The Potential of Technology to Support Online Certification and Reporting

Research carried out by

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Introduction

NCCA commissioned H2 Learning to undertake desk research into the "potential of technology to support online certification and reporting in the context of broader reporting arrangements in a redeveloped senior cycle"[1] (p. 50). This baseline research report reviews a number of current practices in this area and considers the potential use of technology to support certification into the future, including micro-credentials and reporting for senior cycle students in Ireland.

Many education systems internationally are currently considering how they can adapt to better meet the needs of today's increasingly complex world. This includes reviewing existing forms of certification, such as external and/or state examinations and related qualifications and considering how to best prepare students for the next stages of their lives, as they move from the classroom to further or higher education, or to the world of work and become more productive members of society. In many cases this has led to consideration of how to capture and record evidence of student learning and how to certify student achievement. Thus, there is a move to reimagine the kinds of experiences students have in upper secondary school and to capture a broader picture of their interests and abilities in tandem with their formal qualifications. There is a significant amount of work currently underway in Australia, England, Scotland and in the United States around new forms of innovative assessment and accreditation, and these typically use digital technologies to capture a fuller profile of students' wider achievements, both within and outside of school. Many of these reforms are focusing on more flexible forms of learning that place the student at the centre, of their learning so that they can capture and share a more holistic picture of their competencies, abilities and achievements.

Similar reforms and enhancements are taking place here in Ireland in relation to redeveloping our Junior and Senior Cycle programmes. The Framework for Junior Cycle, 2015 has introduced new ways to record student achievement, with the introduction of Classroom-Based Assessments (CBAs), short courses and other relevant areas of learning as part of the Junior Cycle Profile of Achievement.[2]

> The JCPA will draw upon and report on achievement across all elements of assessment including ongoing, formative assessment; Classroom-Based Assessments; and SEC grades which include results from the state-certified examinations and the Assessment Tasks. The JCPA will have a nationally determined format.[3]

[1] NCCA (2021). Senior Cycle Review Advisory Report. https://ncca.ie/en/resources/senior-cycle-review-advisory-report/
[2] NCCA (2023). Junior Cycle Profile of Achievement (JCPA). https://www.gov.ie/en/publication/a26b9-junior-cycle-profile-of-achievement-jcpa/
[3] Department of Education (2015). Framework for Junior Cycle 2015. https://ncca.ie/media/3249/framework-for-junior-cycle-2015-en.pdf

Furthermore, the Senior Cycle Review Advisory Report (2022) stated that a "redeveloped senior cycle could recognise, record and report on a wider picture of student learning and achievement in subjects and modules" and that these reporting arrangements could "take account of new learning pathways and progression to further, adult and higher education and training and the world of work" [4] (p. 50). As senior cycle is redeveloped, consideration may need to be given to how best to capture a wider picture of student learning and achievements and how best to capture this additional evidence in a way that is, reliable and fit for purpose, whilst also being secure. While this paper will primarily focus on the potential of digital technologies to support the online recording, reporting and certifying of student learning and achievements in the context of a redeveloped senior cycle, it should be noted that such innovative practice is also combined with reforms in terms of teaching, learning and assessment approaches. This paper will briefly allude to such reforms but will primarily focus on the potential of digital technologies to support schools and the wider education system in capturing a broader picture of the students at senior cycle. It should also be noted that many of the innovative practices we reference in this review are still evolving and that this is a fast-changing space where schools, departments of education, research organisations and others are actively experimenting. Furthermore, describing the technology enabling these new approaches can become quite technical and for this introductory paper we will attempt to avoid using jargon and highly technical language as much as possible. The goal of the paper is ultimately to explore the potential for digital technology to support certification and reporting as part of the redeveloped senior cycle.

The paper is structured into five sections. Section 1 examines a number of countries, including Ireland, and how they are considering how their education systems can better meet the needs of their young people and society in general, whilst Section 2 provides a brief background to some of the relevant reforms taking place around the globe and introduces some key terms that will underpin the paper. Section 3 shares a range of examples of how other jurisdictions are using digital technologies to capture students' achievements, skills and interests. Section 4 considers the role of digital technology and poses some key questions for consideration within the Irish context and includes a short summary of the main findings of the research in terms of the potential of technology to support online reporting and certification. Section 5, the concluding section, notes that there is significant work underway in relation to developing approaches to reliably record, report and certify students' learning and these could inform future practice in terms of certification and reporting a broader range of student achievement in a redeveloping senior cycle.

[4] NCCA (2021). Senior Cycle Review Advisory Report, p. 46. https://ncca.ie/en/resources/senior-cycle-review-advisory-report/

1. A Changing World for our Learners

Globally a number of countries, including Ireland, are reconsidering their existing approaches to national assessment and accreditation practices.[5,6,7,8] Similar to Ireland, countries, such as Australia,[9] the United States[10] and Scotland,[11] have been reviewing existing assessment approaches and their associated qualifications in recent years.

Many of these reviews are considering how their education systems can better meet the needs of society, and specifically how these systems prepare young people to live and work in an increasingly complex world. In addition, systems are recognising that young people's educational pathways are increasingly non-linear and there are an ever-increasing number of pathways into future education and the world of work. Students also want to capture a more holistic picture of themselves where they showcase their interests (e.g. hobbies, internships, apprenticeships, volunteerism, community service, sports, music), their achievements, both within and outside school, in a way that can be communicated with the wider society.

Reflecting this changing world for learners, the development of student key competencies is a core aspect of senior cycle and in realising the vision to support every student to become more competent, enriched and engaged learners. Key competencies is used as "an umbrella term which refers to the knowledge, skills, values and dispositions students develop during senior cycle" (p. 1)[12] and the "development of students' literacies and numeracy contributes to the development of competencies and vice-versa"[12] (p. 2).

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[5] Badrinarayan, A., & Darling-Hammond, L. (with DiNapoli, M., Kini, T., Miller, T., & Woods, J.). (2023). Developing state assessment systems that support teaching and learning: What can the federal government do? Learning Policy Institute. https://doi.org/10.54300/885.821

[6] Olurinola, O. (n.d.) Digital Technologies for Assessments https://mgiep.unesco.org/article/digital-technologies-for-assessments

[7] Bellin, W., Wenge, M. (2020). The Changing Landscape of Accreditation: Guide to Secondary-School Recognition in the United States. Educational Evaluators Inc. https://www.taicep.org/taiceporgwp/wp-content/uploads/2019/07/The-Changing-Landscape-of-Accreditation-Guide-to-Secondary-School-Recognition-in-the-United-States.pdf

[8] The Scottish Government (2023). It's our Future: Report of the Independent Review of Qualifications and Assessment. https://www.gov.scot/publications/future-report-independent-review-qualifications-assessment/

[9] Lucas, B. (2021). Rethinking assessment in education: The case for change. CSE Leading Education Series; Centre for Strategic Education: East Melbourne, VIC, Australia. https://all-learning.org.au/app/uploads/2022/02/CSE-Leading-Education-Series2-04-2021b.pdf

[10] Patrick, S., Truong, N., & Chambers, A. (2020). Future-focused state policy actions to transform K-12 education. Vienna, VA: Aurora Institute. https://files.eric.ed.gov/fulltext/ED608216.pdf

[11] The Scottish Government (2023). It's our Future: Report of the Independent Review of Qualifications and Assessment. https://www.gov.scot/publications/future-report-independent-review-qualifications-assessment/

[12] NCCA (2023). Key competencies in the senior cycle (draft). https://ncca.ie/media/6267/key_competencies_in_senior_cycle_report_en_2023.pdf

The 7 senior cycle key competencies are illustrated in Figure 1 below:

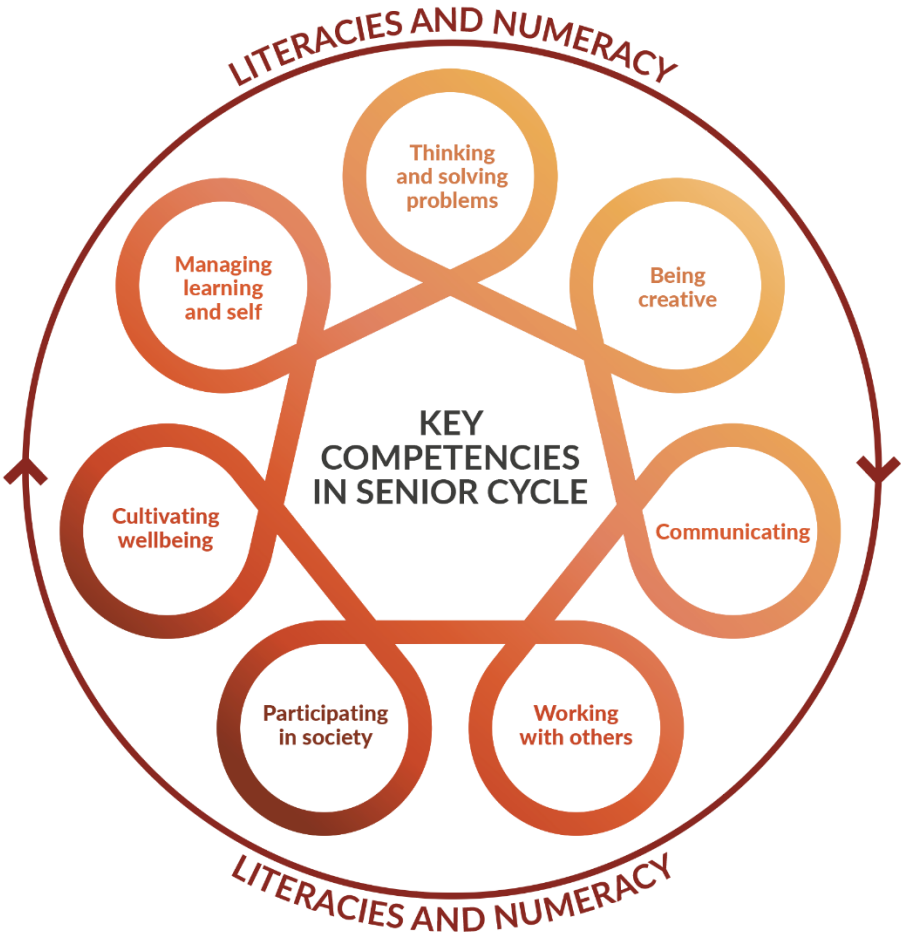

Figure 1: Key competencies in senior cycle and their relationship with literacies and numeracy. [12]

All programmes, subjects and modules in a redeveloped senior cycle support the development of a range of key competencies, and this is achieved in an integrated way. The Transition Year programme provides a range of opportunities through the dimensions to access a range of modules that students can complete in areas such as health and safety[13] and leadership[14] where they have opportunities to develop a range of key competencies.[12]

The World Economic Forum (2020) has identified the top skills and skill groups that employers see as being critical into the future and these include skills such as "critical thinking and analysis, problem solving, and skills in self-management, active learning, resilience, stress tolerance and

[13] Health and Safety Authority (2014). Transition Unit – Student Safety in the Workplace. https://www.hsa.ie/eng/education/teacher_support_and_classroom_resources/student_safety_in_the_workplace_-_transition_year/transition_unit_brief_2014.pdf

[14] About Future Leaders – Transition Year Programme. TOBAR Gaelic Games Learning. https://learning.gaa.ie/FutureLeaders

flexibility"[15] (p. 18). Countries, such as Scotland, are reflecting on the changing world of work and are considering changes to their qualifications and assessment systems as a result. They, along with other countries and educational bodies, are also considering how digital technologies, such as Artificial Intelligence (AI), might impact on the future of assessments and qualifications and on future employment opportunities.

There is a growing realisation that advanced technologies will impact on the kind of work people will engage with, and many traditional jobs that currently rely on working with text and data could be under threat, whilst jobs in the skilled trades sector may remain relatively untouched. Whilst it is impossible to predict what impact such technologies might have on the future of work, there is a growing need to provide students with opportunities to engage in more real-world learning experiences,[16] and to record their participation and accomplishments in such activities within and beyond the school.

The countries referenced above are also reflecting on the dominant role of academic summative assessments, such as the Leaving Certificate Established (LCE), and how to supplement these examinations with additional learner evidence. While some countries are considering assessment reform, there is strong evidence that existing high-stakes assessments are well-regulated, trusted and used by students, parents, schools, and other stakeholders to make further judgements. The results that students achieve in these assessments are viewed as the "trusted currency for negotiating value, such as entry into courses or recruitment into jobs".[17] Such assessment and accreditation systems have been in place for a long period of time and are deeply engrained in society. In the case of the LCE, it dates back to 1925,[18] the first year that State exams were organised by the newly formed Department of Education, which is almost one hundred years ago. While these systems have evolved over time, there is now a renewed focus on exploring how they can be augmented with additional evidence to better meet the needs of the students themselves and a range of stakeholders, including adult education providers (such as Further Education and Training providers and Higher Education providers), employers, the students themselves and others to make better selection decisions in the future.

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[15] The Scottish Government (2023). It's our Future: Report of the Independent Review of Qualifications and Assessment. https://www.gov.scot/publications/future-report-independent-review-qualifications-assessment/

[16] Lockett, P. (2020). A World Of Work We Can't Predict. Forbes. https://www.forbes.com/sites/phyllislockett/2020/01/22/its-time-for-the-world-of-work-to-connect-to-our-classrooms/?sh=6076c72e5a30

[17] Milligan, S., Luo, R., Kamei, T., Rice, S., and Kheang, T. (2020). Recognition of learning success for all: Ensuring trust and utility in a new approach to recognition of learning in senior secondary education in Australia. Learning Creates Australia, Melbourne, Victoria. https://www.learningcreates.org.au/media/attachments/2020/12/07/lca_success_paper_re-design_final9r2.pdf

[18] McGuire, P. (2019). Was the Leaving Cert harder in the old days? The Irish Times. https://www.irishtimes.com/news/education/was-the-leaving-cert-harder-in-the-old-days-1.4065923

In Scotland they have engaged in a number of reviews,[19] of their existing qualifications and assessment approaches in second-level education. These reviews are highlighting the need to prepare learners for a less predictable world and to complement existing state-certified final examinations by also enabling students to highlight "their personal interests, independent projects, work experience, evidence of creativity and collaboration and achievements outside of school". [20] The recent Hayward Report (2024)[21] which is based on an Independent Review of Qualifications and Assessment in Scotland recommends approaches which encourage and celebrate the interests, competences and achievements of every learner. Similar reviews are underway in England, Australia and in the United States where education systems are grappling with how best to capture this information and present it in a way that is accessible and meaningful to multiple audiences.

This section of the report has provided some insights into the current context and how this is relevant for students. In order to frame our discussion around how digital technology can be used to support new forms of reporting and accreditation, we will next consider some of the terminology used in relation to these areas. We begin by considering what is meant by recording, reporting and certifying learning more generally before going on to consider emerging terms in this area such as digital learning profiles, digital and micro-credentials and portfolios.

[19] Stobart, G. (2021). Upper-secondary education student assessment in Scotland: A comparative perspective. OECD. https://www.oecd-ilibrary.org/education/upper-secondary-education-student-assessment-in-scotland_d8785ddf-en?crawler=true&mimetype=application/pdf

[20] Rethinking Assessment Team (2023). Rethinking Assessment digital learner profile pilots: learnings so far. https://rethinkingassessment.com/rethinking-blogs/rethinking-assessment-digital-learner-profile-pilots-learnings-so-far/

[21] It's Our Future - Independent Review of Qualifications and Assessment: report https://www.gov.scot/publications/future-report-independent-review-qualifications-assessment/pages/8/

2: The Terminology

In this section we consider the terms *recording, reporting and certifying*, as these terms can have multiple meaning in the world of education, before introducing a range of new terms associated with related digital practices and tools including digital learning profiles, digital and micro-credentials, digital badges and portfolios. It is important to gain an understanding of the use of these terms within the context of the use of technology in support of online certification, recording and reporting. For example, micro-credentials can be issued using a traditional certificate or diploma, whereas digital badges (which are digital visual representations that often include embedded metadata) can be awarded for a wide range of achievements including the completion of set tasks or in recognition of involvement in a project. Digital badges are also designed to be easily shared and contain verifiable data, such as the earner's name, the issuing organisation and the criteria reached to earn the digital badge itself. The insights in this discussion provide further context for the examples outlined in Section 3.

Recording

Recording has been defined as a process that involves "gathering information and documenting in written, oral and visual forms what is noticed".[22] There are many recording techniques, from observations to checklists and portfolios, to learning journals or learning stories and much more. Such techniques are already well established in many Irish schools and tools, such as the Education Passport, provide a rounded picture of a learner's progress and achievement at primary school.[23] In this report we are primarily interested in approaches that are underpinned by digital technologies, where learners capture their learning stories, and their achievements in some form of digital record. In some jurisdictions these records can be referred to as "Records of Achievement" (RoAs).[24]

RoAs typically follow a structure where they:

- Give a broad view of a student as a person;
- Help the student to keep an up-to-date record of their achievements and pinpoint areas where they might need support or have extra learning requirements;
- Help a student to assess themselves and work out their strengths and weaknesses and, through action planning, indicate areas which might need working on;
- Act as a motivator for students in terms of building a more complete file of achievements;

[22] Hydon, C. (2013). Noticing and Recording Learning. Early Childhood Australia. https://www.acecqa.gov.au/sites/default/files/2020-12/NoticingAndRecordingLearning.pdf
[23] NCCA (n.d.). Education Passport https://ncca.ie/en/primary/reporting-and-transfer/education-passport/
[24] National Information Services Agency (2012). Records of Achievement: what are they? Background and history. Seychelles Nation. https://www.nation.sc/archive/235436/records-of-achievement-what-are-they-background-and-history

- Act as an interview/employment tool for students.

Yet, RoAs are not a new idea, and they were used as far back as the 1970s in the UK.[25] They were originally introduced into schools for students "who had attained, or were likely to attain, few formal qualifications" (p. 322) and they were subsequently used to support student applications for access to a university place. They are still used today, and one example is the Higher Education Achievement Report, which is seen as "a more sophisticated approach to recording student achievement, which acknowledges fully the range of opportunities that higher education institutions in the UK offer to their students".[26]

In addition, the literature also references educational records, which according to the US Department of Education can be defined as:

> records that are directly related to a student and that are maintained by an educational agency or institution or a party acting for or on behalf of the agency or institution. These records include but are not limited to grades, transcripts, class lists, student course schedules, health records (at the K-12 level), student financial information (at the postsecondary level), and student discipline files. The information may be recorded in any way, including, but not limited to, handwriting, print, computer media, videotape, audiotape, film, microfilm, microfiche, and e-mail.[27]

Educational records are typically stored in a student management system, and they record student grades, their attendance, health information and other information related to the student.

In this paper we focus on RoAs and on how such approaches are reported by institutions and by individual students using digital technology. Often such approaches use 'indirect measures', where students offer their school or institution systematic information on their perspectives and their ratings of their learning. For example, some higher education institutions, in the UK[28] and in the US,[29] already use such indirect measures alongside direct measures, such as teacher grades, to capture a fuller picture of their students' interests, abilities and achievements.

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[25] Rhodes, C., Avis, J., & Somervell, H. (1999). Records of achievement, higher education and work: passport or passenger? Research in Post-Compulsory Education, 4(3), 321–330. https://doi.org/10.1080/13596749900200063

[26] The Higher Education Academy (2015). Higher Education Achievement Report (HEAR). https://www.hear.ac.uk/

[27] What is an education record? | Protecting Student Privacy. https://studentprivacy.ed.gov/faq/what-education-record#:~:text=%22Education%20records%22%20are%20records%20that,of%20the%20agency%20or%20institution

[28] The Higher Education Academy (2015). Higher Education Achievement Report (HEAR). https://www.hear.ac.uk/

[29] https://www.umass.edu/oapa/student-experience/outcomes-or-graduation/student-self-reported-learning-outcomes

Reporting

Reporting is seen as being critical in improving students' motivation to learn and thus in this paper we will be focusing on digital reporting tools that enable students to primarily review their learning. Schools regularly gather and store data using their own information systems and report on how a student is performing in school. These are typically shared with parents and other stakeholders, and they are often localised for particular school contexts and used to initiate discussion with parents/guardians and students.[30] Typically, such reporting is referred to as simply a school report and they provide a picture of student accomplishments, and behaviour and they can include comments from either the parent or the student. In some contexts, these reports, or transcripts, as some describe them, can also include additional evidence that the student creates and curates, and which is often validated by the teacher, on areas such as STEM, the Arts, Sports, Management of Self.[31] In relation to reporting,[32] NCCA has developed a number of publications and guidelines to accompany and support the junior cycle on this topic.

Certifying

When it comes to certifying learning, we need to consider what is meant by certification, as it too has multiple meanings, depending on the context in which the word is used. It can be used in relation to a product or programme,[33] and to a profession or an individual, but for our purposes we are concerned with how the term is used to certify student learning, during the redeveloped senior cycle and into the future. Therefore, certification can be defined, as follows:

> Professional or personnel certification is a voluntary process by which individuals are evaluated against predetermined standards for knowledge, skills, or competencies. Participants who demonstrate that they meet the standards by successfully passing an assessment process are granted the certification.[34]

The above definition refers to an individual and not to a product or programme and implies that the successful individual has demonstrated that they have the necessary knowledge, skills or competencies. In Ireland, the State Exams Commission externally assess and certify student learning in the Leaving Certificate Established, Leaving Certificate Vocational, and Leaving

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[30] State Government of Victoria (2024). Reporting Student Achievement and Progress Foundation to 10. https://www2.education.vic.gov.au/pal/reporting-student-achievement/guidance/reporting-parents-and-carers-general-information

[31] Russell, D. (2023). School reports: Communicating progress and achievement. Teacher magazine – Australian Council for Education Research. https://www.teachermagazine.com/au_en/articles/school-reports-communicating-progress-and-achievement

[32] NCCA (n.d.) Reporting. https://ncca.ie/en/junior-cycle/assessment-and-reporting/reporting/

[33] What is the difference between Verification, Validation, Regulatory Compliance and Certification? Interreg North-West Europe Water Test Network. https://vb.nweurope.eu/media/8126/etv-guidance-document-summary-final_forflyer.pdf

[34] Thompson, N. (20220. Certification vs. Certificate. Assessment Systems. https://assess.com/certification-certificate-accreditation/

Certificate Applied Programme and are considered highly regarded and trusted[35] and this certification is recognised by employers and both further and higher education and training providers.

Having briefly considered these three aspects, this section will now focus on the potential use of digital technology to support recording, reporting and certifying including the use of Digital Learning Profiles, Digital Credentials and Micro Credentials.

Digital Learning Profiles

Digital learner profiles[36] can be defined as follows:

> The design of learner profiles should serve as a record of children's and young people's achievements in academic, applied and creative subjects as well as a record of transferable skills. Populated throughout the school journey, learner profiles should be designed to travel with pupils and young people to their next stage of learning, be this secondary school, further or higher education, or work.

Digital learner profiles are associated with a process and are seen as a record that travels with the student throughout their school journey and into the next phase of their lives, whether that is further study or the world of work. Digital learner profiles share many similarities with digital or electronic portfolios, which the NCCA has defined as:[37]

> An electronic portfolio, also known as an e-portfolio or digital portfolio, is a collection of a student's work created using word processing and other multimedia presentations. Examples of types of evidence of learning that might be included in the portfolio are:
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> - written work
> - project work
> - homework
> - charts, diagrams, photographs
> - audio or video recordings of the student's participation in an activity, event or achievement
> - recordings of work in the arts.

[35] Institute for Credentialling Excellence (2010). Defining Features of Quality Certification and Assessment-Based Certificate Programs. Institute for Credentialling Excellence https://www.credentialingexcellence.org/Portals/0/Docs/Accreditation/Features%20Document.pdf

[36] Rethinking Assessment Team (2023). Rethinking Assessment digital learner profile pilots: learnings so far. https://rethinkingassessment.com/rethinking-blogs/rethinking-assessment-digital-learner-profile-pilots-learnings-so-far/

[37] Curriculum online (n.d). Portfolio assessment. NCCA. https://www.curriculumonline.ie/junior-cycle/level-1-learning-programmes-(l1lps)/assessment-and-reporting/portfolio%20assessment/

We will review a number of examples in Section 3 that showcase how a range of digital learner profiles and digital portfolios are currently being deployed in upper secondary school education around the globe to capture a fuller picture of student interests and achievements.

Digital Credentials and Micro-credentials

The Digital Credentials Consortium[38] and others are exploring how digital technology might change the way higher education institutions issue and manage academic credentials. The consortium notes that in the main, higher education has not taken advantage of the potential of digital technology in the area of accreditation to date, while acknowledging that some interesting work is taking place around digital credentials and micro-credentials globally at present. Here we will introduce some of the terminology and later we review some examples of the use of digital credentials and the potential of such approaches.

> A digital credential can be imagined as a combination of two components: a document and an envelope into which that document is placed. The document is like the piece of paper a university issues to a graduate, which might contain the name of the recipient as well as a description of the credential they received. The envelope protects the content of the document so it cannot be changed, and it reliably communicates the authenticity of its contents.[39]

They note that the envelope, similar to the postal service, is safely stored and delivered, and that it contains information about who issued the credential and to whom it was issued creating "robust links to the identity of an issuer (e.g., a specific university) and the learner (e.g., a particular learner)". They also note that work is also underway in many jurisdictions around the document component of a digital credential, that is the content that is stored and shared via the envelope, and these present different ways in which competences can be described. We return to these ideas in the concluding section when we consider some of the possibilities when redeveloping senior cycle.

In addition to digital credentials there is also significant work taking place around micro-credentials in higher and further education. A micro-credential can be defined as, "a proof of the learning outcomes that a learner has acquired following a short learning experience. These learning outcomes have been assessed against transparent standards".[40] The proof is contained in a certified document, usually digital, that "lists the name of the holder, the achieved learning

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[38] Digital Credentials Online. https://digitalcredentials.mit.edu/

[39] Digital Credentials Consortium (n.d.). Building the digital credential infrastructure for the future. https://digitalcredentials.mit.edu/docs/white-paper-building-digital-credential-infrastructure-future.pdf

[40] European Commission (2020). A European approach to micro-credentials – Output of the micro-credentials higher education consultation group - Final report. https://education.ec.europa.eu/sites/default/files/document-library-docs/european-approach-micro-credentials-higher-education-consultation-group-output-final-report.pdf

outcomes, the assessment method, the awarding body and, where applicable, the qualifications framework level and the credits gained".[41] While there are standards set, there is no standardised form for micro-credentials, and they can also be referred to by other terms, such as micro-certs, nanodegrees, or digital badges. In this paper we take a broad approach to digital credentials and use it to refer to any small chunk of learning that is 'accredited' using a digital certificate or badge. Some students may already have had an opportunity to gain digital certification in a wide range of digital skills[42] and through TY modules such as, Student Safety in the Workplace[43] and the GAA Future Leaders programme[44] and others.

The European Commission is at the forefront of work on digital credentials through the creation of the new Europass portal, which includes a Digital Credentials Infrastructure,[45] that allows organisations to issue qualifications, apprenticeships or certificates in an efficient and secure, trustworthy and fraud-resistant digital infrastructure. While micro-credentials are predominantly used in Europe by higher and further education institutions, they are also being used in schools around the world (see some examples from the United States)[46] and by students here in Ireland across some TY programmes, as noted above. In schools, they can be used in a variety of ways that usually enable students to acquire bite-sized credentials that can then be combined or stacked to evidence many different assessment outcomes or can be combined with similar digital badges from other courses - or can be used to certify prior learning that may be required for another course. Digital badges can be designed in any form, as long as the requirements to earn that badge are clearly defined.[47] Figure 1 below captures some of the areas in which students can typically acquire digital badges, and such approaches can enable students to gather evidence on their interests and they can gain digital badges in areas other than traditional curriculum subject areas. This idea of collecting evidence on "My Interests" aligns very much with the idea of capturing a wider picture of the student and it also links with the idea of a Record of Achievement, that can be populated by the student, or by the school, or by both. The advances in digital technology and the growing pervasiveness of these technologies are now allowing schools and students to consider such approaches.

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[41] European Education Area (n.d.). A European approach to micro-credentials. https://education.ec.europa.eu/education-levels/higher-education/micro-credentials
[42] Prodigy Learning. https://www.prodigylearning.com/success-story/colaiste-ghobnait-mos/
[43] NCCA (n.d.). Transition Unit – Student Safety in the Workplace. https://ncca.ie/media/2526/health_and_safety.pdf
[44] About Future Leaders – Transition Year Programme. TOBAR Gaelic Games Learning. https://learning.gaa.ie/FutureLeaders
[45] Europass Portal https://europass.europa.eu/en
[46] The case of Franklin School in the USA is one example of such use.
[47] Niguidula, D. (2020). The Power of Digital Badges. https://www .ascd.org/el/articles/the-power-of-digital-badges

Figure 2: An example of a set of student's digital badges.

Many of these new approaches are creating a digital learner profile or picture of learners, and they have been described as a "trusted digital document that showcases a young person's learning attainments, describing what the learner knows and can do and who they are. It is a document [i.e., the digital learner profile] owned by a learner but designed and populated for them" [48] (p. 25).

This section has considered the terminology used in relation to the recording, reporting and certification of student learning, within and outside school, and how digital technologies are enabling students to capture and share their interests and achievements in new ways. In the next section we will look more closely at a number of practical examples of emerging practices in these areas.

[48] Milligan, S., Luo, R., Kamei, T., Rice, S., and Kheang, T. (2020). Recognition of learning success for all: Ensuring trust and utility in a new approach to recognition of learning in senior secondary education in Australia. Learning Creates Australia, Melbourne, Victoria. https://www.learningcreates.org.au/media/attachments/2020/12/07/lca_success_paper_re-design_final9r2.pdf

3. Some Practical Examples

There are currently a number of organisations proactively developing new forms of recording, reporting and certification through their associated accreditation systems. All of these new systems are using digital technology to either augment traditional examinations, or in some cases as "end-point assessment".[49] End-point assessments (EPAs) can be defined as "the final stage of an apprenticeship. It is an impartial assessment of whether your apprentice has developed the skills, knowledge and behaviours outlined in the apprenticeship standard".[50] However, they are also trying to capture and enable easier sharing of what could be considered a wider picture of a student's achievements.

In this section we will review a selection of use-cases for digital learning profiles, digital portfolios and digital-credential initiatives and some evolving online certification platforms and approaches, before considering some key similarities and differences between them. All use-cases employ digital technologies, but this can differ, depending on the context in which they are being used.

Digital Learning Profiles

Profiling students' wider achievements is not a new idea, and attempts have been made in the past to address this challenge. The UK government encouraged all students to develop a National Record of Achievement (NRA) in the early 1990s. At the time it was described as:

> A portfolio of documents showcasing a student's academic and non-academic achievements, including GCSE certificates, certificates from extracurricular activities, school reports and anything else considered relevant. [51]

Interestingly, the NRA was meant to document both the student's academic and non-academic achievements, however, it did not operate as intended for multiple reasons at that time. These were wide ranging and included philosophical and sociological issues related to what constitutes knowledge as well as practical issues, such as the NRA being seen as too long-winded, lacking clarity around who was guaranteeing the data and there was limited buy-in from employers. It has been suggested that the NRA was ahead of its time, as the digital technology that might have supported such an approach was not as pervasive in schools and in students' lives at that time as

[49] Lucas, B. (2021). Rethinking assessment in education: The case for change. CSE Leading Education Series; Centre for Strategic Education: East Melbourne, VIC, Australia. https://all-learning.org.au/app/uploads/2022/02/CSE-Leading-Education-Series2-04-2021b.pdf

[50] Understanding end-point assessments. Apprenticeships, HM Government. https://www.apprenticeships.gov.uk/employers/end-point-assessments#

[51] Lucas, B. (2021). Rethinking assessment in education: The case for change, p. 29. CSE Leading Education Series; Centre for Strategic Education: East Melbourne, VIC, Australia. https://all-learning.org.au/app/uploads/2022/02/CSE-Leading-Education-Series2-04-2021b.pdf

it is today. Though the NRA is no longer in use, some employer groups at the time felt that such an approach could have merit if it was further developed by making it more simplified and streamlined to the needs of the world of work.[52]

As can be seen from the NRA example above, the idea of capturing a wider picture of our students is not a new idea, and with recent advances in the functionality and availability of digital technology, it is now a real possibility for students, schools and education systems to create and share such records of achievement. A number of countries and organisations are currently exploring the use of digital learning profiles. In England the Edge Foundation recently stated that there is now a need in England to:

> Create a broad baccalaureate and learner profile at age 18 to truly reflect young people's wider talents. This should be complemented by a digital learner profile which highlights learner's formal qualifications, but also their personal interests, independent projects, work experience, evidence of creativity and collaboration and achievements outside of school.[53]

Digital learner profiles have the potential to highlight a learner's formal qualifications alongside their personal interests and other learning experiences that they have participated in. It is also worth noting that this description includes a reference to the Key Competencies, as mentioned in the Introduction, as being important to the workplace of the future. Thus, the digital learning profile should be a rich report that captures a fuller picture of the student, both within and outside of the classroom. Such approaches are currently being piloted in a number of schools across England in order to complement traditional test results with "internally validated evidence … [such as] examples of best work, testimonials, videos of collaborative endeavours and evidence of oral demonstration of learning".[54] This is an evolving space where schools, researchers and other stakeholders are actively engaging and experimenting with new approaches and exploring how digital technologies can support these practices.

One such organisation is Rethinking Assessment,[55] a non-partisan coalition of school leaders from across the state and independent school sectors in the UK who are working with leading researchers, key policymakers, employers and higher education representatives. They state that their primary role is to research best practice in relation to what constitutes a digital learner profile,

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[52] Kodz, J., Atkinson, J., Hillage, J., Maginn, A., & Perryman, S. (1997). Employers' Use of the National Record of Achievement. The Institute for Employment Studies. https://www.employment-studies.co.uk/system/files/resources/files/328.pdf

[53] Edge Foundation (2024). Curriculum and Assessment - Broad, Innovative, Multimodal. https://www.edge.co.uk/policy/support-us/curriculum-and-assessment/

[54] Rethinking Assessment (2024). Building a Learner Profile. https://rethinkingassessment.com/learner-profile/

[55] Rethinking Assessment (2024). It's time to rethink assessment. https://rethinkingassessment.com/rethinking-blogs/its-time-to-rethink-assessment/

by researching the types of evidence a profile might contain and to provide suggestions on how best to validate this. They are currently building a "demonstrator template in Google Sites, which will be freely available to all schools and colleges to build out and adapt".[56] Figure 2 below presents a representation of a digital learner profile from Rethinking Assessment that illustrates the kinds of evidence a student could potentially collect during their time in school. While the current prototype has been developed in Google Sites, they note that they "will also be providing information on the range of commercial providers offering more sophisticated products, for schools and colleges which may wish to go down this route". This suggests that a range of providers, both commercial and government supported organisations, may develop products and services in the future, which will be informed by the lessons learned during the current research phase.

Figure 2 describes the various components that make up the profile that is currently being trialled with a wide range of young people. Ultimately the profile will:

- Contain an overview of the student (i.e. their name, age, etc.);
- Link to a student portfolio, which sits behind the profile;
- Contain multimedia elements, such as video and/or audio;
- Capture evidence of the 3Cs of Success: Creative Thinking, Collaboration and Communication;
- Gather evidence on literacy, numeracy, oracy and digital skills;
- Be a living document that learners can access and update regularly, so they can update their learning journey;
- Allow students to describe an Extended Project, something they are passionate about;
- Allow students to showcase their best pieces of work and their out of school achievements;
- Share any testimonials the young people have received with a wider audience;
- Allow students to share a full range of their skills and interests.

Thus, it will provide a fuller picture of the young person by capturing a broad range of evidence on their interests, abilities and achievements.

[56] Rethinking Assessment (2024). Building a Learner Profile. https://rethinkingassessment.com/learner-profile/

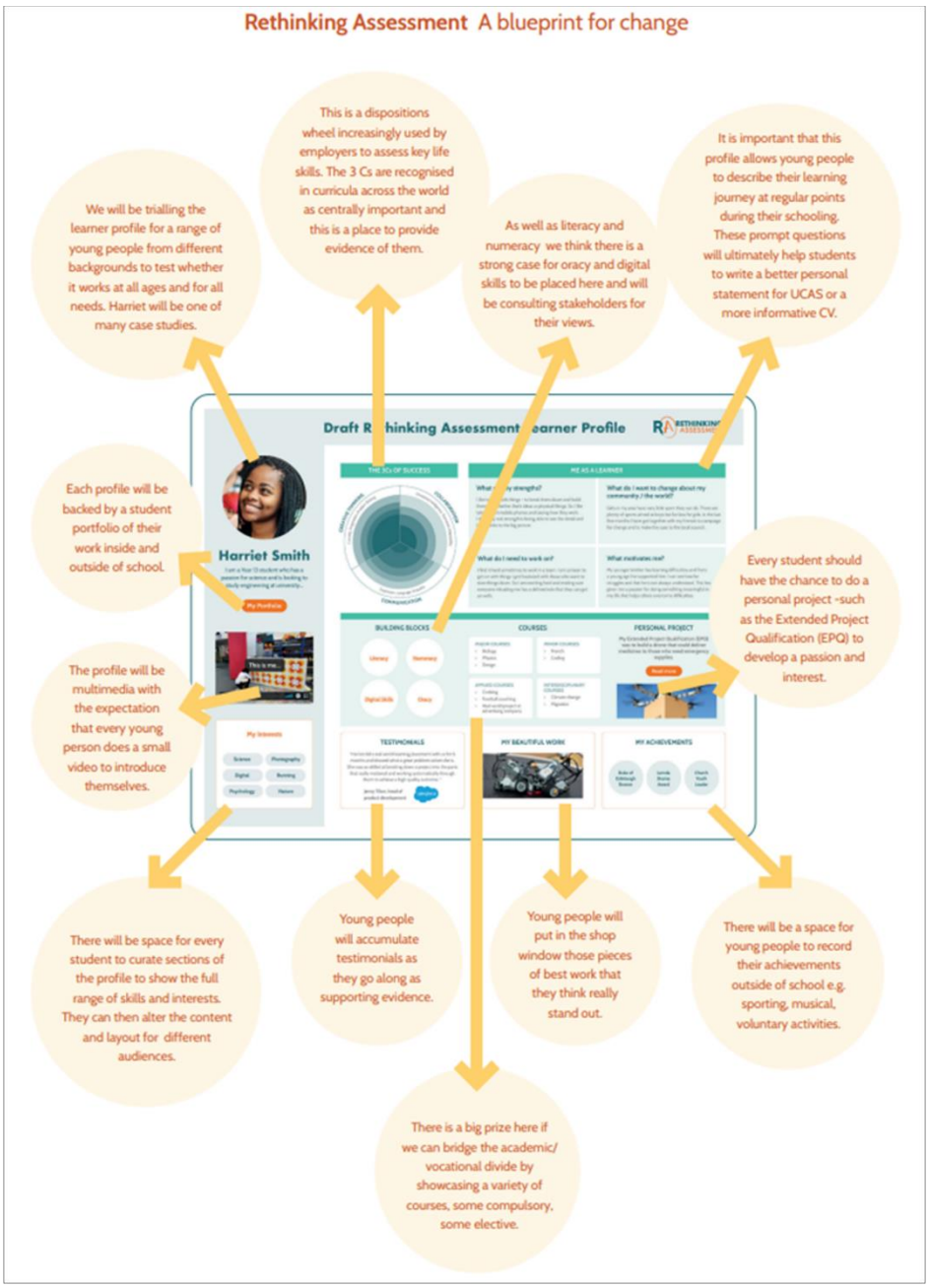

Figure 3: A Digital Learning Profile from Rethinking Assessment.

The International Baccalaureate Organisation is also very cognisant of the recent technological developments in society, specifically around the influence of artificial intelligence and the changing world of work that their students are entering. They are taking these developments into account when considering issues such as digital teaching, digital assessment and digital qualifications.[57] Specifically, they have developed the International Baccalaureate (IB) Learner Profile which

[57] Heinonen, Olli-Pekka (2022). Past, present, future: the IB is a leading edge in a changing world. International Baccalaureate. https://www.ibo.org/news/news-about-the-ib/past-present-future-the-ib-is-a-leading-edge-in-a-changing-world/

describes "a broad range of human capacities and responsibilities that go beyond academic success",[58] as captured fully in Figure 4 below.

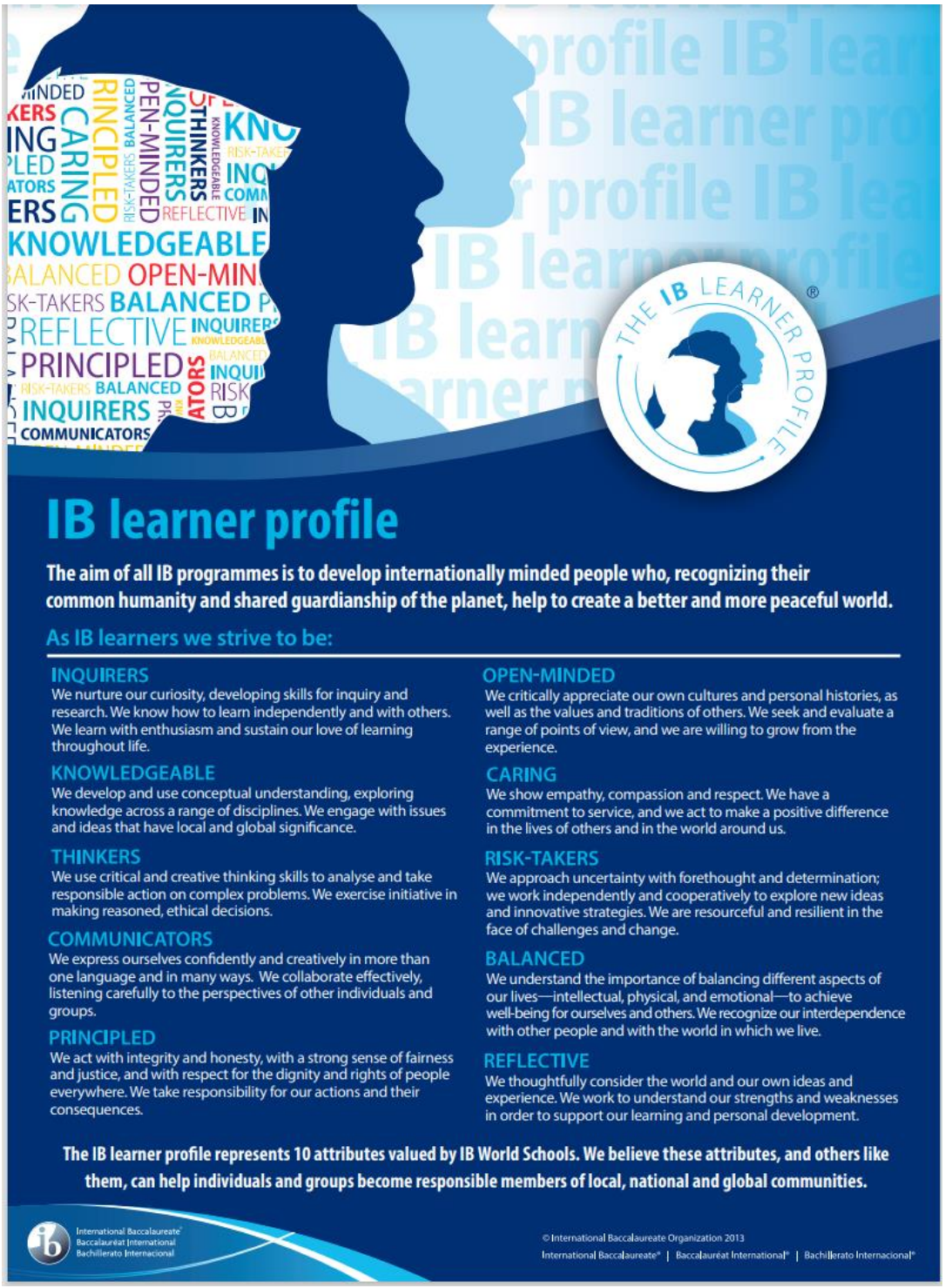

Figure 4: The IB Learner Profile. [59]

[58] International Baccalaureate Organisation (2023). The IB Learner profile. https://www.ibo.org/benefits/learner-profile/

[59] International Baccalaureate Organisation (2013). The IB Learner Profile. https://www.ibo.org/contentassets/fd82f70643ef4086b7d3f292cc214962/learner-profile-en.pdf

The profile, is supported by a programme,[60] that aims to develop learners who are:

Table 1: IB Learner Profiles.

• Inquirers	• Open-minded
• Knowledgeable	• Caring
• Thinkers	• Risk-takers
• Communicators	• Balanced
• Principled	• Reflective

The IB Learner Profile has been in use for over ten years now and it is an example of how IB schools are capturing evidence in relation to a range of human capacities and responsibilities that are typically not captured in formal examinations. Such an approach has a wide application across the entire curriculum. For example, in the subject Art, a student can reflect and identify the attributes that most exemplify their "personalities" in their creation of a piece of art.[61] Similar to the Rethinking Assessment example, the Profile is designed to capture a fuller picture of the learner that resides alongside the student's baccalaureate examination results.

Individual schools, such as The Heritage Xperiential Learning School[62] in India, are also exploring a similar approach to the IB Learner Profile by developing their own learner's profile, which is a statement of educational intent, as captured in Figure 5 below. The school is currently exploring ways to capture "data to evidence each of its components" (p. 31), which comprise of seven areas. At the centre there are three core components, Emotional/Physical, Social/Collaborative, and Cognitive/Creative. Similar to the other examples, these three areas are then sub-divided into seven sections, one being My Ideas, which in turn is sub-divided into key competencies such as inquisitive and/or creative. This is an interesting approach by a school that is striving to collect data and create a broad picture of how a young person is developing.

[60] International Baccalaureate Organisation (2023). MYP passing criteria. https://ibo.org/about-the-ib/what-it-means-to-be-an-ib-student/recognizing-student-achievement/about-assessment/myp-passing-criteria/
[61] International Baccalaureate Organisation (2018). Artwork makes IB learner profile personally meaningful. https://blogs.ibo.org/2018/02/22/artwork-activity-makes-ib-learner-profile-personally-meaningful/
[62] Heritage Xperiential School. https://www.heritagexperiential.org/

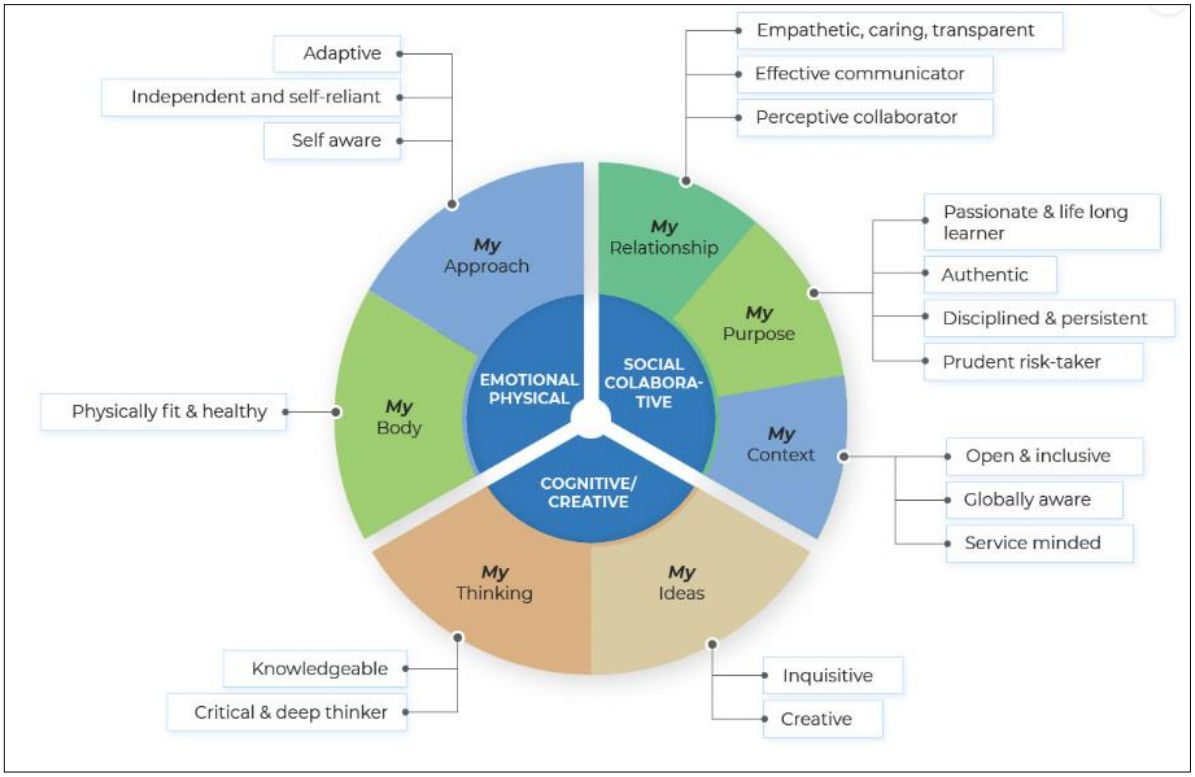

Figure 5: Heritage Xperiential Learning School Learner's Profile.

Other organisations, such as the Mastery Transcript Consortium (MTC)[63] in the United States are developing transcripts, which they call a Mastery Learning Record (MLR), see Figure 6 below, to provide a richer picture of their students. MTC has been working on how to credential meaningful, "open-walled learning"[64] (i.e. learning that takes place outside the classroom) using the MLR approach. The transcripts can be accessed online and are password protected, so that universities or employers can interact with the transcript in real time. The transcript allows the person reviewing it to delve deeper into the interests or skill levels of the student and see evidence of what they have achieved. The transcript can also include formal qualifications and thus can provide a more complete picture of the student.

Their learner record looks similar to many of the profiles that have been showcased earlier in this section, and it contains a number of elements, such as a student statement and evidence on a range of student earned competencies, such as:

- Compassionate

[63] Macdonald, B. (2022). Giving Credit Where It's Due: Education Reimagined with MTC Learning Record. Mastery Transcript Consortium. https://mastery.org/giving-credit-where-its-due-education-reimagined-with-mtc-learning-record/

[64] What do we mean when we say that a learning experience is "Open-Walled?" Taking the term literally, we mean that the experience is not walled in. The idea is that learning is not limited to a closed box called "the classroom" or "the school;" it can happen anywhere. And learning is not limited to a traditional "school day" or "school year;" it can happen anytime. Open-Walled means that education is invited to take place outside the primary learning environment, and, at the same time, the outside world is invited into the primary learning environment. In either direction, such learning is Open-Walled. The walls are open (p. 12) The Big Idea (n.d.) Community-based, learner-centred ecosystems. https://thebigidea.education-reimagined.org/.

- Culturally Competent
- Critical Thinker
- Competent Communicator
- Collaborative
- Academic Mindset

These competencies are further broken down into related sub-competencies. The transcript also includes evidence of a capstone project and other accomplishments that the student has achieved. Thus, the online transcript is updated by the student, and it becomes a place where they can register their achievements and learning experiences in a holistic way.

In April 2023 the MTC became a wholly owned subsidiary of the Education Testing Service (ETS)[65] and is now part of the Skills for the Future initiative,[66] which is spearheaded by ETS and the Carnegie Foundation. The Skills for the Future initiative states on their website that they are "proposing that a new currency of education should be based upon meaningful skills and accomplishments demonstrated through assessment". The consortium states that they are addressing this challenge by creating "a robust, scalable suite of assessment and analytic tools that captures the full range of skills required for American students to succeed in K-12, post-secondary education and beyond".

[65] Educational Testing Service (ETS), founded in 1947, is the world's largest private educational testing and assessment organization and is located in the United States. https://www.carnegiefoundation.org/newsroom/news-releases/carnegie-foundation-ets-partner-to-transform-the-educational-pillars-they-built-the-carnegie-unit-and-standardized-tests/

[66] Carnegie Foundation. Carnegie Foundation for the Advancement of Teaching: Skills for the Future Initiative. https://www.carnegiefoundation.org/our-work/measuring-what-matters/skills-for-the-future-initiative/. Accessed June 2024.

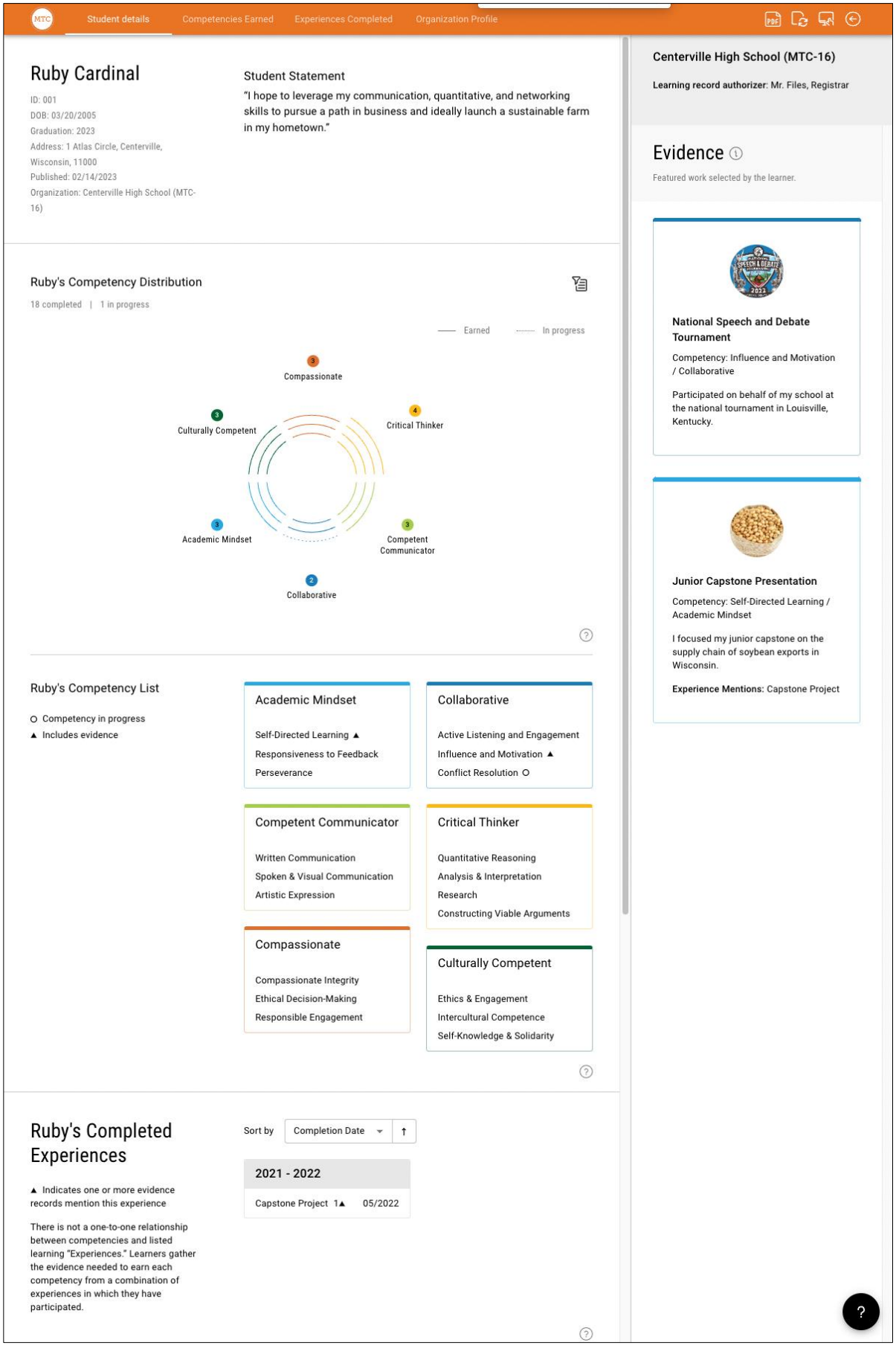

Figure 6: Mastery Transcript Consortium (MTC).

Similarly, the International Big Picture Learning Credential,[67] is also attempting to capture a full picture of students' achievements and interests in Australia. This work is being led by Big Picture Learning Australia (BPLA), a national, not for profit organisation established in Australia in 2006, that works largely with public secondary schools and systems in Australia. BPLA's work is supported by the University of Melbourne and their goal is to "transform the grammar of secondary schooling in a manner that will stem the ever-increasing tide of student disengagement and address inherent equity issues in education for those from diverse backgrounds, while nurturing a sense of social connection and personal agency"[67] (p. 1).

Similar to MTC in the United States they have developed an approach to learning that is focused on student passions and interests, and on how to capture evidence of these learning experiences in a way that it can be shared more widely beyond the school. The BPLA approach enables students to select areas of personal interest and to work in small groups, where they collect evidence of their learning and present it in the form of a passport that can be shared with employers, training organisations or higher education institutions.

Thus, the International Big Picture Learning Credential (see Figure 7 below) is the culmination of a process that "makes visible the capabilities and educational values that students have developed at school"[67] (p. 9).

The flower graph presents the graduate's accomplishments, where each coloured petal represents one of the 6 Learning Goals:

- Knowing How to Learn;
- Personal Qualities;
- Quantitative Reasoning;
- Empirical Reasoning;
- Communication;
- Social Reasoning.

The levels of attainment (the 5 concentric rings encircling the petals) are referenced to external standards - the Australian Qualifications Framework (AQF) and Australian Core Skills Framework (ACSF) - and these are presented in a digital form interpretable by all stakeholders.

[67] Big Picture Learning Australia (n.d.) What is the International Big Picture Learning Credential? https://www.bigpicture.org.au/what-international-big-picture-learning-credential

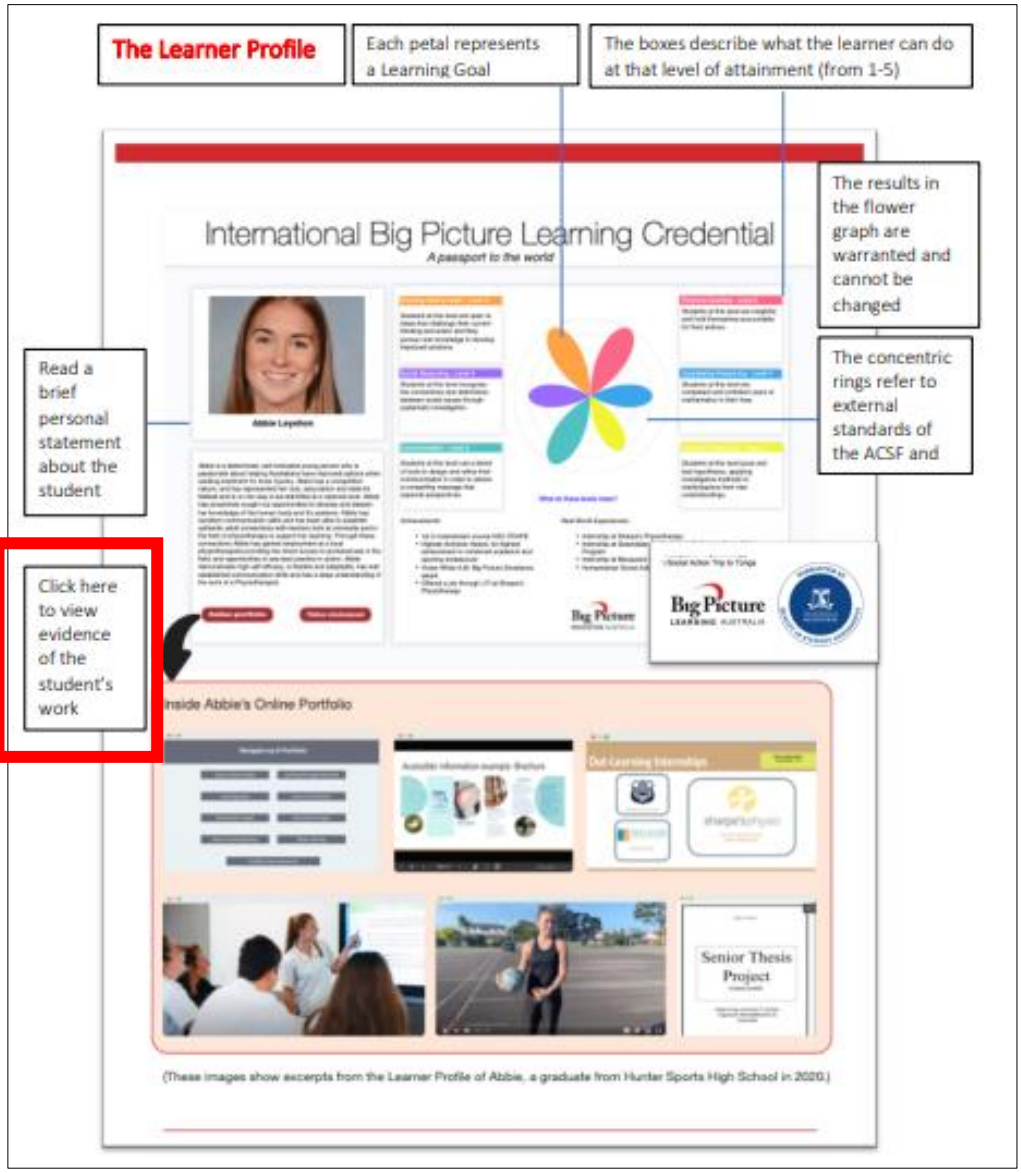

Figure 7: International Big Picture Learning Credential.

Multiple sources of evidence are collected in school, in out of school learning, at exhibitions, and from across the years that a student has been engaged with Big Picture. The project website notes that an extensive artefact of student work, such as a senior project (what others called a capstone project, as in the Mastery Learning Record (MLR), mentioned above), can constitute evidence for any or all of the Learning Goals. Behind each of these profiles sits a Graduation Portfolio (we will briefly return to this idea below), see the red highlighted box in Figure 7 above. We take a closer look at what is typically contained in the student's portfolio on the next page.

Figure 8: Snapshot of portfolio contents.

The portfolio, see Figure 8 above, typically contains evidence of the student's learning, such as their Senior Thesis Project, Autobiography, Post School Project, Out-Learning Summary of work undertaken outside of the school and other relevant evidence. Many of the new accreditation approaches that we have featured in this section are built on digital portfolios, where more detailed evidence is stored behind a profile of the learner. In all cases the students have control over what they include in their portfolio and what they subsequently decide to share with the outside world.

Thus, there is a growing use of technology to capture a broader view of student learning and achievements in a visual way, as seen in the examples in this section. Professor Bill Lucas of Winchester University, and a co-founder of Rethinking Assessment, notes a growing trend to report learner data in more visual ways, for example using images of a flower, a wheel etc. to display learners' interests and achievements in new ways. He further stated that:

> … it is increasingly clear that when it comes to evidencing the knowledge, skills and dispositions young people have acquired in their time at school, rather than a set of scores or grades, there is a move towards using Learner Profiles, Transcripts, Records of Achievement and Portfolios, alongside whatever standardised data is felt to be important (p. 34).[68]

There is evidence that some of these new forms of accreditation, specifically the International Big Picture Learning Credential (IBPLC), are gaining recognition and the work of the Assessment

[68] Lucas, B. (2021). Rethinking assessment in education: The case for change. CSE Leading Education Series; Centre for Strategic Education: East Melbourne, VIC, Australia. https://all-learning.org.au/app/uploads/2022/02/CSE-Leading-Education-Series2-04-2021b.pdf

Research Centre at the University of Melbourne[69] has developed a methodology for organisations, such as schools or certification bodies, to design new assessments and accompanying accreditation or recognition systems. They define recognition as a "process of using assessments to determine and certify the degree to which an individual has attained a particular level of competence, in a report or a credential. Reports and credentials are a form of currency for learning, thus carrying social value and utility" [70] (p. 19). Their research has identified a range of learner profiles in development and these profiles capture a range of student information "such as the student's performance in academic subjects, qualifications attained, attendance rate, level of competence in employability skills and badges from other achievements and participations" (p. 25). They also state that:

> The workload associated with designing and implementing this approach to assessment and recognition of complex capabilities is high, often shared among stakeholders, designers, credential designers, progression builders, assessment task managers and assessors. The use of technology is essential. (p. 28)

The Universities Admissions Centre (UAC) in Australia has provided a digital template on the Cred Folio platform[71] for the IBPLC transcript that is secured by blockchain. Technologies are increasingly being used to ensure the security and integrity of the collected data. Encryption software can be used to ensure the security of the data so that it can only be accessed by those who are authorised to access it, and blockchain can be used to ensure the integrity of the data (i.e., the portfolio) so that the relevant third parties, such as further education providers, potential employers and others, can trust the data.

The IBPLC is gaining acceptance across tertiary education providers and employers around Australia, and it is expanding its network to other countries, such as the USA, Barbados and Kenya.

Earlier we introduced the terms digital credential and micro-credential, which can be viewed as an alternative credentialling system to traditional academic credentials, that is gaining traction internationally. These innovations are present in some of the examples we have already viewed in this section. For example, the University of Melbourne has utilised a specific micro-credential format that was introduced originally by the Mozilla Open Badges Infrastructure (OBI). This is an

[69] Assessment and Evaluation Research Centre, the University of Melbourne. https://education.unimelb.edu.au/aerc
[70] Milligan, S. K., Luo, R., Hassim, E., & Johnston, J. (2020). Future-proofing students: What they need to know and how to assess and credential them. Melbourne, Australia: Melbourne Graduate School of Education, the University of Melbourne: Melbourne. https://www.bigpicture.org.au/files/future-proofing_students_johnson.pdf
[71] Welcome to CredFolio (login page). https://credfolio.com.au/

open-sourced platform that manages a network of entities and objects associated with digital badge credentials.[72] They describe their badges as follows:

> A digital badge typically comprises a simple graphic, together with digital metadata, describing the criteria, standards and assessment required for credentialing, as well as other features, such as expiry dates, where and when the credential was earned and the identity of the assessor or warrantor. Extra digital information may be supplied to illustrate or amplify assessments, such as portfolios, videos of performances, examples of production, artefacts, essays and so on. (p. 19)

As noted earlier there is growing use of micro-credentials and digital badges in secondary education with students engaged in programmes or modules that offer such certification, both within and outside of school. Such certifications are typically used in two ways in schools, the first is course badges where students capture evidence on key milestones within a particular subject (i.e. a badge for completing a Microsoft Office Specialist module). The second type is a schoolwide badge where the badge contains evidence of broader learning goals, from a range of subjects and open-wall experiences. In some cases, badges can be accumulated or stacked within a portfolio, and these are then incorporated by students into their applications for higher education institutions, by organisations such as Mastery Transcript Consortium (MTC) or by the International Big Picture Learning Credential (IBPLC) in Australia.

Nearer to home, the European Commission has developed the European Digital Credentials for learning[73] platform which can:

> include diplomas, transcripts of records and a wide variety of other types of certificates of learning achievement. They are multilingual and signed with a unique electronic seal (that is the digital equivalent of an institution's rubber stamp). This allows education and training institutions to easily authenticate, validate and recognise credentials of any size, shape or form.

European Digital Credentials for learning can describe and certify:

- qualifications (e.g. professional certificates, university diplomas and other learning achievements);

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[72] Milligan, S. K., Luo, R., Hassim, E., & Johnston, J. (2020). Future-proofing students: What they need to know and how to assess and credential them. Melbourne, Australia: Melbourne Graduate School of Education, the University of Melbourne: Melbourne. https://www.bigpicture.org.au/files/future-proofing_students_johnson.pdf

[73] European Digital Credentials for learning. Europass, European Union. https://europa.eu/europass/en/europass-alati/european-digital-credentials#:~:text=European%20Digital%20Credentials%20for%20learning%20include%20diplomas%2C%20transcripts%20of%20records,of%20an%20institution's%20rubber%20stamp

- activities (e.g. participation in classes and non-formal learning events);
- assessments (e.g. transcripts of records); and
- entitlements (e.g. right to enrol in learning opportunities, or to undertake an occupation.

Thus, these are portable digital documents that can be used by individuals, including students, to build an online portfolio to track all their credentials which they can then update and reuse for multiple purposes over time. Thus, student agency is central to these new forms of credentials.

There is a growing trend to enable students to capture and curate their own evidence of their learning, interests and achievements, and in sharing different versions of this data with specific audiences, such as educational institutions, employers. Furthermore, it has been noted that such approaches can also assist employers in easily verifying credentials and processing job applications while it can provide education and training providers with a better understanding of learner credentials from different EU Member States. These digital learning profiles are the documents that fit inside the envelope, which the Digital Credentials Consortium referred to earlier in Section 2. Europe is playing a leading role in creating the infrastructure for such documents, so that learner competencies and skills can be described and evidenced in documents, such as the European Digital Credentials for Learning (EDCs), which are presented below.

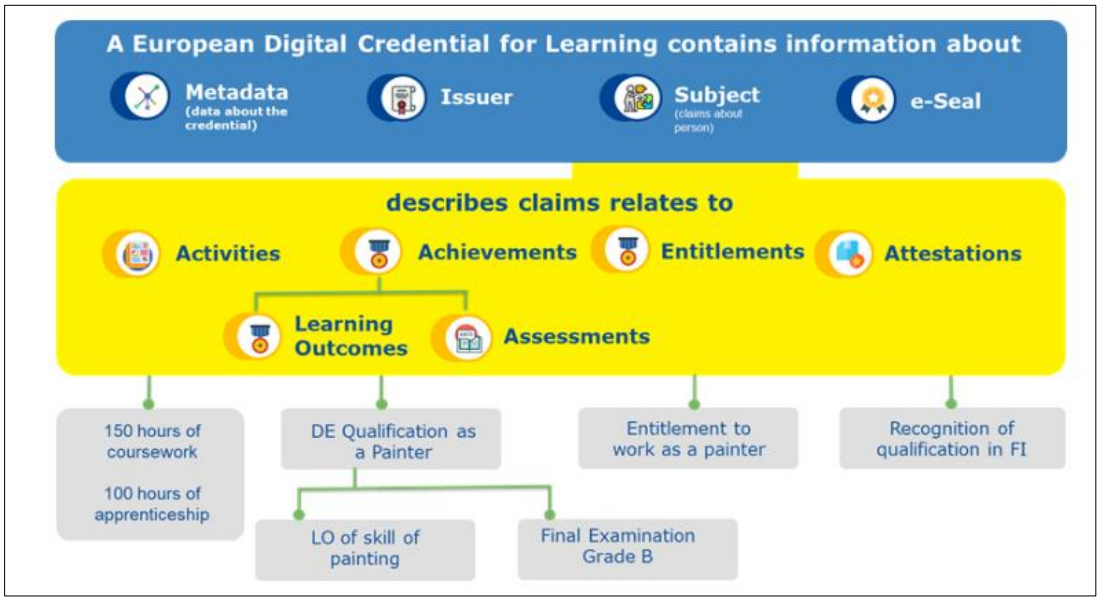

Figure 9: Content of European Digital Credential for Learning.

The European Digital Credentials for learning (EDCs) are standardised tamperproof electronic documents that describe certain skills and learning outcome achievements that their owner has achieved through formal, informal and non-formal learning contexts.

It is anticipated that the EDCs will encourage citizens of all ages to gather evidence of all continuing development and upskilling activities and to store them in one secure online space.

The development of the EDC is linked to the European Learning Model (ELM),[74] which is a "multilingual data model providing a single vocabulary for the description of learning in Europe". One of the key uses of the ELM is to create and issue credentials, which includes digital credentials, so that individuals can:

- build an online portfolio to track their learning while being in control of their data;
- easily reuse their credentials to get a job or apply for an education/training course;
- present and have their credentials verified at any point in their career.

The Commission has the following to say about Digital Credentials in the context of the ELM.

> Digital Credentials contain distinct claims about a learner/individual, describing elements such as the actual activities they have completed, their specific achievements and, if and where applicable, their specific grades. A credential could be an attendance certificate, a qualification (e.g. degree), diploma supplement, transcript of records, etc..[74]

Thus, the European Digital Credentials for Learning platform is providing a secure platform where learners/individuals can store and share their credentials as required with a third party.

Section 3 has highlighted that there is currently a significant amount of innovation taking place in relation to new forms of digital credentials and reporting in schools and other sectors. There is significant overlap between the various digital learning profile examples that have been presented in this section (see Table 2 below). Many of the examples have contained similar features, such as capturing evidence of student key competencies, their interests, their achievements, samples of outstanding academic achievements, etc. They often involve a project element, and they typically contain multimedia evidence of student achievements. Furthermore, all the profiles are created and stored using digital technologies, and these take different formats ranging from simple webpages to secure bespoke platforms.

[74] Introduction to the European Learning Mode. Europass, European Union https://europa.eu/europass/en/node/2128

Table 2: Analysis of Digital Learning Profiles

DLP Features	Profiles Described					
	RTA	IB	HEI	MTC	IBPLC	EDC
Overview of the student (their name, age, etc.)	Y	Y	Y	Y	Y	Y
Reflective statement from the student				Y	Y	Y
Link to a student portfolio	Y	Y		Y	Y	Y
Profile contains multimedia elements	Y			Y	Y	Y
Living document regularly updated by the student	Y			Y	Y	Y
Evidence gathered on Key Competencies (i.e. Collaboration, Critical Thinking etc.)	Y	Y		Y	Y	Y
Evidence gathered on core skills (e.g. Literacy, Numeracy, Oracy, digital skills)	Y			Y		Y
Captures information and evidence on how learners think, learn and relate to others			Y			
Contains an extended project or capstone project	Y			Y	Y	
Allows students to showcase their best work	Y			Y		
Providing filtered access for a variety of audiences (i.e. different views depending on who is viewing the profile)	Y			Y	Y	
Allow students to share a full picture of their skills and interests	Y			Y	Y	Y
Capture their qualifications				Y	Y	Y

Please note that the various Digital Learning Profile systems summarised in table 2 above differ in the levels of security they provide in terms of a) validating data that is added to the system, b) ensuring the security and integrity of the data while being stored, and c) ensuring access only to authorised users. Those systems that include national qualifications (i.e., state examination results) typically incorporate security procedures to ensure the security of the data which aligns with existing good practices. There is always a need for users to ensure that the security, data privacy and terms of service of any preferred chosen system matches their needs.

In saying that, the technologies available today allow schools and students to create digital profiles that fit with their context, as in the case of the IB, MTC and IBPL for example. These profiles can be structured and presented in different ways, using a combination of different features, thus enabling learners to customise their profile to meet their specific needs. They can be housed on open platforms, such as a webpage, or on secure platforms such as the IBPC or European Digital Credentials for Learning platform.

4. Considering the Potential of Digital Technology

Section 3 has shared a number of examples, from different jurisdictions, of ongoing work in relation to online certification and reporting approaches that utilise digital technologies. The examples range from digital learning profiles to portfolios, to a range of digital credentialing platforms that could potentially be used to broaden reporting arrangements in a redeveloped senior cycle.

The examples illustrated that there are a range of digital reporting approaches being utilised and these range from simple webpages, as in the case of Rethinking Assessment, to sophisticated online platforms as in the case of the European Digital Credentials for Learning platform. In this section we briefly highlight some issues that should be considered in developing systems, such as digital learning profiles, which store and share these documents in a secure and trustworthy manner.

Significant work is already underway by a number of organisations, such as the EU Commission, The Digital Credentials Consortium and the W3C Verifiable Credential data model,[75] to create robust and trustworthy systems that will capture and securely deliver learner credentials around the world. This section of the report will reflect on the potential of digital technology in this respect and outline some of the key considerations including the choice of platform, authentication and data security, key questions for consideration and how to provide a more holistic picture of student learning.

Data Platforms

In creating any such system at whatever level, school, national or international, there is a lot of work to be done in devising a structure for the data collected – in terms of deciding what data is collected, how it is collected, how equivalencies are recognised, assigning authorities for specific judgements of value and ensuring that those 'authorities' have the confidence of the users of the data. As noted above, this data can be collected and curated by students or by schools using a range of technologies. Irish schools are using platforms, such as the Post Primary Online Database (PPOD) as well as their own Management Information Systems (MIS), to record student data including Junior Cycle Classroom Based Assessments and short courses that students may have taken. In Section 2, we mentioned the reporting systems that post-primary schools use to gather and maintain data securely on their students. In addition, post-primary schools are also using a

[75] Verifiable Credentials Data Model v1.1. W3C. https://www.w3.org/TR/vc-data-model/

range of management information systems, in tandem with PPOD, to help manage the day-to-day tasks in schools.

The technology is also there to create attractive interfaces (i.e. the Digital Learning Profile examples in Section 3) that can then link to databases of relevant evidence. At its simplest these profiles can be created using Google Sites or MS Office templates, or they can alternatively be created using tools provided with a sophisticated platform, such as the European Digital Credentials for Learning.

Authentication and Data Security

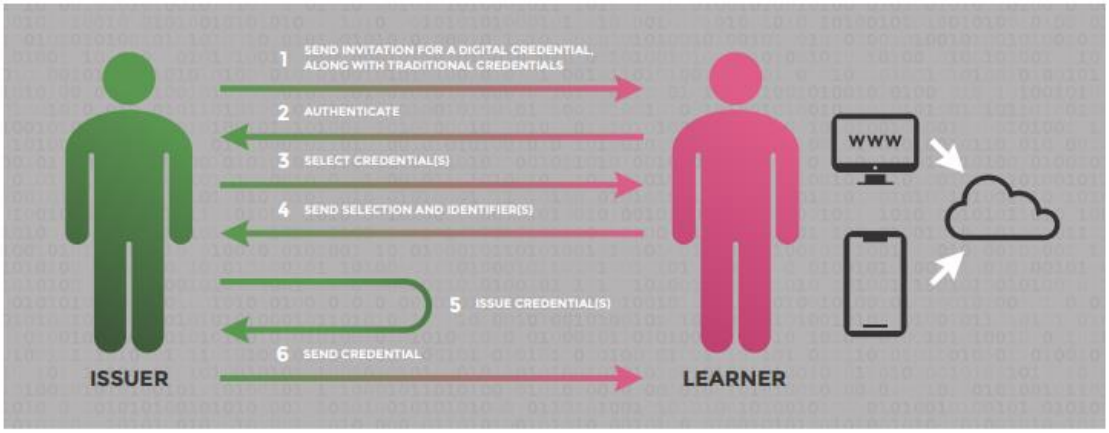

Figure 10: Issuing and receiving credentials. [76]

The Digital Credentials Consortium created the graphic above, Figure 10, to capture the role technology will play in issuing and receiving credentials, between the learner and the issuing body, from any digital credential system. In this case a learner has completed a course, or a module and they will seek a credential from the issuer, maybe a university, school or sporting organisation, for example, and the issuer will authenticate that the learner is who they say they are and will send the correct credential to the learner, who will then store it in their digital wallet.[77] All these interactions will be facilitated using Web based technologies in the following ways:

- A wallet that is installed and accessed on a device, such as a smartphone.
- A website with storage and management features that is either hosted by universities, service providers, or technically proficient users themselves.

This is one example of how digital technologies will enable learners to collect digital credentials using web and mobile technologies. There is an expectation that such practices will increase.

[76] Digital Credentials Consortium (2020). Building the digital credential infrastructure for the future., https://digitalcredentials.mit.edu/docs/white-paper-building-digital-credential-infrastructure-future.pdf

[77] A digital wallet is the electronic version of the physical wallet you carry. They can be used to store more than just money [including] gift cards and membership cards." Time Magazine (2023). What Is a Digital Wallet and How Does It Work? https://time.com/personal-finance/article/what-is-a-digital-wallet/

At the outset of this paper, we mentioned the importance of trust and security and there is ongoing work around using technologies, such as digital signatures, encryption, blockchain and biometrics to ensure credentials are valid and reliable. Much of this work is currently confined to higher and further education, but there is little doubt that it will make its way into digital credential systems for schools, such as the European Digital Credentials for Learning and others.

Asking the Key Questions

Section 3 has shared a number of emerging approaches that showcase the potential of technology to support certification and to support online certification and reporting in a redeveloped senior cycle. There is no doubt that new solutions will be developed in the future on back of this pioneering exploratory work. Rethinking Assessment[78] developed a number of key questions, that should be considered prior to selecting a technology solution including aspects such as:

- Who will own the profile and what will it contain?
- Is the technology inclusive, equitable, accessible and usable by all students?
- Will everything be validated externally?
- How will the profile link with existing qualifications/certification?
- What are employers' perspectives on these profiles?
- Will universities use it in terms of admission?
- What is the role of the teacher in such solutions?
- Will the technology be a positive support for teaching and learning?
- At what age should learners start to compile them?

In some jurisdictions, a selection of these questions has been answered and solutions created, such as the International Big Picture Learning Credential (IBPLC) in Australia, to meet the needs of universities, employers and a changing society. These developments are recognising that educational pathways are increasingly non-linear and that learners acquire competencies from a wide range of experiences both in and out of school and there is a growing need to capture a more holistic picture of the student that has currency and that is manageable for all in our education system.

Providing a More Holistic Picture

The examples presented in Section 3 illustrated that a number of schools globally are using digital technologies to enable students to capture a more holistic picture of their achievements, their interests and their competencies. These schools are developing digital profiles to augment and

[78] Rethinking Assessment (2024). Building a Learner Profile. https://rethinkingassessment.com/learner-profile/

complement student performance on established academic assessments which are similar to the Irish Leaving Certificate Established (LCE). These profiles place a strong emphasis on students capturing evidence on how they are developing their key competencies which are similar in nature to the student key competencies in senior cycle.

In the case of the MTC and IBPLC examples, students gather evidence on their progress in relation to a range of competencies, which align closely to the senior cycle competencies, by gathering evidence on their work-based learning experiences, their out of school learning and by compiling capstone reports on topics of interest, such as physiotherapy or animal welfare. In compiling their evidence students use digital technologies to record videos or audio reports, they include digital images and other artefacts to illustrate how they are developing their competencies. They engage in cross-curricular learning by making meaningful connections between and across different areas of learning. The IBPL digital profile presents a rich array of evidence that includes live links to an online portfolio that students can present their profile in an accessible format to outsider stakeholders, such as university admission offices and future employers.

5. Conclusion

This paper has shown that significant work is underway in relation to developing approaches to reliably record, report and certify students' learning in a more holistic way and has outlined the scope to use digital technologies to create and collate evidence that demonstrates and recognises student progress. It has established that the use of alternative Records of Assessment (RoAs) is not a new phenomenon, and outlined how they are now easier to construct and implement because of the availability of a range of appropriate technological tools

As senior cycle is redeveloped, there may be scope to gather evidence of existing qualifications, achievements and interests using digital technologies. Students in some schools currently collect digital credentials, during TY and at other stages of their senior cycle journey, and store these in their digital profile. In other words, these digital credentials can be shared by the issuing body with the student, so that they in turn can share their relevant credentials with others. Ideally these credentials should be stored in one location, a student digital profile, where the student has control over their data and with whom they will share it.

Ultimately digital profiles consist of data (i.e., documents, images, videos) that relate to a student and increasingly school systems and digital platforms collect and store such data online in the cloud. Post primary schools already use a range of systems and platforms, that include PPOD and the school's own management information system and proprietary platforms such as those provided by Google, Microsoft and others that enable stakeholders to access data in a timely and secure manner. Systems that host digital learning profiles, such as European Digital Credentials for Learning platform and the IBPLC, are constructed to address issues such as verification of credentials, data security and appropriate levels of privacy for the various elements of the data stored (i.e. student work, external certificates, testimonials). These, in addition to cost and equity of access are important areas for consideration when selecting and using these platforms to host student data, while teacher and student support for compiling such profiles is acknowledged as a key factor in successful implementation.

This paper has provided an opportunity to showcase some examples of innovative projects in this space. While many of these projects are still in the initial stages, there are examples emerging of approaches that could inform future practice in terms of certification and reporting a broader range of student achievement in a redeveloping senior cycle.