond generic PD, was also important. Some such support was available in 2011–2012 from a dedicated ICTs Pedagogy Officer, a technologically experienced teacher seconded from a local school with funding provided by the Australian Government's *Teaching Teachers for the Future* project (Oakley and Pegrum 2015). After this point, the task of individualised support fell to the *Teaching and Learning with ICTs* lecturer and other programme staff, though in time a dedicated part-time staff member was employed to look after the e-portfolio platform, supporting both students and staff as required. In addition, the growing involvement of programme staff as members of the assessment panels—alongside school principals and deputies —from 2012 to 2014 helped them to perceive the bigger picture of e-portfolio use and to develop a more sophisticated understanding of the then still new *Australian Professional Standards for Teachers,* against which pre-service teachers were asked to reflect. Through this process staff were able to make more explicit connections between their teaching, their students' learning, and assessment.

Integrating Technology

The Changing Nature of Technology Users

In a baseline survey conducted in the first year of implementation, it was observed that although most pre-service teachers were making considerable use of ICTs for social, entertainment and simple information access purposes, very few had ever engaged in more complex activities involving web 2.0 tools (Oakley et al. 2014; cf. Istenic Starcic et al. 2016). This finding dovetails with extensive research that has found little empirical evidence of the existence of a homogenous, digitally accomplished generation of 'digital natives' (Andrews and Cole 2015; Hargittai 2010; Thomas 2011).

Nonetheless, with the spread of mobile smart devices in everyday life, students have generally become more comfortable and more accomplished in their dealings with digital technologies. What is more, during the past five years we have observed the level of peer-to-peer collaboration and support around new technologies growing considerably, and in a very specific way. As pre-service teachers' confidence and abilities increased from cohort to cohort, the reliance on a few expert students, which was noted in the first two cohorts in particular, gradually gave way to a broader sharing between a much larger number of students, all seeking ways to improve the technological aspects of their e-portfolios. In this way, the potential of e-portfolios to support further development of students' technological skills (Lin 2008) has been realised.

Indeed, following on from the *Teaching Teachers for the Future* project (DEEWR, n.d.), and in light of the *Australian Professional Standards for Teachers* and their ICT elaborations (AITSL, n.d.), there is a clear expectation that all Australian teacher educators and teachers, including pre-service teachers, have upgraded or are upgrading their technological knowledge, linking it to their existing or developing content and pedagogical knowledge (Mishra and Koehler 2006). The key aim of the *Teaching and Learning with ICTs* unit, which predated the *Teaching Teachers for the Future* project, has always been to help teachers develop this integrated skillset, but initially there was a strong focus specifically on technology, in large part due to the need to level the playing field for those pre-service teachers who arrived at their fourth semester with an inadequate technological grounding. However, with many now arriving in class with greater technological skills, and most being willing to seek help from peers when necessary, it has become possible over the last two to three years to focus less on technological knowledge per se and more on its integration with content and pedagogical knowledge, which is in line with wider trends in pre-service teacher education (Drummond and Sweeney 2016). This has included promoting pre-service teachers' awareness of the differentiation of technology usage for early childhood, primary and secondary levels, and of their students' typical developmental arcs across these levels.

To the extent that there is still a focus on technology, it involves introducing the pre-service teachers to tools they may not have seen before; showing them examples of how other teachers and students have used them; and encouraging them to explore these, use them with their own students on practicum placements and preserve records of this usage, and employ them to enrich the presentation of their accomplishments in their e-portfolios. The pre-service teachers are thereby encouraged "to explore the use of multimedia to reflect the breadth and depth of learning outcomes" (Haverkamp and Vogt 2015, p. 286, with reference to O'Keeffe and Donnelly 2013). E-portfolios can support the development of multimodal and broader digital literacies as they "encourage[e] deeper learning through the use of multimedia artefacts as richer forms of literacy to express understanding" (Lambert et al. 2007, p. 76, cited in Samaras and Fox 2013, p. 24; cf. Istenic Starčič et al. 2016). A selection of the tools most commonly integrated by recent pre-service teachers into their e-portfolios is listed in Table 1, along with examples of how they have been used.

The Changing Nature of Technology

From 2011 to 2014, each pre-service teacher created his or her e-portfolio on an individual wiki set up by programme staff on the Wikispaces platform, and hosted within a secure, password-protected environment. In line with our observation that five years ago students had limited skills with web 2.0 services, many struggled with uploading material to their wikis, and there was initially little embedding of multimedia artefacts of the kind wikis are designed to support. To our surprise, only a small number of pre-service teachers attended the optional technical workshops offered, though it was noticed that a larger number sought help at the point of need from a few expert peers.

Online peer commentary was restricted in the first year as the pre-service teachers' wikis were private by default and they needed to invite peers to view them, but at their request the wikis were opened up to the whole cohort from 2012; this meant that each individual worked on his or her own wiki, but could view and leave comments on peers' wikis. Due to technical issues the wikis subsequently reverted to invitation-only spaces, but students were repeatedly encouraged to invite peers to view their work, with nearly all opening up their wikis to at least some classmates. While a few students expressed concern over possible plagiarism of their work by others, which aligns with past findings in locations such as Hong Kong and Taiwan (Yang et al. 2016), most preferred a more open structure. Significantly, the process of writing for a wider audience and the ability to access and comment on others' work appear to have led to a deepening of reflections through a process of "reflection in community" (Eynon et al. 2014, n.p.). Furthermore, this has helped foster the kind of networked, web 2.0-supported structure which is becoming common in contemporary e-portfolios (Tur and Marín 2015), where students can interact within their cohorts but also externally with

Table 1 A selection of pre-service teachers' preferred tools for integration into e-portfolios

Purpose of tool	Popular services	Example of usage
Document embedding	• Box (www.box.com) • FlipSnack (www.flipsnack.com) • Scribd (www.scribd.com)	• Embedding lesson plans & essays
Mind mapping	• MindMeister (www.mindmeister.com) • SimpleMind (www.simpleapps.eu)	• Mapping personal learning networks (PLNs)
Image annotation	• ThingLink (www.thinglink.com)	• Annotating photographs of student work
Collage creation	• Cincopa (www.cincopa.com) • PhotoSnack (www.photosnack.com)	• Presenting collages of student work
Slideshow creation	• Prezi (prezi.com)	• Presenting elements of a teaching philosophy
Slideshow embedding	• SlideShare (www.slideshare.net)	• Embedding academic presentations created for other units of study
Animated avatar creation	• Voki (www.voki.com)	• Introducing sections of the e-portfolio
Animated video creation	• PowToon (www.powtoon.com)	• Presenting selections of resources
Video embedding	• YouTube (www.youtube.com)	• Embedding teaching videos
Multimedia poster creation	• Canva (www.canva.com) • Glogster (edu.glogster.com)	• Presenting a self-introduction
Multimedia timeline creation	• Capzles (www.capzles.com) • Timetoast (www.timetoast.com)	• Presenting a study history
Digital storytelling	• Storybird (storybird.com)	• Presenting reflections on teaching

practicum colleagues, mentors, and other educators. In addition, a self-assessment questionnaire, designed to aid the pre-service teachers in maintaining a focus on their e-portfolio contributions, was incorporated into the *E-portfolios Guide* in 2012 and has been used by some to keep their work on track. In brief, the incorporation of elements of both peer and self-assessment can help prepare students (and perhaps pre-service teachers in particular) for future professional practices as well as reducing the pressure on academic staff to provide all the feedback themselves (Trevitt et al. 2014).

In 2011, wikis were seen as state-of-the-art, flexible, generic online spaces which lent themselves to the construction of e-portfolios. By 2014, there were many competitors, including drag-and-drop website building services with clean, contemporary interfaces. Due to an overwhelming number of requests from our increasingly tech-savvy students that year, we decided to offer the pre-service teachers a free choice of platforms from the start of 2015. Around half opted to continue using the Wikispaces e-portfolio spaces provided for them, while the others were willing to risk a lack of technical support in selecting their own

services, with the most common choices by far being Weebly (www.weebly.com) and Wix (www.wix.com). The pre-service teachers were generally able to solve their own technical problems, often with the aid of peers, with very few seeking recourse to the lecturer or the part-time support staff member.

Continuing the trend of previous years, the overview of requirements in the *E-portfolio Guide,* echoed in the unit outline, was broadened further, setting general parameters with plenty of illustrative examples, but without closely prescribing the necessary content. In fact, our current approach very much parallels that of Andrews and Cole (2015), who comment:

> When using e-portfolios for assessment purposes, Moores and Parks (2010) advise that assessment guidelines should be transparent but not too prescriptive. There is a fine line between encouraging creativity and innovation, but still providing clarity on structure, size and required elements to include. E-portfolios are consistent with the growth in person-alised and holistic approaches in education (Ellaway and Masters, 2008), and thus assessment guidelines need to be written with this in mind. (p. 571).

In some ways, the pre-service teachers' e-portfolios have come to act as alternative or supplementary spaces to the university's administratively oriented, one-size-fits-all LMS; they are able to function as more "owner-centric" spaces (Shroff et al. 2013, p. 144) aligned with contemporary trends towards the personalisation of learning, and specifically towards PLEs, which can be defined as "appropriate environment[s] centred on the learner, connecting each tool, service, relationship, etc. in the learning process" (Tur and Marín 2015, p. 61, with reference to Adell and Castañeda 2010, & Attwell 2007). Importantly, in these personalised spaces, the pre-service teachers have been able to work semiautonomously to develop the kinds of 'transferable skills' (Simatele 2015), also known as 'generic capabilities' or 'graduate attributes' (Trevitt et al. 2014), which give graduates "enhanced capacity to deal with an unknown and unknowable future" (ibid., p. 70). A related term which has found resonance in recent research is '21st century skills', incorporating for example communication, collabo-ration and critical thinking (Mishra and Kereluik 2011; P21, n.d.) as well as, crucially, creativity (Henriksen et al. 2015; Stansberry et al. 2015). The development of cre-ativity, as often expressed through the innovative use of multimedia web 2.0 tools like those listed in Table 1, certainly goes hand in hand with the freedom and independence opened up by more personalised learning spaces. In short, the pre-service teachers have been able to fashion their own learning stories, and construct their identities both as students and soon-to-graduate professionals, with the support of their choice of materials presented through their choice of services on their choice of platforms. In 2015, it was found that the best e-portfolios, as assessed by the lecturer at the end of the semester, were roughly evenly distributed across Wikispaces and alternative platforms, and incorporated a wide range of different tools and services, and ways of employing those tools and services.

With the spread of mobile technologies, today's students are not only able to access and work on their e-portfolios using a variety of devices in a variety of locations, but to use those same devices to make multimedia recordings of their learning experiences in their everyday educational and noneducational

environments (Pegrum 2014). Such digital recordings can be easily integrated into e-portfolios (Shroff and Linger 2015). Drawing on their practicum placements in school classrooms, our pre-service teachers have been able to create a whole range of artefacts—such as annotated images, audio recordings, and even subtitled videos —to support their reflections on their learning, and demonstrate their growing competence as teachers. At the same time, this has made it all the more pressing a concern to ensure students always consider copyright, as well as confidentiality (Andrews and Cole 2015), with the materials they include.

Future Directions

Much has been written in the last few years about the need for a new generation of LMSs that more closely resemble PLEs. Discussing next generation digital learning environments (NGDLEs), the ELI (2015) suggests that these may take after smartphones where content and functionality can be aggregated in individualised ways for every student and teacher:

> learners and instructors must have the ability to shape and customize their learning environments to support their needs and objectives. By espousing a component-based architecture based on standards and best practices, **the NGDLE encourages exploration of new approaches and the development of new tools.** (n.p; bold in original)

Or, as Ros et al. (2014) write of what they call third-generation LMSs, their features make them:

> user centered and allow building personal learning environments (PLEs) in a simple way. A PLE is as "a set of devices, tools, applications, and physical or virtual spaces associated by learners at a specific time, for a specific purpose, and in a given context" (Gillet, Law & Chatterjee, 2010). In this context, a course is a mash-up of services where students and faculty choose the most appropriate ones for their work. (p. 1252)

Moreover, there would currently seem to be considerable promise for rejuvenating, and even reconceptualising, LMSs thanks to the development of the Experience Application Programming Interface (xAPI, also known as Tin Can API), a still-evolving set of open specifications designed to help track and collate a wide variety of learning experiences within personalised online spaces (Lim 2016). This is an area to watch over coming years.

For now, e-portfolios, as they have evolved over the past half-decade, already foreshadow many of the characteristics imputed to next generation learning environments. If we as educators can give students the autonomy to choose their preferred technological tools, the freedom to express themselves multimodally, the scaffolding they need to author accounts of their own learning journeys, the guidance they require to reflect carefully on those journeys, and the motivation to network with peers and the wider professional community they will enter on graduation, then we have already begun introducing them to some of what the new generation of digital learning environments may offer.

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