Better 21C Credentials

Evaluating the promise, perils and disruptive potential of digital credentials

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EXECUTIVE SUMMARY

Credentials are signals that warrant that learning has been achieved: educators warrant that learners have demonstrated learning outcomes at or above the required standard; graduates use them to communicate their achievements and seek advancement; and employers and the wider community perceive them as indicators of achievement and potential performance. Traditional macro credentials such as degrees have been conferred for centuries. Since 2012, startups have curated short, self-paced courses, usually known as MOOCs (massive open online courses) enabling anyone with an Internet connection to complete components of macro credentials from prestigious institutions. MOOC platforms increasingly offer learners the opportunity to earn a micro credential (for a fee) through verified assessment (for a fee), that can be upgraded to credit towards a degree (for a fee). Through this method, the degree is more cost-effective for the learner, and potentially for the provider if scale can be achieved and maintained.

This paper calls these emerging micro signifiers 21C credentials, and contends that to be deemed excellent, they must meet or exceed five essential criteria. They must:

1. Clearly communicate achievement of appropriate outcomes and standards with sufficient granularity to predict future performance;
2. Be based on judgments of rich evidence created in response to authentic assessments in a range of complex, ill-defined tasks;
3. Maximise assessment integrity, appropriately verifying the identity and the contribution of the learner;
4. Balance time and money invested by the learner with benefits realised during and after conferral (credit or entry to a higher credential, enhanced status or career advantage); and
5. Be sustainable, based on sound business models, crisp and consistent value propositions, and compliant with regulatory frameworks.

While one would hope that all credentials (be they macro, micro, paper or digital) meet all five criteria, excellent 21C digital credentials that use badging technologies have added affordances. They can be more granular, stackable, evidentiary, personalised and machine-readable (if built according to technical standards), enabling rich analytics.

This paper analyses 19 case studies, whose selection is based on sufficient public information being available for analysis. It is impossible and unfair to make thorough evaluations of these cases on limited information. Nevertheless, some overarching observations can be made, albeit with several caveats. This paper compares a credit-eligible MOOC credential with a similar university course: overall the MOOC does not, as yet, provide a ‘better’ 21C credential. However, it is way too early to dismiss 21C credentials attained through MOOCs and similar channels. Rogers (1995) claims that innovations are adopted if they have relative advantage, are compatible, easy to understand, trial-able and observable. Many emerging credentials are beginning to meet these criteria. Christensen (2016) theorises that disruptive innovations take hold in niche markets, but eventually redefine the industry, making products and services more accessible and affordable to a broader population. In a time when higher education credentials are highly sought after, but very expensive, it is difficult to see how 21C credentials, done well, will not eventually have a disruptive influence on higher education as we now know it.

1. INTRODUCING 21C CREDENTIALS

1.1 What is the purpose of credentials?

Education providers have issued credentials for centuries. Also known as qualifications, awards and certificates, credentials are used by different groups for different reasons:

- Education providers issue credentials (completed qualifications or credit towards such) to warrant that learners have demonstrated learning outcomes at or above the required standard;
- Recipients (students and graduates) use them to communicate their achievements and seek advancement (such as credit towards a higher credential, employment or professional standing);
- Employers and the wider community see them as indicators of achievement and, independently from the intentions of educational providers, as predictors of potential future performance.

1.2 Macro credentials

Macro credential is a term that usually describes a qualification such as a degree that is issued securely by an accredited institution, and traditionally on paper or parchment (and more recently in digital formats)[1]. Degrees are achieved over extended periods on successful completion of a course (or program), usually by collating marks and grades derived in response to assessment tasks in components called by various names (such as courses, units or subjects). Traditional degree credentials have been conferred, somewhat uncontested, for centuries. However, more recently increasing costs and falling graduate employment rates have prompted a rising chorus questioning their value:

- Some suggest that industry and non-academic certifications are more valuable than degrees, and industry certifications reassure employers of learners' achievement (Blumenstyk, 2015; Callaghan, 2015; Ganzglass, 2014; Ganzglass, Bird, & Prince, 2011);
- In 2015, Ernst and Young removed the degree classification from its entry criteria, claiming there is no evidence that success at university correlates with achievement in later life (Sherriff, 2015). Similarly, in early 2016, publisher Penguin Random House dropped degree requirements for applicants (Coughlin, 2016);
- Student perceptions may also be changing: learners believe that their academic qualifications have a declining role in shaping their employment outcomes in a congested and competitive graduate labour market (Tomlinson, 2007, 2008).

[1]The Groningen Declaration (http://gd.warpnet.nl) seeks to bring together key stakeholders in the Digital Student Data Ecosystem. Across Australian and New Zealand universities, Digital Student Data Taskforce is working towards managing digital student academic record data. Anticipated benefits include: credential and qualification security and integrity; student mobility and credential portability; process automation and more efficient services; enhanced international student recruitment opportunities; and full participation in the Groningen Declaration (see Appendix). The French government recently announced a new digital authentication system for degrees and qualifications (Elmes, 2016)

Conversely, research suggests that employers in the United States increasingly expect employees to hold a degree (Burning Glass Technologies, 2014), and open courses' increasing popularity may be in part due to their becoming credit-eligible (Shah, 2015a).

A key aspect of any credential is the assessment upon which it is based – the quality of a credential hinges upon learning evidence. Key questions when evaluating the quality of credentials include: what did the learner have to do, how, with whom, how often, and in what conditions to earn the credential? The quality of the assessment has a direct impact on the quality of learning that the credential signifies (Boud, 2010). In their *Assessment 2020: Seven propositions for assessment reform in higher education*, Boud and Associates' list of underpinning principles include:

- Assessment is a central feature of teaching and the curriculum. It powerfully frames how students learn and what students achieve. It is one of the most significant influences on students' experience of higher education and all that they gain from it. The reason for an explicit focus on improving assessment practice is the huge impact it has on the quality of learning;
- Assessment plays a key role in both fostering learning and the certification of students. However, unless it first satisfies the educational purpose of ensuring students can identify high quality work and can relate this knowledge to their own work, the likelihood that they will reach high standards themselves is much reduced (p.1).

The seven propositions assert that assessment has most effect when:

1. Assessment is used to engage students in learning that is productive;
2. Feedback is used to actively improve student learning;
3. Students and teachers become responsible partners in learning and assessment;
4. Students are inducted into the assessment practices and cultures of higher education;
5. Assessment for learning is placed at the centre of subject and program design;
6. Assessment for learning is a focus for staff and institutional development;
7. Assessment provides inclusive and trustworthy representation of student achievement.

The seventh proposition (above) refers to certifying learning and is accompanied by the following detail which is pertinent to this discussion of the limitations of traditional credentials (emphasis added):

> Certification **accurately and richly** portrays graduates' and students' achievements to inform future careers and learning. An academic transcript that lists subject titles and grades provides limited information to students, employers or educational institutions. **Increased scope and sophistication** of the reporting of achievement is needed to communicate outcomes well. **Two areas for improvement are: veracity, in grades that are fully and robustly aligned with learning outcomes and standards; and, richness, in the documentation of student accomplishments to convey information about what students can and cannot do** (p.3).

1.3 The emergence of 21C micro credentials

For many years, components of degrees have been delivered in whole or in part on campuses or online, or both. Since 2012, there has been increasing use of massive open-access online learning

(MOOCs) where anyone with an Internet connection can complete components of macro credentials from prestigious institutions. These micro credentials are conferred digitally, principally through

- PDF documents
- Image files (e.g. jpeg) or
- Digital badges.

Lemoine and Richardson cite a helpful definition of credentials issued using digital badging technologies (pp. 39-40):

A digital badge is a clickable graphic that contains an online record of 1) an achievement, 2) the work required for the achievement, 3) evidence of such work, and 4) information about the organization, individual, or entity that issued the badge. Mozilla has created an Open Badges Infrastructure (OBI) standard that includes a display platform called the Badge Backpack so that badge earners will have a free, hosted, public location for management and display of their digital badges. Thus, badges earned by individuals from disparate organizations that use custom badging platforms may be aggregated in one location for others to view. Digital badges can be used, among other things, to depict course completion, establish micro-credentials, represent honors, show event participation, and demonstrate community membership (Bixler & Layng, 2013; cited by Lemoine & Richardson, 2015).

Digital credentials that use badging technologies (referred to as 21C credentials in this paper) have added affordances. They can be more:

- **Granular**: more than simply communicating marks and grades, they can pinpoint where skills and competencies – for example, innovative thinking, teamwork – have been demonstrated;
- **Stackable**: because they are digital, they can be added to credential repositories, mapped to qualifications frameworks, and more easily be understood in terms of credit-eligibility towards other credential systems;
- **Evidentiary**: they can point the reader of the credential directly to learning evidence created by the learner;
- **Personalised**: because they can more accurately represent each learner's achievements, highlighting where skills or outcomes were achieved above the minimum standard;
- **Machine-readable**: if built using open technical standards, they enable rich analytics, showing, for example, which graduates in a cohort excelled in communication skills or teamwork.

New credentials can be conferred in relation to a range of learning experiences such as:

- Brief training sessions, often video only (e.g. Lynda.com)
- Courses (often equivalent to a semester experience in a degree) e.g. edX

- Clusters of courses using new terms: Udacity offers a Nanodegree, MIT offers a MicroMasters, and Coursera offers Specialisations.

The provider landscape is very volatile, but at this stage providers can be roughly categorised as follows (see case studies in Section 3):

1. Open access courses: offering free access to courses, usually requiring payment for proctored assessment and for the credential, with a small proportion of credentials exchangeable for credit towards a degree (sometimes with extra payment)

2. Paid access courses: subscription or membership is required to access learning resources

3. Assessment service (no courses provided): these services are often related to competency-based educational initiatives, assuring the provider that certain learning outcomes have been met by the learner before taking the course.

4. Initiatives recognising achievement: usually traditional providers who use digital, non-credit-bearing credentials to indicate achievement of learning or participation.

1.4 Sustainability: business models, adoptability and quality assurance

Credit is a hypothetical currency used to communicate a learner's progress towards completion of a macro credential.

For learners, credit has temporal and financial costs:

- Credit granted for prior learning or experience represents a discount of time or money or both; and

- Credit yet to be earned represents future investment of time or money or both.

Conversely, for providers of macro credentials,

- Credit granted for prior learning or experience is foregone revenue against fixed costs;

- Credit yet to be earned by learners represents future revenue; and

- Scale can ensure financial sustainability because a high volume of learners brings mass revenue that diminishes some fixed costs. At the same time, scale heightens quality assurance challenges.

Credentials can lose their perceived value – and providers can lose credibility – when:

- Credentials are attainable through fraudulent means, in whole or in part. This includes fake certificates, learner plagiarism, cheating, ghost writing and other forms of assessment impersonation;

- Providers of credentials fall into disrepute or cease to exist. This happens in traditional institutions, but is more likely in startup organisations (including providers of MOOCs);

- Employers and industry perceive, rightly or wrongly, that credential bearers cannot perform at expected levels;

- Graduates believe, rightly or wrongly, that the expected benefits of the credential in terms of employment, career advancement, or professional status do not match or outweigh the costs of acquiring it;

- Credential arrangements fail to comply with regulatory frameworks or have inadequate quality assurance processes.

New and emerging credentials can be classified as disruptive innovations within the higher education sector. The theory of disruptive innovation coined by Christensen explains the phenomenon by which an innovation transforms a sector through simplicity, convenience, accessibility, and affordability. Initially, such innovations take hold in niche markets, but eventually the new product or idea completely redefines the industry. These innovations make products and services more accessible and affordable, thereby making them available to a much larger population (Christensen, 2016).

Many innovations never become adopted widely. According to Rogers, several factors affect the rate of adoption of innovations including:

- Relative advantage: is the innovation seen as better than what it supplements or supersedes?
- Compatibility: is the innovation seen as compatible with the user's needs?
- Complexity: is the innovation difficult to understand and use? Simplicity assists adoption.
- 'Trial-ability': can the innovation be trialed on a limited basis?
- Observability: are the outcomes of the innovation visible? Higher visibility increases the likelihood of adoption (Rogers, 1995).

Applying Rogers' factors to innovative 21C credentials, key questions include:

- **Relative advantage**: Is the new credential seen as having relative advantage over an existing one, supplementing or even superseding it? In comparison to traditional credentials, is it more timely (faster), more effective (focused on employment outcomes), or more efficient (less expensive to produce, less expensive to acquire) – or all of the above?
- **Compatibility**: Does it relate to or lead to a higher credential? If not, what is the value proposition for learners to invest time and effort in credentials that are unproven or unknown to potential employers?
- **Complexity**: Is the new credential easy to understand and explainable in a concise and consistent manner?
- **'Trial-ability'**: Can the new credential be trialled? In some open platforms, for example edX, learners can access course materials for free, then convert to paid access to earn the credential.
- **Observability**: Is the new digital credential visible? Digital credentials, like digital photos, movies and books, can be visible online, but not on a mantelpiece. Digital credentials that can be also printed and displayed might add value in the eyes of the learner.

Most established higher education providers confer degrees within regulatory frameworks and qualifications profiles, and often with additional professional accreditation (Altbach, Reisberg, & Rumbley, 2009; Harris & Webb, 2010; Tuck, 2007). Operating outside of such frameworks lessens

consumer confidence, and threatens a sustainable enterprise. Interestingly, startups that issue credentials, like those examined in Section 3, are often offshoots of established institutions which can test ideas and solutions, and remain at arm's length, so as not to threaten accreditation. In 2015, most large MOOC providers monetised their credentials and added some form of remote proctoring (Shah, 2015a).

1.5 Evaluating 21C credentials

The above challenges lead to the following essential criteria for excellent 21C credentials:

1. Clearly communicate achievement of appropriate outcomes and standards with sufficient granularity to predict future performance;

2. Are based on judgments of rich evidence created in response to authentic assessments in a range of complex, ill-defined tasks;

3. Maximise assessment integrity, appropriately verifying the identity and the contribution of the learner;

4. Balance time and money invested by the learner with benefits realised during and after conferral (credit or entry to a higher credential, enhanced status or career advantage); and

5. Are sustainable, based on sound business models, crisp and consistent value propositions, and compliance with regulatory frameworks.

While one would hope that all credentials (be they macro, micro, paper or digital) meet all five criteria, excellent 21C digital credentials that use badging technologies have added affordances. They can be more granular, stackable, evidentiary, personalised and machine-readable (if built according to technical standards), enabling rich analytics.

In Section 2, a brief summary of the main drivers influencing 21C credentials is provided. In Section 3, a framework for evaluating 21C credentials is provided that expands on the criteria above, and selected case studies are analysed using that framework.

2. BACKGROUND: A SYNOPSIS OF THE MAIN DRIVERS AND EMERGING TRENDS

2.1 From inputs to learning: evidencing all outcomes and standards

The transition from education based on inputs to outcomes has been rapid: quality assurance agencies increasingly require higher education providers to contextualise, embed and assess learning outcomes rather than inputs (Australian Qualifications Framework Council, 2013; Coates, 2010; Ewell, 2013; Higher Education Standards Panel, 2014; Lumina Foundation, 2014; Tuck, 2007), including widely-agreed generic employability outcomes such as written and oral communication, critical thinking; problem solving; learning and working independently and collaboratively; and ethical and inclusive engagement with communities, cultures and nations (Business Council of Australia, 2011; Oliver, 2011; The National Network of Business and Industry Associations, 2015). Australia's Higher Education Standards Framework (1.4.2) requires that the expected learning outcomes for each degree course include discipline-specific knowledge and skills and their application; generic skills and their application; knowledge and skills required for employment and further study, including those required for registration to practise; and skills in independent and critical thinking suitable for life-long learning. On completion of a course (1.4.4), students must have demonstrated the learning outcomes specified for the course, whether assessed at unit level, course level, or in combination (Commonwealth of Australia, 2015).

2.2 Graduate employment, employability and the unpredictable future of work

Until quite recently, conferral of a degree signified success in completed studies, and future potential as a graduate working in a professional field. Lately, there has been a persistent decline in the employment rates of new Australian graduates (Graduate Careers Australia, 2014, 2015) along with changes in employers' perceptions – some showing less regard or requirement for degrees (Blumenstyk, 2015; Callaghan, 2015), others evidencing an increasing call for degrees (Burning Glass Technologies, 2014). Students' perceptions are also changing: research has found that students think their academic qualifications have a declining role in shaping their employment outcomes in a congested and competitive graduate labour market (Tomlinson, 2007, 2008). These changes are happening amidst disruptive forces, with predictions of more to come: a 2015 report (Committee for Economic Development of Australia, 2015) claims that Australia is on the cusp of a new digital revolution with almost five million jobs facing a high probability of being replaced by automation. Some suggest that we need to educate ourselves as *digital citizens* who can use the Internet, process simple word documents and find information online; *digital workers* who can use more sophisticated tools directly related to a particular occupation; or *digital makers* who can build digital technology (UK Digital Skills Taskforce, 2014). Others focus more on science, technology, engineering, arts and mathematics (Bakhshi, Frey, & Osborne, 2015; Bakhshi & Windsor, 2015) and entrepreneurial, scientific and emotional skills (Dolphin, 2015). Whatever the future holds, there are signs that patterns of work are already changing, with online commerce driving a 24/7/365 economy, and more people choosing self-employment, short term and part-time work (Lewis, 2015; Phillips, 2015) in the 'gig' economy driven by the sharing platforms (Charlton, 2015; Potter, 2015).

2.3 From quantitative measures of learning to qualitative evidence on social media

Debate continues about how learning outcomes might be assessed, evidenced and credentialled at scale in higher education; test scores are predicated on quantitative measures, and what lies

beneath the numbers is a mix of assessment tasks. When assessment focuses on testing and measuring, teaching staff spend vast amounts of time and resources setting, marking and moderating results related to traditional assessment methods; students prepare or swot for tests and exams that require them to show what they can do in a limited time (often using a pen rather than a keyboard connected to global information channels). An alternative to designing tasks to enable teachers to test and measure generic skills is to invite students to provide compelling evidence that they have mastered discipline knowledge and generic skills at appropriate standards, or even better, finding ways that assessors other than teaching staff can provide endorsements or feedback as part of peer and mentor assessment of and for learning (Boud & Associates, 2010). This signals a shift from measuring learning to judging performance based on richer and more qualitative evidence of achievement (Yorke, 2008). Naturally, this leads educators to turn to portfolios and progress files as tools that enable students to assume responsibility for demonstrating evidence of their achievements within and beyond the curriculum. The challenges of implementing portfolio systems are well documented (Joint Information Systems Committee, 2006, 2008) and they include student engagement with institutional systems that rarely have longevity beyond enrolment (Jafari, 2004), particularly when online professional networks proliferate (examples include LinkedIn, GitHub, Doximity, RallyPoint) (Bischke, 2014).

2.4 Open learning of micro skills, on the go

Higher education is now well acquainted with massive open online courses (MOOCs) and many prestigious universities, often in commercial partnerships, offer no-cost or low-cost learning experiences and credentials (IBIS Capital, 2013; Norton, Sonnemann, & McGannon, 2013). At the same time, there appears to be a movement to 'micro' digital habitats and practices: sales of smaller tablet devices outstrip laptop and desktop sales; apps on mobile devices offer focused habitats more cheaply than large installed software applications; social media enable individuals to publish to the world (Twitter), share their thoughts (Blogger) or favourite images (Pinterest), curate their personal presence (Facebook) or professional portfolio (LinkedIn). Australians are high-volume consumers of such experiences on mobile devices (Alcorn, Buchanan, Smith, & Gregory, 2015; Australian Communications and Media Authority, 2015).

2.5 Portfolio living in the age of MOOCs and professional networks

Institutional eportfolio systems have now started to look curious in a world where LinkedIn appears to be the essential professional networking platform, supplemented by profession-specific networks such as GitHub, Doximity and similar. Some networks include free resources and courses. However, since 2012, dubbed as the year of the MOOC by *TIME* magazine, companies such as edX, Coursera and Udacity have become recognised globally. As they have evolved, these companies have increasingly offered credentials, usually for payment for verified assessment (commonly through online proctoring). MOOC developments in 2015 included:

1. Rising enrolments and courses: Student enrolments doubled, with more people signing up in 2015 than in the previous three years (the total number of students who signed up for at least one course has crossed 35 million). In 2015, 1,800 new courses were announced, taking the total number of courses to 4,200 from over 550 universities (Shah, 2015b);
2. More self-paced courses, moving away from start and end dates, and deadlines for assignments (Shah, 2015a, 2015b);

3. Monetised credentials (average cost of a Coursera certificate is AUD66; for edX, AUD72; Udacity has a subscription model of $200 per month (Coursera, 2016; Shah, 2015a);
4. Targeting younger learners such as high school students, closing the readiness gap (Shah, 2015a);
5. Moving to credit-eligible courses, predicted to be the sustaining factor for MOOCs (Bowen, 2015; Carey, 2015).

2.6 From badging to the big end of town

Technology solutions such as **Mozilla's Open Badges** have made it possible for anyone (institution, organisation, small group of individuals) to issue, earn and display online credentials (signified as badges): helping learners display 21st century skills, and unlock career and educational opportunities (Eisenberg, 2011; Mozilla, 2012; The Mozilla Foundation and Peer 2 Peer University, 2012; Young, 2012). Digital badging technologies enable recognition for micro and macro skills and achievements that happen within and beyond formal institutional contexts. Issuers of these credentials – be they formal (and potentially credit-bearing) or informal – can design and issue badges; and learners can store earned credentials in digital backpacks and display them on social media sites if and when they choose—just as traditional CVs list degree qualifications. Digital badge credentials can embed more detailed aspects of learning. For example, whereas achievement of learning may be somewhat invisible in collated marks and grades, these digital credentials can have baked-in criteria and learning evidence.

Since 2012, this field has transitioned from what some have seen as passing fad to having a major impact on established institutions. The meaning and value of the credentials is determined by the issuer, and just like monetary currency, the various types and denominations might be exchangeable for credit, or used for entry or higher status in a network. Management systems, such as Blackboard and Moodle, enable automated digital badging; while platforms such as Credly enable anyone with an Internet connection to design and issue their own badges. These badges are usually unsophisticated in design and carry a lower degree of importance or kudos than formal macro credentials. Such badges are often compared to Scout badges but they belong to a broad family called digital micro credentials.

At the other end of that family tree, digital credentials issued in open access systems such as edX can be purchased and exchanged for credit towards a macro credential (a recognised and accredited degree). For example, edX Verified Certificates appear in the following credit-eligible courses (subjects) (as at January 2016):

- Global Freshman Academy (edX and Arizona State University) offer full freshman (first-year) university courses for credit. They are open to everyone, everywhere and offer a cost-effective way to earn university credit. Example: AST111 Introduction to Solar Systems Astronomy from ASUx is a credit-eligible course. Credit details: 4 credit hours.[2] Cost: USD600 — pay for credit earned after passing the course with a C or better.
- Charter Oak State College: award credit to students who pass edX member courses with third party credit and an official transcript. Example: Introduction to Computer Science and Programming Using Python (offered by MIT). Credit details: 3 credit hours.[3] Cost:

[2] A standard bachelor's degree at ASU consists of 60 credit hours.

[3] A standard bachelor's degree at Charter Oak State College consists of 120 credit hours.

USD300 (USD100 per credit hour) — pay for credit earned after passing the course with a grade of 80 per cent or better.

- ACE Alternative Credit Project: learners can earn credits for general education courses that transfer to participating colleges. Credit is delivered through ACE and participating partner institutions, and is not directly awarded through edX or the institution offering the course. Example: Linear Differential Equations (Boston University).
- MIT Micro-Masters: students who complete required courses (and the proctored exam qualify to apply to gain credit at MIT for the graduate master's degree program in supply chain management.

In January 2016, a consortium of six edX partner universities[4] announced that they are seeking to establish a new alliance in which each organisation's massive open online courses are formally granted credit by partner institutions (Grove, 2016). This is another form of credit for prior learning, in that universities accept a course (subject) from another provider because it has had proctored assessment – the real news is that all these universities are moving towards giving credit for MOOCs completed at lower cost to the user and using remote proctored assessment. The business plan underpinning this venture is likely to be aimed at scaling online degrees, and ensuring that students who convert from MOOCs are retained and complete remaining units at the usual university fee.

2.7 Credential frameworks and systems

In recent years, several countries have adopted and adapted qualifications frameworks and credit transfer systems so that graduates can have their degrees recognised in other jurisdictions. The Lumina Foundation in the United States has recently proposed a credential registry and taxonomical framework to help categorise which credentials reflect what skills. About 80 organisations are co-sponsors (McIntire, 2015). The framework's beta phase (Lumina Foundation, 2015) will focus on:

- Mapping credentials to assess ease and integrity of profiling
- Convening a technical review team to examine the framework's internal structure
- Conducting proof-of-concept using real-world applications
- Drawing on insights from the ongoing national dialogue on credentialling

On the more technical side, the IMS Digital Credentialing initiative, with Mozilla and MacArthur Foundations, is working towards a learning badge ecosystem of the future to further the adoption, integration and transferability of digital credentials within institutions, schools, and corporations. Two projects are underway: the IMS eT project makes use of the Open Badges Standard as its technical underpinning; and, the Digital Credentials Currency Framework augments the metadata embedded within badges by defining a structure that communicates value and aids consumer comparison. Future projects will address badge analytics, expand interoperability, help define badges for K-12 teachers' professional development and extracurricular programs, and explore and develop a new form of learning representation such as the Comprehensive Learner Record (IMS Global Learning Consortium, 2015).

[4] Delft University of Technology, Swiss Federal Institute of Technology in Lausanne, The Australian National University, The University of Queensland, University of British Columbia and Boston University

2.8 Platforms that aggregate your credentials – and your life

Educational institutions invest heavily in learning management systems and (often separate) student management systems that record student progress towards macro credentials. Most often, progress is counted as credits acquired through collated marks and grades. Few systems enable collation of qualitative or more descriptive indicators of knowledge and skills acquired. If more did, there would be the possibility of analytics such as student progress towards skill acquisition (including broader graduate attributes) during the course, and matching with skills required by employers. Some new systems are starting to move into these spaces. Selected examples include:

- **Fidelis** (fideliseducation.com) is a 'personalised learning ecosystem' that also manages connections with mentors, coaches, and online communities. The company provides software that allows colleges, businesses, and other customers to build and publish micro credentials in the form of objective assessments, and for students to display those credentials;
- **Parchment** (parchment.com) transmits transcripts electronically and securely and also enables learners, educators and employers to send and receive other types of credentials securely online (Pittinsky 2015);
- **Degreed** (degreed.com) enables learners to create a portfolio of their lifelong learning experiences through a free service that scores and displays accredited and non-accredited learning, catalogues all informal online learning experiences (e.g. from Lynda.com or Codecademy) as well as badges;
- **Class-central** (class-central.com) enables learners to search for and evaluate credentials related to MOOCs and similar providers.

2.9 The academy strikes back: the University Learning Store

The University Learning Store is an initiative of seven US universities[5] creating an online platform that features modular content, skills assessments and student-facing services (coaches and counsellors). The platform will provide an alternative process for credentials that are much shorter and cheaper, and will offer products from different providers. The platform will be aimed at entry-level employees and students, as well as mid-career and senior employees (Fain, 2015).

In Section 3, a framework for evaluating 21C Credentials is provided with an analysis of selected case studies.

[5] Georgia Institute of Technology, Northwestern University, the University of Washington, the University of California's Davis, Irvine and Los Angeles campuses, and the University of Wisconsin Extension

3. EVALUATION FRAMEWORK AND CASE STUDIES

In this section, a framework is proposed for evaluating 21C credentials (Section 3.1), and 19 selected case studies (3.2 – 3.20) are analysed against the criteria proposed. The case studies come from a range of services, categorised as follows:

1. **Open access courses:** offering free access to courses, usually requiring payment for proctored assessment and for the credential, with a small proportion of credentials exchangeable for credit towards a degree (sometimes with extra payment);

2. **Paid access courses:** subscription or membership is required to access learning resources;

3. **Assessment service** (no courses provided): these services are often related to competency-based educational initiatives, assuring the provider that certain learning outcomes have been met by the learner before taking the course; and

4. **Initiatives recognising achievement:** usually traditional providers who use digital noncredit-bearing credentials to indicate achievement of learning or participation.

The analyses are based on publicly accessible information (usually frequently asked questions, as at January 2016) and focus on the credentials offered, rather than associated courses or the companies or institutions. The claims made and language used in the case studies match information on the credential provider's website; this information has not been evaluated and validity is not assured. It is also important to note that many companies do not share their business model and financial sustainability with the public, so this information is rarely available for the case studies.

3.1 Evaluation Framework for 21C Credentials

Excellent 21C credentials:

1. Clearly communicate achievement of appropriate outcomes and standards with sufficient granularity to predict future performance.

Key questions include:

- Does the credential include assessment of appropriate outcomes including the so-called soft skills and capabilities related to performance in employment?
- Are stakeholders such as employers, industry and the wider community satisfied that those who graduate with new and emerging credentials have the skills to match their qualifications?
- Does the credential have sufficient granularity to clearly communicate what the learner can do?

2. Are based on judgments of rich evidence created in response to authentic assessments in a range of complex, ill-defined tasks

Key questions include:

- Are the underpinning assessments appropriate, challenging learners to tackle a range of complex, ill-defined issues that simulate those they will encounter as graduates?
- Do assessments provide assessors with an array of evidence upon which to make judgements about complex performance?

3. Maximise assessment integrity, appropriately verifying the identity and the contribution of the learner

Key questions include:

- Can the credential be attained fraudulently without great difficulty?
- What measures are in place to ensure academic integrity, including assuring the identity of the learner?

4. Balance time and money invested by the learner with benefits realised during and after conferral (credit or entry to a higher credential, enhanced status or career advantage)

Key questions include:

- What is the cost of the credential to the learner (in time or money)?
- What are the benefits during the course (e.g. access to coaching)?
- What are the benefits after the course (e.g. credit or entry to a higher credential, status or career advantage)?
- Are the benefits durable over time?

5. Are sustainable, based on sound business models, crisp and consistent value propositions, and compliance with regulatory frameworks

Key questions include:

- What is the business model and how does it ensure the financial sustainability of the institution? Can revenue be increased through add-on services?
- Is the value proposition crisp, clear and consistently communicated?
- Can quality be assured when credentials are conferred at scale?
- How are staff and students protected by policy and procedures that assure compliance with regulatory frameworks?

3.2 EdX Verified Certificate

EdX was founded by Harvard University and MIT in 2012 and now has more than 85 global partners. EdX Verified Certificates (https://www.edx.org/verified-certificate) are available for a fee that varies by course. These certificates require learners to verify their identity before they can receive their certificate (XSeries certificates are available when students successfully complete a series of courses that make up an XSeries).
EdX partners with a variety of institutions to offer credit-eligible courses based on their verified certificates.

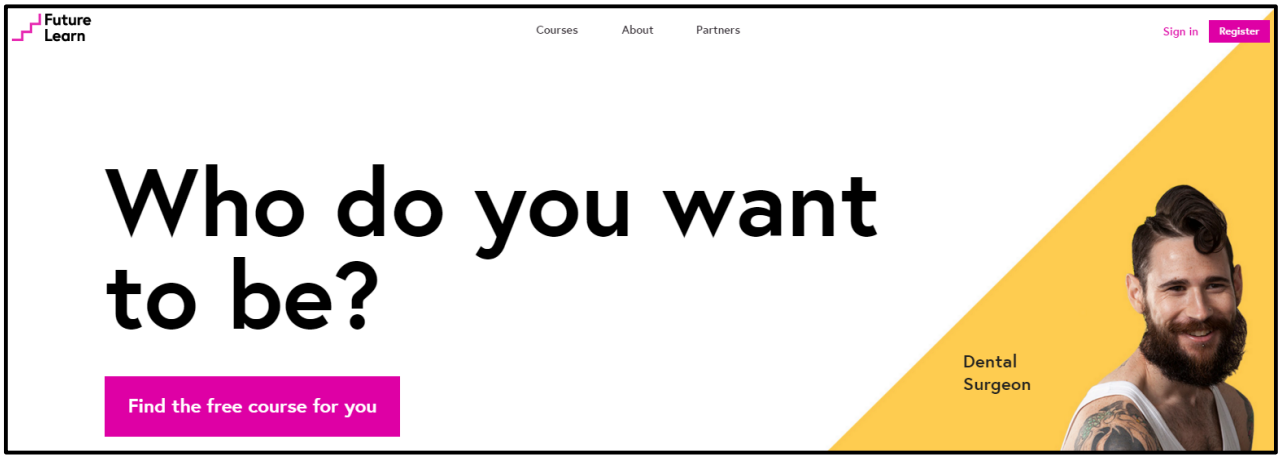
1. Outcomes	A brief synopsis of the content that learners will learn is provided prior to registration. Additional information related to the learning outcomes is provided to registrants and some courses refer specifically to the development of transferable capabilities (e.g. critical thinking, problem solving etc.). However, on the Verified Certificate, the course name is the only indicator of the course content and achievement of individual learning outcomes is not indicated or specified (no grade or mark).
2. Assessments	The edX platform offers course developers significant flexibility in assessment options. Customisable assessment options include: multiple-choice questions, fill-in-the-blanks, drag and drop tools, population of fields with numerical or mathematical expressions (e.g. formulae), interactive simulations, open response assessments and the submission of images. Assessment can be automated or require peer or self-assessment. Information about the assessment methods in any course is only visible to the user post-registration. Assessment methods and grades are not included on the credential artifact.
3. Integrity	When learners register for a course that offers a verified certificate they are asked to submit a photo of themselves and a photo of a government-issued ID through the use of a webcam. As the course progresses, they may be asked to re-verify their identity. A webcam, or a mobile phone camera, can be used to complete verification. Verified certificates include an edX-verified stamp and can be shared through social media or downloaded at edx.org. Once course grades are finalised, a learner who has earned a certificate will see it available for download on their dashboard.
4. Cost-benefit	Verified certificates may be used as evidence of learning for job applications, promotions, or school applications; but unless the course is credit-eligible and an additional fee is paid (see examples in section 2.6 above), they do not include a final grade or the number of credit hours that the course might earn at a university. The money provided to edX as part of the verified certificate process goes toward paying for courses and improving edX; so while there is a minimum fee for a course, you can help support edX and other students by choosing to pay more.
5. Sustainability	edX is a not-for-profit enterprise but courses are provided in partnership with a variety of organisations, including accredited higher education providers.

3.3 Coursera Course Certificate

Coursera (https://www.coursera.org/signature/) was founded in 2012 by academic staff from Stanford University. Coursera offers learners the opportunity to complete individual courses or specialisations; specialisations consist of a series of related courses followed by a peer-assessed capstone project.

1. Outcomes	Course concepts are outlined in course syllabi and appear to be based primarily on knowledge acquisition (this may vary by course). The course name is the only indicator of the course content provided on the course certificate.
2. Assessments	Assessment is automated (e.g. quizzes) or peer-graded. In automatically graded assignments, some courses penalise late submissions and multiple attempts, others limit the number of attempts possible. For peer-reviewed assessments: a grade is calculated using the median scores (from peers) on each component. Some courses penalise failure to complete peer review or self-evaluations. If self-evaluation is within five per cent of the peer grade, the learner receives the higher of the two scores. In some courses, learners can resubmit their assignment and receive new peer reviews. To pass, learners must pass all graded items. Capstone projects require learners to apply what they have learned to a practical question or problem. Capstone projects use the peer grading system. To pass a capstone, learners must achieve a passing grade for the final project and any required steps or components, and complete all of the required peer evaluations.
3. Integrity	Course Certificates require identity verification through the submission of a webcam photo and photographic ID, and through profiling and matching a sample of typing pattern. Certificates are provided as downloadable PDF files, and can be shared electronically using a secure Coursera URL (that enables verification).
4. Cost-benefit	Learners must pay (USSD20-100) to submit graded assignments to earn a Course Certificate. Certificates don't carry university credit. Coursera suggests checking with individual universities about whether they will accept Specialization Certificates for credit.
5. Sustainability	Revenue from Course Certificate fees is shared between Coursera and the partner institution offering the course.

3.4 FutureLearn Statement of Attainment



FutureLearn (https://www.futurelearn.com) is a private company wholly owned by The Open University, with 76 partners, including universities, the British Council, the British Library, the British Museum, and the National Film and Television School.

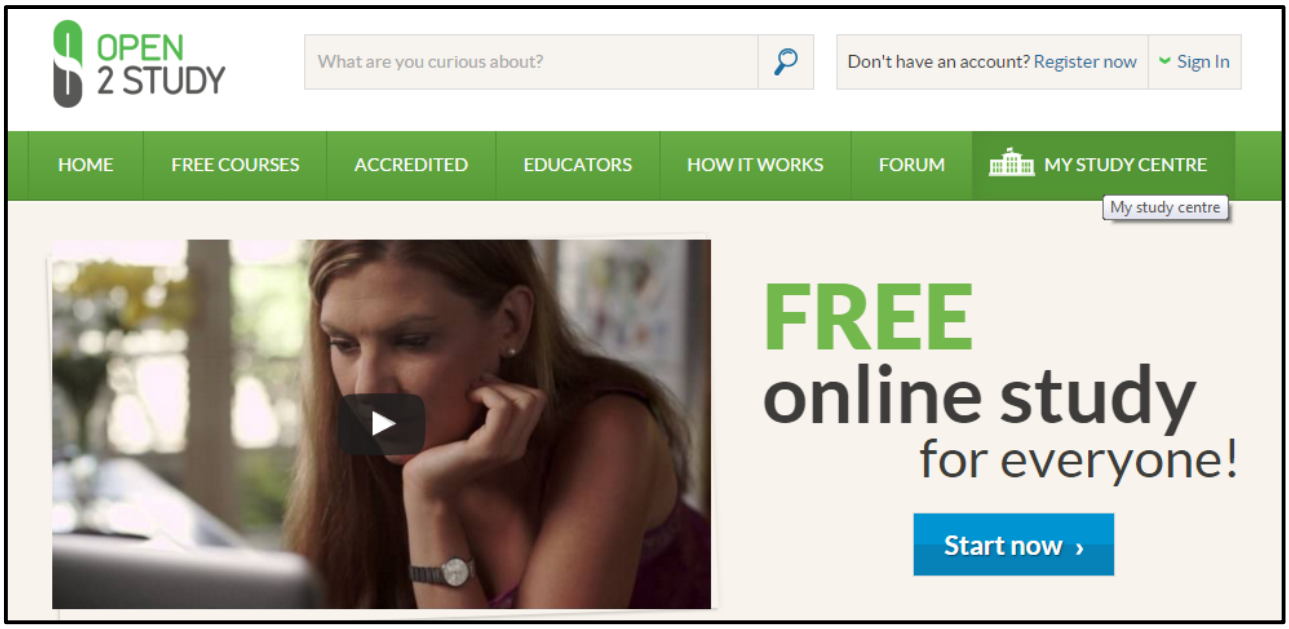
1. Outcomes	The majority of FutureLearn exams have a pass mark of 50 per cent. If you pass the exam, you will receive a Statement of Attainment stating that you passed. The Statement of Attainment will also include your percentage score. If you sit the exam but do not achieve the pass mark, you will not receive a Statement. Statements include an outline of what is learned. Learning outcomes vary by course. A synopsis of the course content is provided prior to registration and, in some courses, learning outcomes are listed; however, most courses appear to focus on the acquisition of content knowledge rather than generic skills development.
2. Assessments	Quizzes are not scored; there is no limit to the number of tries of each question and feedback and hints are provided on each attempt. Tests are scored and are limited to three tries. These count towards the overall mark and are designed to test knowledge. The system gives three points if an item is answered correctly the first time, two on the second attempt and one on the third. Many courses also offer the opportunity to do assignments and get peer feedback. Most courses have the option to buy a Statement of Participation. To be eligible, students need to have completed the majority of steps of a course and all of the tests. In some courses, learners are also offered the chance get a Statement of Attainment by passing an invigilated exam at a local test centre.
3. Integrity	The Statement of Attainment (only provided for a few courses) is a university-branded, printed certificate that shows the learner's name, the course, the name and logo of provider, the subject areas covered by the course, and the number of hours of study required per week; Statements are also signed by the provider. The certificate states that the final exam was carried out under invigilated conditions and shows the percentage score achieved. At the invigilated face-to-face exams, learners must provide two forms of non-expired, photo- and/or signature-bearing ID (one primary ID e.g. passport and one supplementary ID e.g. credit card).
4. Cost-benefit	Neither the Statement of Participation (GBP34 plus shipping, digital and printed) nor the Statement of Attainment is credit-bearing.
5. Sustainability	Courses are not currently accredited, but organisations may choose to recognise courses in the future.

3.5 Udacity Certificate

Udacity (https://www.udacity.com/) is building an online university that teaches the skills that employers need, and delivers credentials endorsed by employers at a fraction of the cost of traditional institutions. With partners such as Google, Facebook and Salesforce, Udacity offers nanodegree programs and credentials, through online courses and hands-on projects.

1. Outcomes	Udacity's learning outcomes include the skills required for specific job titles and needed to solve real word problems. All Udacity courses include a project requiring learners to build 'a real tool for the real world,' such as a blog, search engine, game or app; that demonstrates skills to potential employers and can be added to a portfolio of evidence. The curriculum and credentials are also created and endorsed in partnership with companies such as Google, AT&T, Autodesk, Cloudera, Salesforce, Amazon and Facebook.
2. Assessments	Learners must pass required specifications but this can be done when they feel ready. Each course includes non-assessed problem sets. Portfolio projects are used to help demonstrate learning. For paying students, these projects receive personal feedback from individual graders, and students need to pass certain criteria in order to meet program completion requirements. There are no final exams. Nanodegree credentials are conferred on completion of five to eight projects. Individual courses have one final project that is required for paying students wishing to earn a certificate.
3. Integrity	Udacity certificates are awarded based on successful completion of all the required components of a program. After successfully completing projects, learner identity is verified and they may be asked to do an exit interview.
4. Cost-benefit	All programs are billed on a monthly subscription basis (minimum, one-month paid enrollment for courses; two months for each nanodegree). Nanodegree programs cost USD200 per month, per program. Most programs are expected to take six months to a year. Nanodegree candidates have access to (1) Career Advisor program; (2) Udacity Profile tool that allows direct approach by potential employers; and (3) coach support, including 1-1 sessions and access to the Coaches' Lounge, a private forum where coaches answer questions about the learning material or projects. Udacity guarantees that learners will gain employment within six months of graduating or they will provide a 100 per cent refund of their tuition.
5. Sustainability	Udacity is not an accredited institution and does not directly provide college credit. However, they have partnered with Georgia Tech to offer an accredited, fully online master's degree in computer science. The courses are hosted on Udacity but the degree is conferred by Georgia Tech.

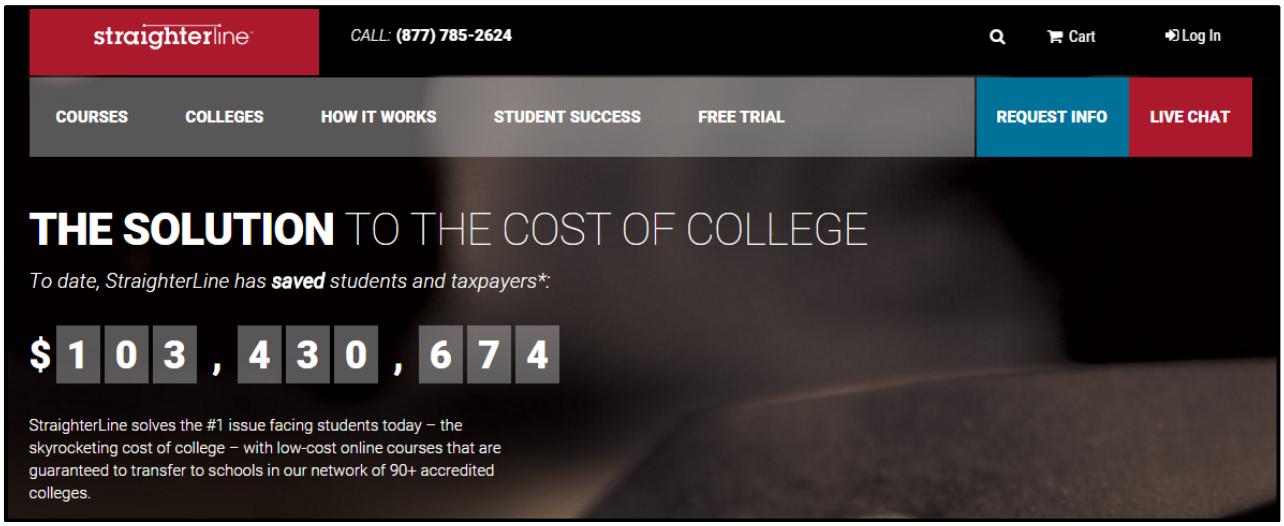
3.6 Open2Study Certificate of Achievement



Open2Study (https://www.open2study.com) is a free online education platform backed by Open Universities Australia, a private accredited Australian online education provider. The courses provided through Open2Study are not accredited.

1. Outcomes	Students are provided with a list of what they will learn. Most courses appear to focus on the acquisition of content knowledge rather than generic skills development.
2. Assessments	Each course is divided into four modules, and up to ten topics. At the end of each topic, a quiz or a simulator exercise helps the learner test their understanding but these do not count towards a final grade. Each module is assessed by an automated multiple-choice test The learner gets three attempts at every assessment. Learners can skip the content and go straight to the assessment. The highest score is recorded. Learners need an overall grade average of at least 60 per cent to pass the course. Even if an assessment is missed, the learner will pass if their overall average is at least 60 per cent.
3. Integrity	Learners are not verified. All persons participating in Open2Study Courses are expected to comply with the requirements set down in the Open2Study Code of Ethics for the duration of their participation. Open2Study provides Certificates of Achievement that can be downloaded and shared on social media such as LinkedIn, Facebook and Google+.
4. Cost-benefit	Courses and Certificates of Achievement are free. Certificates are not a formal qualification and are not associated with credit, but can be used to demonstrate interest in learning to potential employers or educational institutions.
5. Sustainability	Open2Study is not an accredited education provider. The courses are designed to give learners an idea of a particular subject area. Courses are provided in partnership with other education institutions who provide links to their related accredited courses. No credit is provided towards these courses.

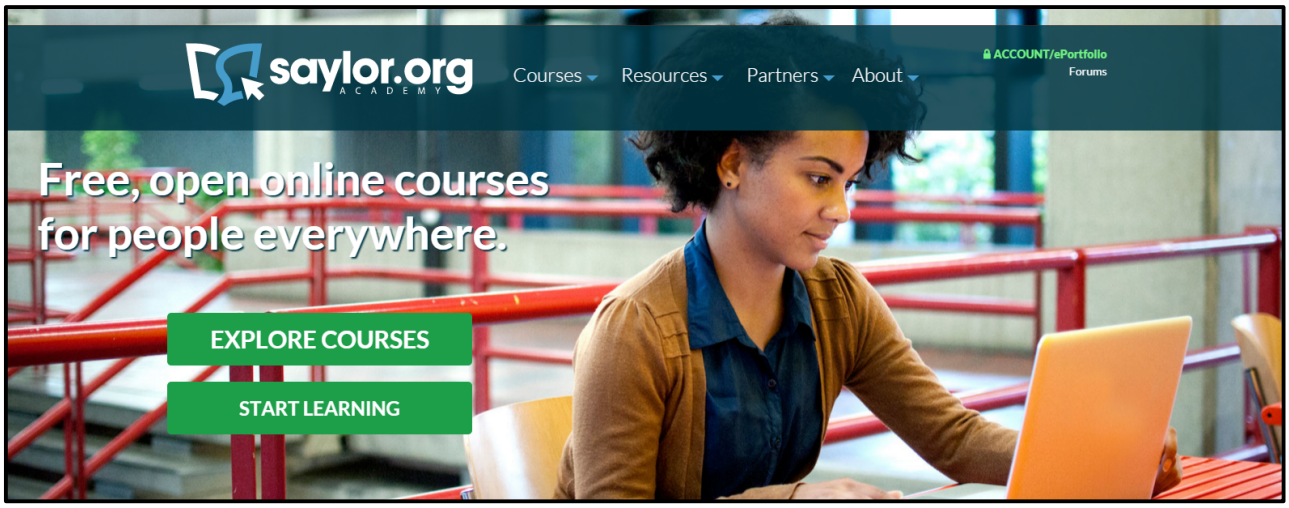
3.7 StraighterLine Transcript



StraighterLine (straighterline.com) partners with accredited colleges to provide affordable courses that are transferable for credit at some colleges. Credit transfer is guaranteed where students enroll in the courses within degree plans at partner colleges.

1. Outcomes	StraighterLine provides a letter and number grade to students for each course. Individual marks for assessments are not listed on transcripts, only a Pass/Fail. A Course Syllabus is provided for each course and includes a course description and detailed learning objectives.
2. Assessments	Assessments vary by course but typically include a mixture of exams, quizzes and essays. A grade of at least 70 per cent is required for an ACE CREDIT recommendation or credit recognition at most StraighterLine partner colleges. Learners must complete all graded assessments before they can request a transcript. Unless otherwise noted, learners have one attempt at graded assessments, all of which are timed and only one question is displayed at a time. However, learners can retake courses as many times as they choose, but are charged for every attempt. At the end of the graded assessment, learners can view their score and see all their submitted answers.
3. Integrity	StraighterLine requires proctoring (via webcam with a microphone) of all final exams. Other exams during the course may be non-proctored, however, students must confirm that the work is their own and that they have taken the exam in accordance with the StraighterLine Academic Honesty Policy. Some courses, such as English Composition I, have no final exam, and written work is subject to review via plagiarism detection software and other protocols. Learners may request the full text of the question, including all possible answers for use in follow-up tutoring.
4. Cost-benefit	Learners pay USD99 per month for StraighterLine membership in addition to course fees (typically USD49 per course). If learners enrol at a partner college they can receive full course credit for StraighterLine courses within their degree plan. Courses provided through StraighterLine are up to 60 per cent cheaper than completing the same courses though partner colleges.
5. Sustainability	Partner colleges and pathways to entering their degree programs are advertised through the StraighterLine platform.

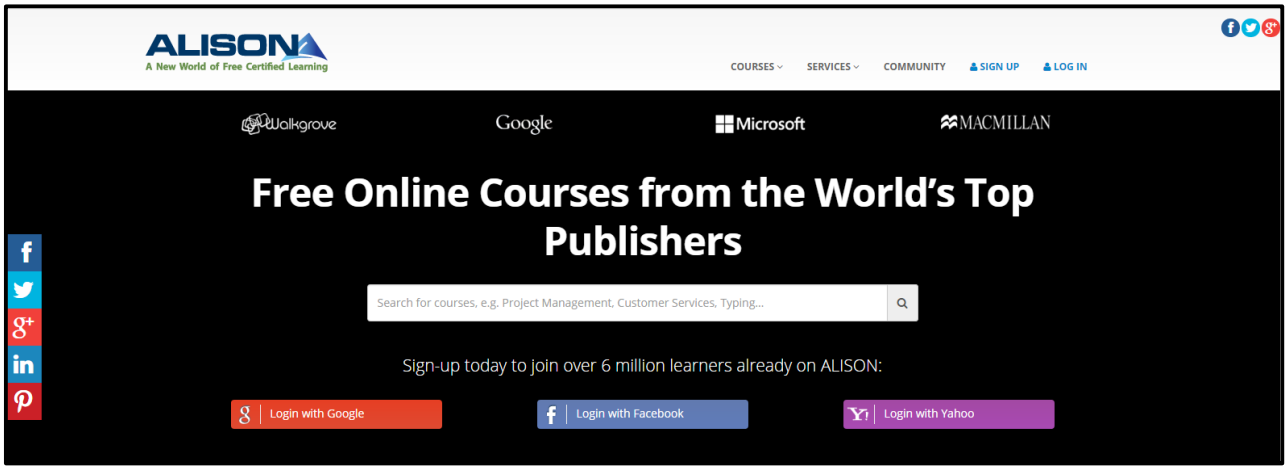
3.8 Saylor Academy Certificate



Saylor Academy (http://www.saylor.org/) offers free courses with low fees for exam proctoring and transcripts; courses are fully online and self-paced, with exams available 24/7. Most courses do not lead to college credit but many do and credit for these courses is guaranteed at over a dozen Saylor Academy partner colleges.

1. Outcomes	A course description and detailed learning objectives are provided for each course and learners do not require a login to view them. Students can request a transcript with itemised grades for each course completed and the date of completion. Transcripts can also be viewed and printed through Accredible; in this version of the transcript the name and a description of each course/module is listed as well as a grade.
2. Assessments	To get a certificate or college credit, learners must get a passing score of 70 per cent. College credit is based entirely on the grade achieved on a proctored exam. Saylor recommends that learners first take the free certificate exam so they know what to expect in the proctored exam. The proctored exam is similar to, but not identical to, the certificate exam for the same course. Each attempt at either exam will be different from other attempts, as exams are pulled semi-randomly from a larger pool of test questions. Students can retake the proctored exam as many times as they like, but must pay again each time.
3. Integrity	To earn a recommendation for college credit, the exam must be proctored by ProctorU in a place decided by the student. Students can take the exam as many times as they wish, with two weeks between attempts and each attempt incurs the same fee. For courses recommended by certain accrediting bodies, alternative arrangements with an in-person proctor are also possible.
4. Cost-benefit	Access to course content and certificates is completely free. Proctored exam attempts cost USD25. Obtaining a transcript from ACE CREDIT carries a one-time fee of USD40. Each additional transcript from ACE CREDIT is USD15. Individual colleges may charge fees to transfer credit.
5. Sustainability	Saylor Academy is a non-profit academy and issues free certificates of completion. It is not accredited but some courses have been recommended for college credit. Saylor has partnerships with accredited colleges that guarantee credit transfer.

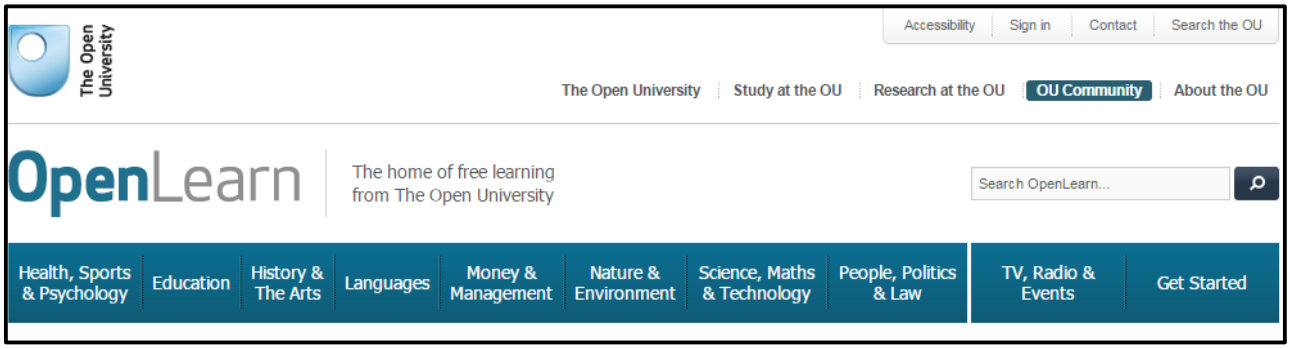
3.9 ALISON Certificate of Completion



ALISON (https://alison.com/) is a global online learning community that provides free, education resources for developing workplace skills. Every online course is standards-based and certified. Courses are offered at certificate and diploma level.

1. Outcomes	ALISON provides a Certificate of Completion to indicate that the learner has achieved a particular level of knowledge or skill-set. Potential employers can test a graduate's knowledge at anytime, anywhere, by asking the graduate to sit a Flash Test on the ALISON platform to prove their skills. Over 14 per cent of ALISON graduates stated in a survey in 2014 that learning with ALISON helped them get a new job, a promotion, or college placement, an opportunity for success. Categories of courses include those that teach 'personal development and soft skills' and 'digital literacy and IT skills' as well as courses listed by subject. A course description and specific learning outcomes are listed for each subject.
2. Assessments	Learners can retake assessments but must study all sections of the course (100 per cent progress indicated by a green tick beside each section) and achieve a minimum score of 80 per cent in each assessment to pass and become a certified ALISON graduate. Once satisfactorily complete, the Certificate of Completion will be available (some must be purchased).
3. Integrity	Certificate options vary; some are free (such as Microsoft Digital Literacy and a number of Health and Safety Authority courses), some do not have certificates, and others have a fee. The fee depends on the type of course and the format. After verification of the learning activity and scores achieved in assessments, certificates are signed by a certification officer.
4. Cost-benefit	Users can pay a nominal fee to download certificates only, automatically. Learners may purchase paper parchments and framed certificates that are shipped via mail. They do not have to purchase a parchment to be certified. Diplomas are available as paper or framed parchment only. Once learners are certified, they can view the price of a certificate.
5. Sustainability	ALISON courses are not accredited or recognised by any institute.

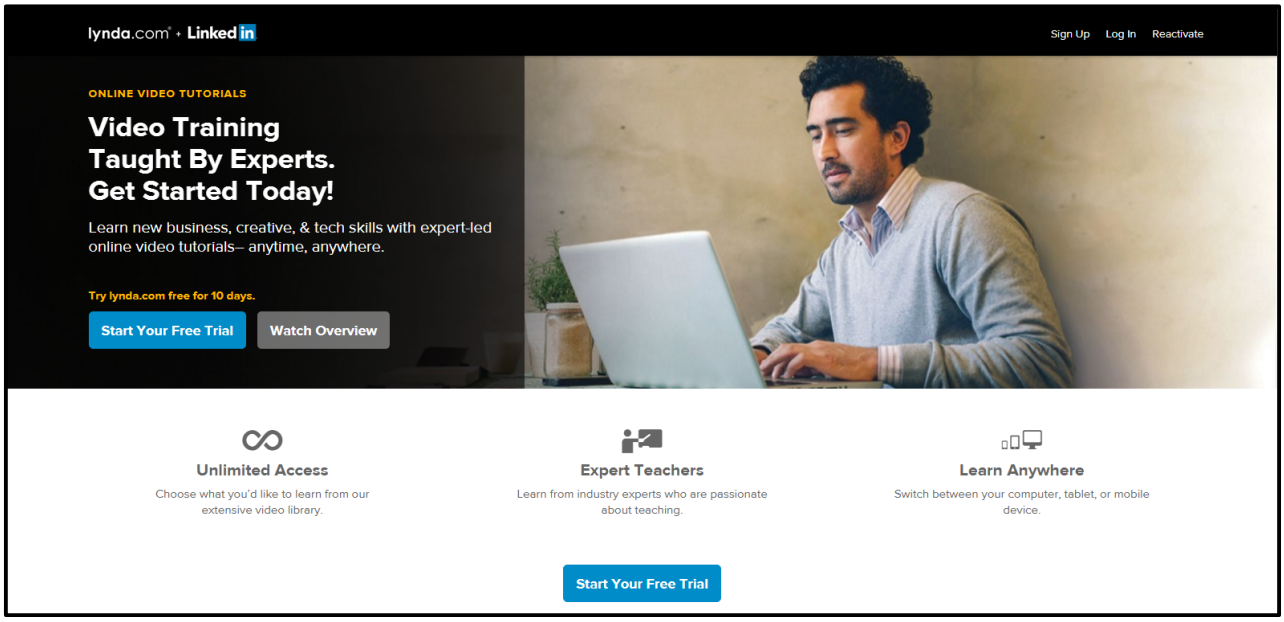
3.10 OpenLearn Badges



OpenLearn (http://www.open.ac.uk/) is the home of free learning from The Open University. OpenLearn gives access to topical and interactive content, from expert blogs, to videos and games. This 'open media' also often links to BBC television and radio programmes. Some courses give learners the opportunity to earn a badge and Statement of Participation (Badged Open Courses) that can be shared via Facebook, Twitter or LinkedIn.

1. Outcomes	A course description and learning outcomes are listed for each course. The learning outcomes are both skills- and knowledge-based.
2. Assessments	To receive a digital badge, learners must complete all the compulsory interactive quizzes that count towards the badge and score a minimum of 50 per cent. Learners can try each question three times and receive automated feedback indicating whether their answer is incorrect or partially correct. If they answer correctly the first time they receive three marks, on the second two marks and on the third one mark. Once they attempt a question three times they are shown the correct answer to the question. There is no limit to the number of times quizzes can be attempted, but there can only be one attempt in a 24 hour period. Some graded quizzes do not count towards the badge. At the end of the course learners are sent an email and the badge appears in their profile.
3. Integrity	Learners do not need to verify their identity to create an account.
4. Cost-benefit	OpenLearn provides a range of free courses, including Badged Open Courses in which learners who successfully complete the course gain a digital badge and Statement of Participation. The content and the digital badge are free, but it is not possible to gain any qualifications or credit through OpenLearn. Learners need to register for an Open University course if they want to become a student and have the support of a tutor, sit examinations and gain qualifications.
5. Sustainability	OpenLearn is a not-for-profit education provider and is not accredited.

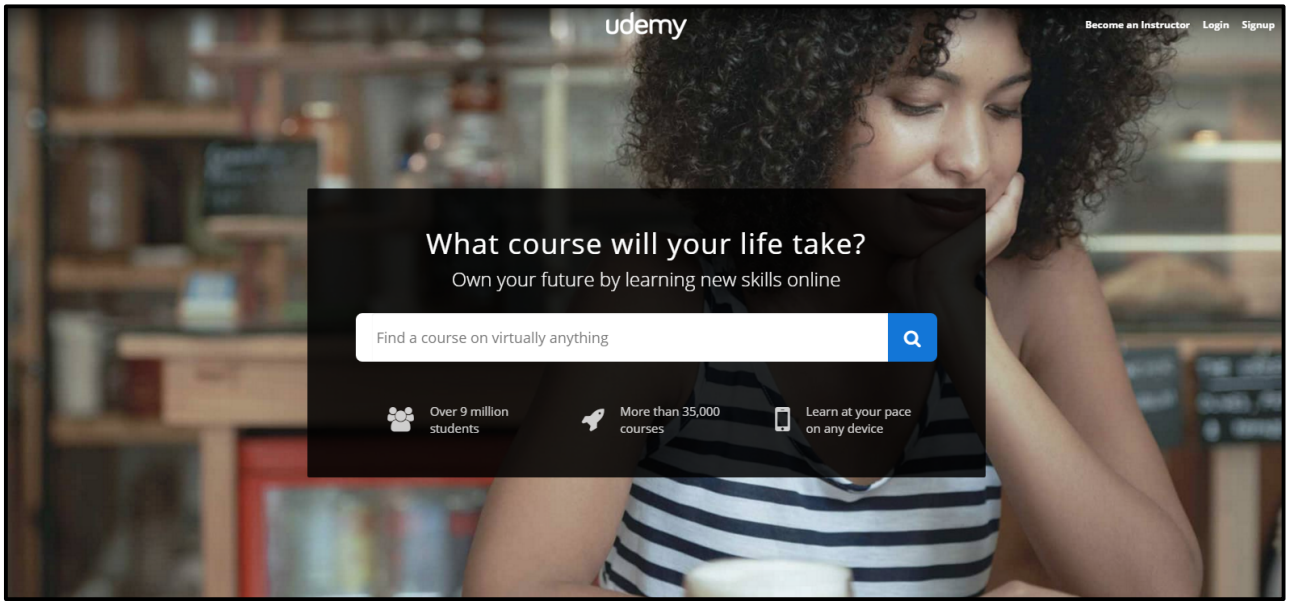
3.11 Lynda.com Certificate of Completion



Lynda (http://www.lynda.com/) is an online learning company that helps anyone learn business, software, technology and creative skills to achieve personal and professional goals. Through individual, corporate, academic and government subscriptions, members have access to the lynda.com video library of engaging, top-quality courses taught by recognised industry experts.

1. Outcomes	The name of the course is the only indicator of the course content provided on the certificate of completion and there is no assessment of learning outcomes.
2. Assessments	There are no assessments. The Lynda.com Certificate of Completion rewards members for watching a complete course on Lynda.com.
3. Integrity	The Lynda.com system is able to track when a member watches and finishes a movie in a course. Upon completion of a course, a certificate of completion is automatically generated that can be viewed online, downloaded and emailed.
4. Cost-benefit	Learners who purchase a user account have access to the content of all courses and complimentary access to Certificates of Completion. Monthly, annual, premium, and corporate multi-user accounts are available for purchase. Completing a course does not mean that the member is then certified in that respective software, it only reflects that they completed the course on Lynda.com. No other organisation recognises a Lynda.com Certificate.
5. Sustainability	Lynda.com is not an accredited institution, but offers skills-based courses taught by experts.

3.12 Udemy Certificate of Completion



Udemy (https://www.udemy.com/) was launched as an online marketplace where anyone, anywhere can take or teach a course. The platform offers more than 350,000 courses and allows users to learn at their own pace on any device.

1. Outcomes	The name of the course is the only indicator of the course content provided on the certificate of completion and there is no assessment of learning outcomes.
2. Assessments	There are no assessments.
3. Integrity	Learners create an account by entering their name, email and a password. The identity of learners is not verified.
4. Cost-benefit	Some courses are free but most must be purchased. The cost of paid courses varies from as little as USD9 to as much as USD300 depending on the length and content of the course. Once learners purchase a course they have access to that course for life and can learn at their own pace. If learners are not happy with the content of a course they can request a full refund within 30 days of purchase. Most courses offer a certificate of completion. When all lectures in a course have been watched, a gold or green trophy will appear, signifying that the certificate of completion is ready for download. Certificates can be saved as a .pdf or .jpg file. In addition, certificates can be shared on Facebook, Twitter, and LinkedIn directly from Udemy.
5. Sustainability	Udemy is not an accredited institution, but offers skills-based courses taught by experts.

^Exito4me

3.13 College-Level Examination Program (CLEP)

Developed by the College Board, CLEP (https://clep.collegeboard.org/) allows learners to earn college credit for knowledge acquired through independent study, prior learning or workplace experience through taking standardised exams.

1. Outcomes	CLEP does not offer a professional development component or a curriculum associated with the examinations. It allows students to earn credit for what they already know. CLEP assesses the learning outcomes of the colleges courses for which they provide credit.
2. Assessments	CLEP exams are administered online through an Internet-based testing platform and taken at a test centre. They consist mostly of multiple-choice questions, essays and listening sections for world languages. Most are 90 minutes in length and freshman- and sophomore-level credit can be awarded. Immediate scoring reports are generated except for exams with essays. Exams are scored on a scale of 20 to 80. A score of 50 is a passing score across all CLEP exams. Students must wait three months to retest. Exams are regularly reviewed and go through a multi-step validation process before going live. CLEP examinations are administered at 1,800 college test centres.
3. Integrity	CLEP exams are taken at college test centres. To take a CLEP exam learners must register online and select their preferred test centre. They must take a valid registration ticket, downloaded through the 'My account' portal to the test centre and produce government-issued ID to verify their identity.
4. Cost-benefit	CLEP examinations are accepted for credit and/or placement by 2,900 colleges and universities and CLEP learners can complete examinations for 33 college subjects. The CLEP exams that institutions accept for credit, the amount of credit and the other prerequisites or conditions vary. One CLEP exam costs USD80 (or no cost to active duty military personnel). In addition to the non-refundable exam fee, each test centre charges an additional fee to be paid directly to the institution. CLEP does not offer a professional development component or a curriculum associated with the examinations, however, it does provide test exams for free.
5. Sustainability	CLEP exams are accredited by the American Council on Education (ACE).

3.14 Deakin Professional Practice Credentials

Deakin University created DeakinDigital (deakindigital.com) as a wholly-owned subsidiary to develop and administer a range of professional practice credentials. Deakin University can now use those credentials in Deakin's professional practice degrees.

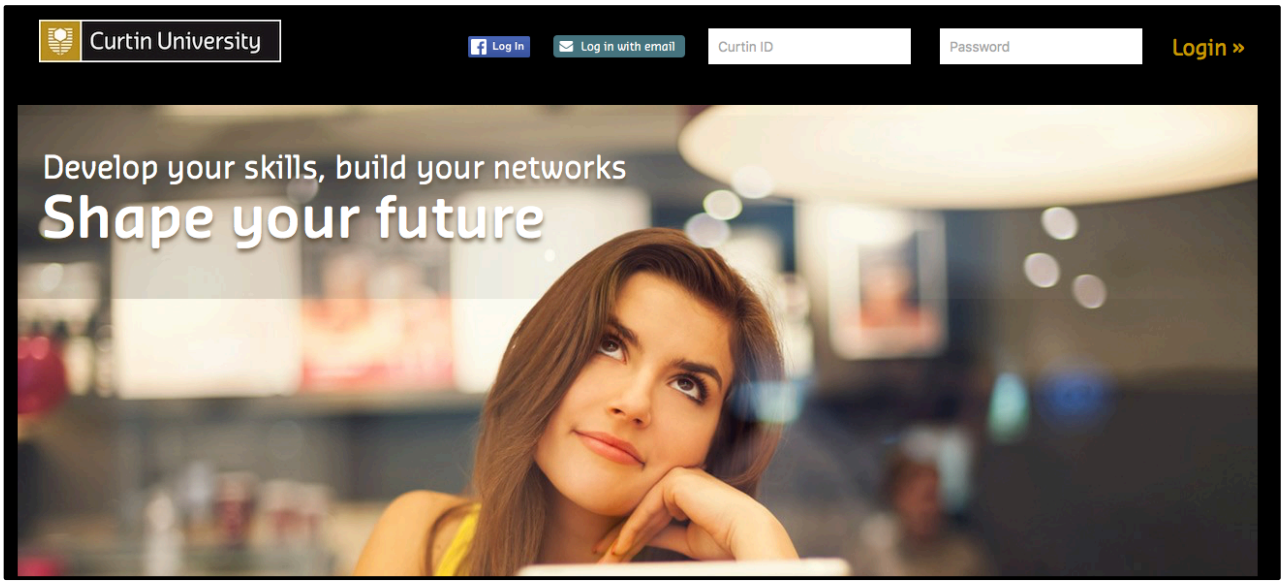
1. Outcomes	Professional Practice Credentials signify achievement of skills aligned with Deakin University's employability-related graduate learning outcomes, e.g. communication, teamwork, critical thinking, and emotional judgement. The credentials are aligned to the Australian Qualifications Framework.
2. Assessments	Assessment consists of a presentation of portfolio of evidence, as well as a panel interview with assessors supervised by the relevant Faculty.
3. Integrity	Student verification is required, in person, and online. The candidate's identity is verified online using the same methods as banks and government departments. Credential assessments require candidates to undertake a video interview during which biometrics are used to confirm their identity. Upon successful completion of the assessment, candidates receive a digital credential that links to an assertion of their verified identity.
4. Cost-benefit	DeakinDigital Professional Practice Credentials can be used for significant amounts of credit within Deakin's professional practice degrees, which are intended for professionals with extensive industry experience. In Deakin's Master of Professional Practice (Information Technology), for example, learners earn designated Credentials ($495 each) as a prelude to completing a four credit point capstone unit (priced at the usual Deakin University level). Upon successful completion of the Capstone, the Master degree is conferred. The cost of the degree is lowered from about $38,000 to $20,000. The credentials are administered by DeakinDigital.
5. Sustainability	DeakinDigital Credentials are aligned to a Professional Capability Standard, Australian Qualification Framework and internationally recognised industry skill frameworks.

3.15 Deakin Hallmarks

Deakin Hallmarks (http://tiny.cc/deakinhallmarks) are Deakin University awards that recognise outstanding achievement at course (degree) level in employability-related graduate learning outcomes.

1. Outcomes	Hallmarks have been developed through consultation between faculties and relevant employers, industry or professional bodies to ensure that they signify outstanding achievement as valued and judged in professional life. The intention is that such awards highlight the skills and capabilities that employers seek in new graduates.
2. Assessments	Hallmarks are awarded at a course (degree) level and are completely independent from grades achieved in units. Students who are well advanced in their course are invited to submit evidence of their achievement of the criteria and standards of Hallmarks offered in that course. The submission requirements vary and may include a portfolio of evidence or other demonstration of their capabilities (e.g. demonstration of communication skills through achieving publication of an article on a relevant industry platform and oral presentation). Submissions are assessed by a panel convened by course directors that includes representatives from industry. The descriptors, criteria and processes for the award of each Hallmark are endorsed by Faculty boards and approved by the Deputy Vice-Chancellor Education.
3. Integrity	Deakin Hallmarks are only available to Deakin students who are enrolled in the specific course in which the Hallmark is offered. At assessment, students provide proof of identity and present artifacts of learning evidence curated during their course. Evidence may include artifacts from their coursework but must also include work completed in addition to their coursework. The personalised nature of the evidence necessitates that student submissions are individualised and distinct.
4. Cost-benefit	There is no charge to students. Students awarded a Deakin Hallmark receive a digital badge containing evidence of their achievement. The Hallmarks are unique in that they bear the insignia of Deakin University and the criteria, evidence, and metadata associated with conferral of the award are embedded within the Hallmark. Recipients are encouraged to share their Hallmarks through their digital résumés and appropriate social media channels as evidence of their employability. Hallmarks are not credit bearing, and cannot be used as a substitute for course credit, or for recognition of prior learning. They are recorded on students' academic statement of achievement (AHEGS) and acknowledged at graduation.
5. Sustainability	Deakin Hallmarks are Deakin University awards. Deakin is a self-accrediting higher education institution and students awarded Hallmarks have their achievement recorded on their Australian Higher Education Graduate Statement (AHEGS) upon completion of their degree.

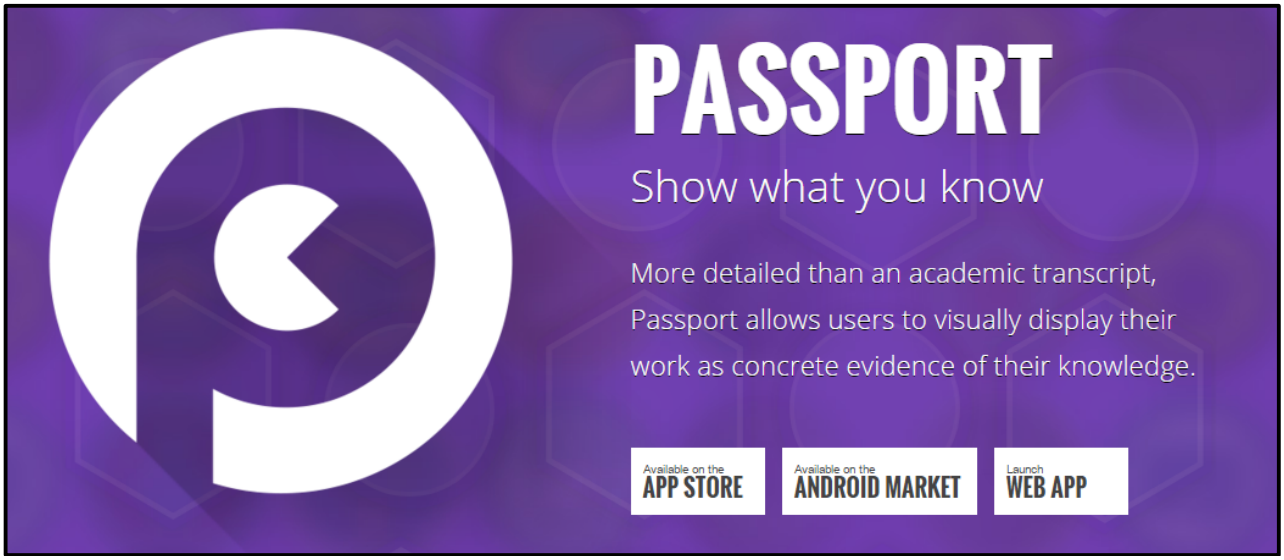
3.16 Curtin Challenge Badges towards the Curtin Extra Certificate



Curtin Challenge (https://challenge.curtin.edu.au) is a platform where learners can explore different themes of interest to achieve their personal and professional goals, develop skills and build networks while earning badges and achievements. These badges contribute to successful achievement of the paper-based Curtin Extra Certificate.

1. Outcomes	Different modules have different learning outcomes. Some are aimed at helping learners to discover their strengths, create their personal brand, develop communication skills, enhance emotional intelligence and understand workplace expectations. The Curtin Leaders Program combines leadership skills modules with volunteering to help students learn valuable study skills, boost employability and get involved in the community.
2. Assessments	Curtin Challenge offers Curtin students the opportunity to gain extra credit for leadership development and provides interactive online experience in career preparation. Students work through video and written content then complete challenges to earn badges. The modules can be done at the students' own pace; anytime, anywhere, on any device. Students can view each other's profiles and compete against their friends to earn badges, gain experience points and level up.
3. Integrity	Students use their university ID to login to the Curtin Challenge platform.
4. Cost-benefit	There is no financial cost to students, and they can get official recognition through the Curtin Extra Certificate conferred at graduation.
5. Sustainability	Curtin is a self-accrediting higher education institution. Curtin Challenge badges can be used by Curtin students to achieve the non-credit bearing Curtin Extra Certificate.

3.17 Purdue Passport



Purdue University has developed mobile apps that enable badges to be created, awarded and displayed. The apps, available online, are called Passport and Passport Profile.
Passport (http://www.itap.purdue.edu/studio/passport/) is a learning and portfolio system that uses digital badges to demonstrate users' competencies and achievements.

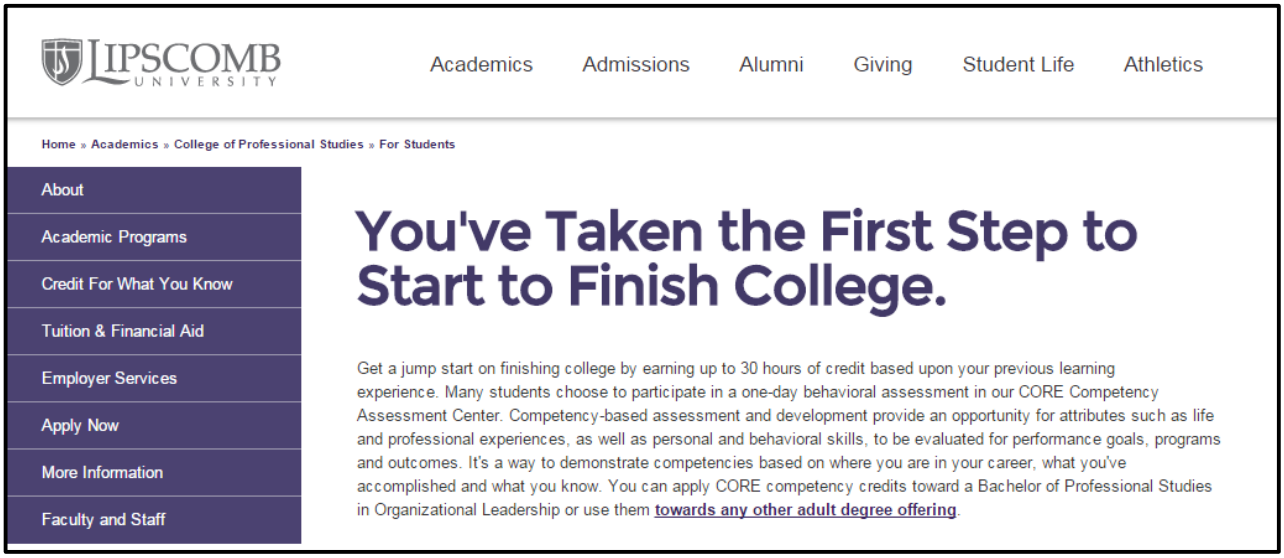
1. Outcomes	More detailed than an academic transcript, Passport allows users to visually display their work as concrete evidence of their knowledge. The learning outcomes and methods of assessment are determined by the issuer.
2. Assessments	Passport facilitates flexible outcomes-based assessment. Teachers can create quizzes, video assignments, and file and upload assignments. Passport's scorecard allows teachers to translate achievements – such as essays, online discussions, blog posts and video demonstrations – into a numeric-based evaluation system for grading purposes. Teachers create their own badges that can be uploaded and shared outside of the system through the public Passport Profile in Mozilla Backpack, LinkedIn and Facebook.
3. Integrity	Anyone can create and issue a badge. The issuer also determines who can access the resources and assessments; they can be made open to anybody with a Passport Profile or made available selectively through email invitation.
4. Cost-benefit	Passport provides a framework that guides users through learning activities. Users can review supplemental material, submit content, complete quizzes or surveys, and gather instructor approvals. Learners receive badges that demonstrate their competencies or achievements. Anyone can create a free Passport account though which they can create and issue or earn badges.
5. Sustainability	Passport is a free to use application developed by Purdue University.

3.18 Central Oklahoma: Student Transformative Learning Record

Students' academic transcripts display their aptitude in discipline knowledge. A Student Transformative Learning Record (STLR) is like a second transcript, issued by the University of Central Oklahoma, that provides their students with a record of their growth and transformative learning around the University's other five core value tenets: global and cultural competencies; health and wellness; leadership; research; and creative and scholarly activities (http://www.uco.edu/central/tl/stlr/index.asp).

1. Outcomes	STLR 'credit' records extracurricular learning achievements. Examples include: learning how to work well in diverse teams; development of leadership skills as president of a student organisation; ability to interact positively and appropriately with co-workers, customers, and others from different countries and cultures; finding out how to contribute as productive citizens to their local communities, the nation, and the world through volunteering; or practice in solving unscripted problems and devising creative solutions while doing independent research.
2. Assessments	STLR credits can be earned in four ways: completing STLR assignments e.g. reflection paper from a service learning project; attending official STLR events e.g. international festival; joining or getting elected to a student group; and STLR TL Student projects e.g. researching syllabus wording, helping in an after-school program or holding an intern position. To get credit for these activities, students must reflect on their experiences, receive feedback from trained faculty or staff, and then store evidence of those experiential artifacts in their portfolios. Trained faculty or a staff supervisor use the STLR Rubric to evaluate the student's progress. The assessment records the student's achievement towards transformative learning and is documented in their transformative learning record.
3. Integrity	Only students enrolled at the University of Central Oklahoma can earn STLR credit and they are assessed by Faculty or staff.
4. Cost-benefit	There is no cost. Students can be paid for some activities e.g. for working on some projects. Students receive a record and transcript of their learning and build an digital portfolio of evidence that can be shared as a link in job applications, cover letters, and résumés.
5. Sustainability	University of Central Oklahoma is an accredited higher education provider. STLR 'credit' records extracurricular achievements.

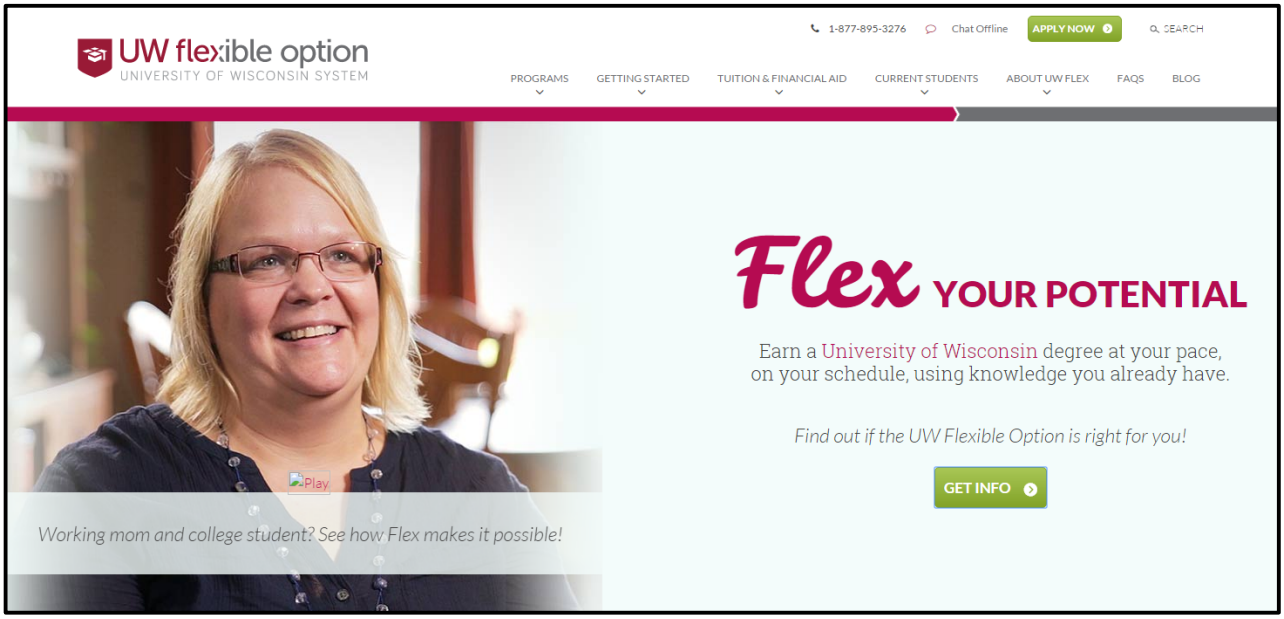
3.19 Lipscomb CORE



Lipscomb University recognises pre-existing competencies, knowledge, skills and abilities acquired through out-of-class learning experiences. Through CORE, Lipscomb evaluates and rewards those competencies with badges (http://www.lipscomb.edu/professionalstudies/core-for-students).

1. Outcomes	Lipscomb University, is working with Fidelis, to award badges that describe the 'soft' skills its students have acquired; such as communicating effectively and working in teams. A key component of the CORE program is a badge system that rates a participant's level of competency in key areas. Each competency area carries its own badges and levels and badges are earned as each level of competency is met.
2. Assessments	CORE credit can be earned in four ways: completion of a full-day experiential assessment experience; prior learning evidence e.g. transcripts, certificates, military experience or other documented training; exams taken to prove and document efficiency in a specific area e.g. maths, foreign languages, science or history; or creation of a portfolio of previous work to demonstrate that the objectives have already been achieved.
3. Integrity	A team of three behavioural assessors from different professional backgrounds uses rigorous exercises to analyse learners' competencies. Individuals are assessed against the competency model developed for their particular role (or a future role) to determine their strengths and development areas. This process typically begins with a job analysis to define the requirements of a particular role in an organisation. It then proceeds to a tailored construction stage where the standard CORE test modules are shaped to fit the organisation's needs. Following their visit to the CORE Assessment Centre, participants are given their competency strengths and weaknesses. Follow-up discussion and education focus on how to bridge the gap to meet new levels of growth and expectations.
4. Cost-benefit	Lipscomb has developed 41 badges based on employment-screening techniques developed by Polaris Assessment Systems. Degree-seeking students can earn credit for coursework by demonstrating their competency through earning CORE program badges. Core credit can count towards a Bachelor of Professional Studies in Organizational Leadership or any other adult degree offering. The cost of the service is not clearly indicated on the site
5. Sustainability	Lipscomb University is an accredited education provider.

3.20 Wisconsin Flex



The UW Flexible Option (http://flex.wisconsin.edu/) is a self-paced, competency-based education format that allows busy adult learners to start any month, study at their own pace, and earn credit using their existing knowledge.

1. Outcomes	Wisconsin Flex offer eight degree and certificate programs in which credit can be earned by drawing upon existing knowledge to complete assessments and make progress. Rather than create courses, expert faculty from University of Wisconsin System institutions identify competencies—skills and abilities—that they consider necessary to earn a UW credential.
2. Assessments	Assessments are developed by UW faculty, who draw upon the latest standards in business and industry to capture the competencies that define UW degrees and certificates. Some assessments are based on tests and papers used in traditional classroom formats. Others require a portfolio assessment. Still others require observations of clinical demonstrations and other experiences.
3. Integrity	Learners must meet the General Education Requirements and any elective requirements specific to each degree or certificate, as well as completing the unique competency sets that define each program. To maintain academic standards, UW System faculty oversee all aspects of Flexible Option programs. Most programs are offered online. However, some programs include hands-on or clinical assessments and experiences that require interactions in work and clinical settings.
4. Cost-benefit	Learners can earn a University of Wisconsin degree or certificate by drawing on prior experiences for credit and completing assessments at their own pace while receiving personalised support from an academic success coach. Learners are supported in preparing for assessments and selecting learning resources.
5. Sustainability	The institutions offering competency-based Flexible Option programs—University of Wisconsin-Milwaukee, UW-Parkside, and UW Colleges—are accredited by the Higher Learning Commission of the North Central Association of Colleges & Schools.

4. ANALYSIS AND EVALUATION

4.1 An overview of verification, payment and credit-eligibility

Nineteen case studies are included in this paper, selected based on there being sufficient public information for analysis. It is impossible and unfair to make thorough evaluations of these various models without auditing numerous individual courses on each platform. Nevertheless, some overarching observations can be made with regard to the verification of learner identity, the requirement for payment by the learner, and whether the credential is credit-eligible towards a higher and more formal qualification. Table 1 provides an overview of these aspects of the case studies.

Table 1. Case study overview

Category	Credential	Verified	Payment required	Credit-eligible
Open access courses	edX Verified Certificate	Yes	Yes	Yes
	Coursera Course Certificate	Yes	Yes	
	FutureLearn Statement of Attainment	Yes	Yes	
	Udacity Certificate	Yes	Yes	Yes
	Open2Study Certificate of Achievement			
	StraighterLine Transcript	Yes	Yes	Yes
	Saylor Academy Certificate	Yes	Yes	Yes
	ALISON Certificate of Completion	Yes		
	OpenLearn Badges			
Paid access courses	Lynda.com Certificate of Completion		Yes	
	Udemy Certificate of Completion		Yes	
Assessment only	College-Level Examination Program (CLEP)	Yes	Yes	Yes
	Deakin Professional Practice Credentials	Yes	Yes	Yes
Initiatives recognising achievement	Deakin Hallmarks	Yes		
	Curtin Challenge Badges	Yes		
	Purdue Passport			
	Central Oklahoma Student Transformative Learning Record	Yes		
	Lipscomb CORE	Yes	Yes	Yes
	Wisconsin Flex	Yes	Yes	Yes

4.2 Are 21C credentials better (yet)?

While it is impossible to make a global judgement as to whether any of these providers issues 'better' credentials overall, it is reasonable to compare a MOOC credit-eligible course closely with a similar university course. We provide an example in table 2 below. This evaluation is based on a comparison between:

1. A MOOC course that can be used as credit towards the first year of a university degree; and
2. An Australian course (subject) that leads to the same proportion of credit in the first year of a degree.

The courses compared both pertain to a generic introduction to health science, and are worth about one-eigth of a first year of university study if the student passes at the minimum level. The comparison is for illustrative purposes, and the limitations of this comparison are obvious, being based on a sample of two.

The table shows an overall judgement, and the reasons for the judgement (the full details and descriptors are provided in Appendix B). Overall, and based only on what can be seen in the course description, the MOOC is a much more effective option, but in most cases, is either the

same, or lower quality than the university course. However, university practices can be of variable quality, and it is early days for credit-eligible MOOC courses. It would be premature to judge that universities or similar institutions provide a superior learning experience. This analysis, however, does not so much judge the quality of the experience, but the quality of the credential.

Table 2. Comparison of a credit-bearing MOOC to completion of equivalent credit at an Australian university (using courses pertaining to a generic introduction to health science)

	Is the MOOC better than the university?
1. Credential clearly communicates achievement of appropriate outcomes and standards	Both the MOOC and the university describe the learning outcomes clearly; however, the university maps outcomes and assessment tasks to graduate learning outcomes that include 'soft' skills and capabilities related to employment. It is unlikely that the MOOC assesses outcomes that are not focused on knowledge.
• Does the credential include assessment of appropriate outcomes including the so-called 'soft' skills and capabilities related to performance in employment?	
• Does the credential have sufficient granularity to clearly communicate what the learner can do?	No, both the MOOC and the university use grades to describe success, and neither indicates which outcomes are achieved and which are not.
2. Credential is based on judgments of rich evidence created in response to authentic assessments in a range of complex, ill-defined tasks.	No. The vast majority of evidence in the MOOC is short answers or multiple-choice questions.
• Are the underpinning assessments appropriate, challenging learners to tackle a range of complex, ill-defined issues that simulate those they will encounter as graduates? Do assessments provide assessors with an array of evidence upon which to make judgements about complex performance?	No, the MOOC assessment is mostly short answer or multiple-choice. The university requires the student to investigate, synthesise and evaluate issues within the area of study. This would appear to be more complex and demanding. As university grading is by human assessors in 50% of the assessments, the feedback would likely be more discursive and qualitative, and if good practice, provide timely suggestions for improvement.
3. Credential maximises assessment integrity, appropriately verifying the identity and the contribution of the learner • Can the credential be attained fraudulently without great difficulty? What measures are in place to ensure academic integrity, including assuring the identity of the learner?	Probably not: a higher proportion of assessment in the MOOC is proctored remotely; however, the on-site supervision required by the university is likely to be more difficult to evade.
4. Credential balances time and money invested by the learner with benefits realised during and after conferral (credit or entry to a higher credential, enhanced status or career advantage) • What are the benefits after the course (e.g. credit or entry to a higher credential, status or career advantage)? Are the benefits durable over time?	Probably not, as the longevity and exchangeability of the MOOC credit is at this stage largely unknown (but this could change rapidly).
• What are the benefits during the course (e.g. access to coaching)?	No. University provides a vast array of services with (presumably) timely responses.
• What is the cost of the credential to the learner (in time)?	In this instance, the MOOC requires more hours of engagement which the learner may see as a negative.
• What is the cost of the credential to the learner (in money)?	The MOOC is a much more affordable option.
5. Credential is sustainable, based on sound business models, crisp and consistent value propositions, and compliance with regulatory frameworks • How are staff and students protected by policy and procedures that assure compliance with regulatory frameworks?	No. The MOOC provider is not as bound by regulatory requirements as is a university, at this stage.

Even so, like many disruptive innovations, the consumer will decide the path: cheaper digital songs may not meet the quality of high-fidelity recordings, but most consumers have happily foregone the quality for the cost. Education may be the same, with new providers such as edX providing cheaper pathways to the later years of a traditional degree experience. For example, companies like Udacity claim that their credentials are more pertinent to employment, created with industry partners, and provide students access to coaching, including one -on-one sessions. Such a model is likely to prove highly competitive with university courses in particular disciplines.

Although many new companies and education providers are still evolving, their credentials seem to get traction if they meet certain criteria. This paper contends that to be truly disruptive and take hold, these innovations need to meet the five essential criteria in the evaluative framework. The 21C Credentials Good Practice Guide (see Appendix C) is intended to prompt innovators to design and implement their credentials successfully.

5. CONCLUSION

This paper contends that credentials are the core business of higher education, and they can only be sustained if they are underpinned by excellent and appropriate assessment accompanied by timely and constructive feedback. When designing for generation Google, who are surrounded by open-access learning resources, the key may be to spend less time reinventing learning resources, and more time and energy giving feedback and coaching, based on more authentic assessment. We also need to rethink the limits of credential integrity. No matter what methods are deployed when we invigilate assessments on campus or in the cloud, those who are determined to subvert them do so. Sadly, we only know who cheats when we catch them. Perhaps the way forward is to have highly authenticated and rich qualitative assessments at key milestones in a course.

Experts in innovation tell us that a minimum viable product can be any two of the following: fast, good or cheap (Linkner 2015). If we extend this, somewhat clumsily, to higher education, we could challenge ourselves to rethink educational design and delivery to create 21C credentials that are: faster, in that they are achieved in a more timely fashion for the user; better, in that they are more effective signifiers of appropriate achievements; and cheaper, in that they are more efficient (lower price for learners, less resource-intensive for educators). Ramsden claims that the aim of teaching is simple: it is to make student learning possible (Ramsden, 2003). To paraphrase: the aim of credentialing is less simple, but its prime purpose is to warrant that learning outcomes and standards have been demonstrated. Truly 21C digital credentials can also be more granular, stackable, evidentiary and personalised, enabling rich analytics.

APPENDIX A: GRONINGEN DECLARATION

We, the signatories of this Groningen Declaration on Digital Student Data Depositories Worldwide, are witnessing a growing awareness in large parts of the worlds of politics and academics, as well as in public opinion, of the need to establish a more complete and far-reaching delivery of digital student data. As we see it, digital student data portability and digital student data depositories are becoming increasingly concrete and relevant realities, and in the years to come, they will contribute decisively to the free movement of students and skilled workers on a global scale.

In order to make this free movement of students and skilled workers a reality, and in order to unleash the full potential of digital student data depositories, we want to look into privacy rights, ownership of data, identification, access, and forwarding/sharing of data, next to compatibility of systems and comparability of data. Respecting the principle of autonomy and diversity of systems and modes of delivery, the overriding principle is to seek convergence rather than to create uniformity.

It is understood that there are more stakeholders involved than just the digital student data depositories themselves. These other stakeholders include, of course, first and foremost the students themselves; then education institutions at the primary, secondary and tertiary level; national ministries of education; employers; and so forth. This group of stakeholders would not be primarily concerned with the technical part, but with acceptance and recognition and is, as such, of vital importance for the acceptance of the goals of this declaration. These stakeholders are therefore naturally included among the signatories.

The Groningen Global Founding Seminar of Digital Student Data Depositories Worldwide that is now coming to a close aimed at gathering the critical mass that may bring about global momentum as the best possible way to bring about change. And the best way we can think of to continue, after the seminar, is through promoting concrete measures to achieve tangible forward steps.

The present declaration will take the above named issues as overarching themes for the road ahead.

We consider the following issues - ownership of data sets; privacy rights, identification; access; consulting; forwarding/sharing; compatibility; comparability; acceptance; and recognition - in order to establish a global area of convergence on digital student data depositories, and we pledge to share best practices in digital secure systems and to co-ordinate our policies on:

- the purpose, feasibility and cost-efficiency of worldwide exchange of digital student data
- the ways to make our systems more compatible, inter alia by looking into semantic interoperability
- the ways to make data more easily comparable
- sharing or forwarding of data through designated systems
- promoting acceptance, for purposes of recognition, of digital student data in lieu of paper documents
- adherence to national or federal privacy rights, both at the sending and at the receiving ends, when data are transferred
- phasing out of paper based documents and of paper based authentications (legalisations) where practicable
- establishment of a Global Standing Secretariat on Digital Student Data Depositories Worldwide, to develop a follow-up structure, consisting of a “consultative group” of representatives of all signatories, plus a smaller “follow-up group”, in order to organize future events.

We hereby undertake to attain these objectives within the framework of our respective organisational competencies, thereby fully respecting the diversity of current systems. To that end, we will mutually seek governmental, intergovernmental and/or non-governmental co-operation.

Groningen, 16 April 2012

APPENDIX B: COMPARISON OF A MOOC COURSE AND A UNIVERSITY COURSE (SUBJECT)

Criteria	The MOOC course	The university course	Is the new MOOC credential better?
1. Credential clearly communicates achievement of appropriate outcomes and standards	Learning outcomes clearly described.	Learning outcomes clearly described.	Both the MOOC and the University describe the learning outcomes clearly; however, the university maps outcomes and assessment tasks to graduate learning outcomes that include 'soft' skills and capabilities related to employment. It is unlikely that the MOOC assesses outcomes that are not focused on knowledge.
• Does the credential include assessment of appropriate outcomes including the so-called 'soft' skills and capabilities related to performance in employment?	No evidence of assessing broader skills, and this is unlikely given that most assessments are quiz-based.	Learning outcomes and assessment tasks are mapped to graduate learning outcomes that include 'soft' skills and capabilities related to employment.	
• Does the credential have sufficient granularity to clearly communicate what the learner can do?	No. Overall success is described in grades: A = 90% or higher B = 80% or higher C = 70% or higher Must achieve 70% to be credit-eligible.	No. Overall success is described in grades: High Distinction = 80% or higher Distinction = 70% – 79% Credit = 60% – 69% Pass = 50% – 59% Must achieve 50% to be credit-eligible.	No, both the MOOC and the university use grades to describe success, and neither indicate which outcomes are achieved and which are not.
2. Credential is based on judgments of rich evidence created in response to authentic assessments in a range of complex, ill-defined tasks	Assessment tasks: 1. Interactives – 10% (1-2 questions each week) 2. Case Studies – 15% (4-5 questions each week) 3. Quizzes –15% (10 questions each week) 4. Midterm – 25% (30 multiple choice questions, two hours, proctored) 5. Final exam – 35% (40 multiple choice questions, two hours, proctored)	Assessment tasks: 1. Readings review (800 words) – 20% (an ill-defined task) 2. Assignment (1200 words) Investigate and evaluate an issue – 30% (an ill-defined task) 3. Final exam – 50% (all multiple choice questions, two hours, proctored)	No. The vast majority of evidence in the MOOC is short answers or multiple-choice questions.
• Are the underpinning assessments appropriate, challenging learners to tackle a range of complex, ill-defined issues that simulate those they will encounter as graduates? Do assessments provide assessors with an array of evidence upon which to make judgements about complex performance?	Difficult to know. Case studies suggest application of knowledge to real examples; however, the vast majority of assessment is multiple choice or short answer. The quality of feedback is unknown, but is likely to be minimal.	The first two assessments require the student to investigate, synthesise and evaluate issues within the area of study. This would appear to be more complex and demanding. As grading is by human assessors, the feedback would likely be more discursive and qualitative, and if good practice, provide timely suggestions for improvement.	No, the MOOC assessment is mostly short answer or multiple-choice. The University requires the student to investigate, synthesise and evaluate issues within the area of study. This would appear to be more complex and demanding. As all university grading is by human assessors in 50% of the assessments, the feedback would likely be more discursive and qualitative, and if good practice, provide timely suggestions for improvement.
3. Credential maximises assessment integrity, appropriately verifying the identity and the contribution of the learner • Can the credential be attained fraudulently without great difficulty? What measures are in place to ensure academic integrity, including assuring the identity of the learner?	All assessment is through login. In addition, two exams worth a total of 60% of the final grade are remotely proctored.	All assessment is through login. In addition, one exam worth 50% of the final grade is proctored on site.	Probably not: a higher proportion of assessment in the MOOC is proctored remotely; however, the on-site supervision required by the university is likely to be more difficult to evade.

4. Credential balances time and money invested by the learner with benefits realised during and after conferral (credit or entry to a higher credential, enhanced status or career advantage) • What are the benefits after the course (e.g. credit or entry to a higher credential, status or career advantage)? Are the benefits durable over time?	One eighth of first year university degree; the period for claiming credit is one year; may be used at other institutions, but this is largely unknown.	One eighth of first year university degree; the credit remains viable for seven years; can be used at other institutions.	Probably not, as the longevity and exchangeability of the MOOC credit is at this stage largely unknown (but this could change rapidly).
• What are the benefits during the course (e.g. access to coaching)?	One optional live question and answer session; discussion forum. No other live human interaction.	eLive sessions; discussion boards. Students have access to a vast array of support and assistance.	No. university provides a vast array of services with (presumably) timely responses.
• What is the cost of the credential to the learner (in time)?	7.5-week, three-credit course requires **135 hours** of student work (approximately 12-18 hours per week).	1 hour seminar and 1.5 hour tutorial each week (plus private study); 10 hours per week X 10 weeks = **100 hours**	In this instance, the MOOC requires more hours of engagement which the learner may see as a negative.
• What is the cost of the credential to the learner (in money)?	USD$49 + $600 = $649	Fee determined by regulation: AUD$1114 (Commonwealth Supported Place students)	The MOOC is a much more affordable option.
5. Credential is sustainable, based on sound business models, crisp and consistent value propositions, and compliance with regulatory frameworks • How are staff and students protected by policy and procedures that assure compliance with regulatory frameworks?	The business model is largely unknown, although edX is a non-profit company. With regard to regulation, the learner is informed of the policies and expectations clearly through the edX site, but the level of 'protection' for the learner is unknown. There is no appeal on the final grade, for example.	The business model is largely unknown; however, the University is required to report its overall financial arrangements. Substantial processes are in place to 'protect' the learner, including support services, appeals, grade review, and so on. The learner can also appeal to the regulator.	No. The MOOC provider is not as bound by regulatory requirements as is a university, at this stage.

APPENDIX C: 21C CREDENTIAL: GOOD PRACTICE GUIDE

Excellent 21C credentials:

1. Clearly communicate achievement of appropriate outcomes and standards with sufficient granularity to predict future performance
    - *Use design thinking:* use the credential to solve a learning challenge, based on user feedback. Doing 'badges for the sake of badges' is unlikely to be worth your time, or anyone else's. Test your ideas on a skeptical colleague: if you can convince them, you probably have a viable idea.
    - *Exceed expectations:* set the intended outcomes to match user expectations, especially employers – and test that those expectations are met or exceeded over time.
    - *Language counts:* 'badges' can sound trivial. Prefer terms that focus on credentials that warrant learning. Use the term 'badging' only when referring to technology.
    - *Simplify, simplify, simplify:* be disciplined: in a sentence or two, explain who does what, when, why and how this credential will improve someone's life. Be clear, concise and consistent in the messaging. Be prepared to explain it repeatedly – one-minute concept movies are very useful.
    - *Be serious, look serious:* if you want credentials to be taken seriously, design them to look serious. Bear in mind that presenting mature learners with poorly imaged credentials is not likely to enthuse them, particularly when the credentials are visible to others, such as professional bodies and employers.
2. Are based on judgments of rich evidence created in response to authentic assessments in a range of complex, ill-defined tasks
    - *True tasks:* ensure assessments challenge learners to produce artifacts that evidence their skills in a range of complex, ill-defined issues that simulate those they will encounter as graduates. Life is not a multiple-choice quiz.
    - *Repurpose*: if you are implementing credentials in a unit (subject), consider removing or replacing an assessment task. This signals to students that the credential is important to you, and to the institution.
    - *Make evidence the learner's responsibility:* Require rich evidence to be available to assessors and potential employers as appropriate.
    - *Curation is key:* set the standard and the timeframe, require learners to select and assemble the evidence. Assessors, like employers, want to see the selected highlights, or improvement over time.
3. Maximise assessment integrity, appropriately verifying the identity and the contribution of the learner
    - *Jailbreak your credential* – regularly – then fix the gap, ensuring your credential cannot be attained fraudulently without great difficulty.
    - *Who's who*: verify learner identity in multiple ways and at unpredictable times.
    - *Go bespoke*: design assessments that make plagiarism or impersonation difficult and expensive.
4. Balance time and money invested by the learner with benefits realised during and after conferral (credit or entry to a higher credential, enhanced status or career advantage)
    - *Price-check!* Set the credential price (time and money) with care, and based on market research.
    - *Value proposition:* communicate the lasting benefits of the credentials based on evidence.
5. Are sustainable, based on sound business models, crisp and consistent value propositions, and compliance with regulatory frameworks
    - *Do the math:* calculate the costs (time and money) of delivering the credential versus the likely revenue, and check the credential is competitive. Carefully check the implications of lost revenue against credit granted.
    - *Stackable is good:* ensure your credential can 'roll up' to higher credentials, or professional status. But beware of creating an ecosystem that is so complex that no one can understand it – keep it simple. Eligibility for credit regulated by a qualifications framework is likely to assist.
    - *Make the technology disappear: solve* this problem last, not first. Select a simple, seamless and sustainable technology solution.
    - *Play by the rules: if* your credentials are at institution level, make sure you abide by policies associated with use of logos, crests and other branding, and that the academic area responsible for awards, prizes and credentials is aware of and ready to assist you in archiving the awards. Check carefully about awarding credit towards regulated courses.

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