Online Assessment

Literature Review

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Executive Summary

This is a literature review of online assessment. The introduction places online assessment in the context of assessment, considers online assessment terminology, the electronic management of assessment and notes that online assessment often means online tests and exams. The relationship between online assessment, technology and media is outlined.

There is a summary of the brief and the approach to the literature review is presented. It considers the scholarly literature, the grey literature and educational resources for online (digital) assessment. The gaps in the literature are noted as is the value of the assessment OF/FOR/AS learning framework (National Forum, 2019).

Assessment in UCD is discussed in Section 4. It starts with a consideration of the role of assessment in the university and then explores the impact of technology on assessment at UCD. The electronic management of assessment is considered.

Online assessment in the literature is explored In Section 5. It begins with the electronic management of assessment (EMA) and how this has changed assessment practice. The benefits of EMA are outlined. Then exams are considered, from traditional paper & pen exams to the range of online exams. The impact of online invigilated exams is outlined.

Assessment design is considered in some detail. Three types of assessment decisions ae identified; there are policy decisions, design decisions and judgement decisions. Assessment design decisions, and their context, are reviewed as is the impact of technology on assessment design. Online assessment design is specifically considered and how traditional assessment designs have been changed by the possibilities of technology are discussed.

The impact of online assessment design on faculty workload is an important consideration, it can lead to further adoption or abandonment. Online assessment designs were challenged during the COVID-19 pandemic and are challenged by ever-changing technology. Online assessment design is now, in 2023, outlined as far as it can be ascertained.

The review next considers the role of technology in online assessment. Dimensions of online assessment are presented and the integration of technology into assessment is discussed as are the wide range of technology tools for assessment. Section 5 concludes with a consideration of the benefits of online assessment.

Responses to online assessment from institutions, faculty and students are discussed in section 6. A range of institutional responses from encouragement and support to the introduction of digital exams is noted. Faculty responses are explored in more detail and themes such as the efficient management of assessment, supporting student learning, the innovation of online assessment and the need for institutional support are clear from the literature.

Student response to online assessment is less clear. There are reports of the benefits and the overall sense is that students like online exams. Digital media assessment is more challenging and students can be conservative in their response to innovative assessment. The importance of feedback to students and their learning is evident and the value of feedback mechanisms available online is considered.

Section 6 concludes with the challenges to online assessment. Access to computers and the internet is an important challenge to identify and manage. Newly available technology, such as ChatGPT means that online assessment cannot stand still, it has to evolve and develop and this applies to all forms of assessment in higher education.

Any review of online assessment in 2023 has to consider the impact of the COVID-19 pandemic, this is section 7. The pandemic moved assessment online from 2020 to 2022. It had a major impact on in person exams, they were stopped and online exams or alternate assessments had to be used. After the initial stages, when coping was necessary for all, academic integrity became an issue and higher education reflected on the experience. Exams in 2023 are in flux, some are remaining online, in person exams have resumed and the final pattern for exams has to emerge. The impact of the pandemic on online assessment is discussed.

Institutional capacity for online assessment is considered in section 8. In section 4 it is evident that UCD manages much of the assessment process electronically (EMA). It has experience with online exams and some experience with innovative assessments using technology. There is considerable support for technology enhanced learning. This section reviews UCD's vision for online assessment and suggests how it might be developed. The impact of online assessment in terms of policy and quality assurance is briefly considered.

Stakeholder engagement, the impact of online assessment on students and faculty and the need to manage any proposed changes is discussed. An approach to implementation is outlined and an action plan for online assessment is suggested.

The report concludes with a summary of the main arguments and draws conclusions from the literature.

2

Introduction

2.1 Online assessment

2.1.1. Assessment

Assessment, its definition and explanation changes. In 1998 Freeman and Lewis (p. 314) stated that assessment is 'any process that aims to judge the extent of students' learning'. QQI in Assessment & Standards, first published in 2009, states that

> Learner assessment (specifically assessment of learning) means inference (e.g. judgement or estimation or evaluation) of a learner's knowledge, skill or competence by comparison with a standard based on appropriate evidence (QQI, 2022).

Bearman, et al., (2016, p. 547) 'define university assessment as the graded and non-graded tasks, undertaken by an enrolled student as part of their formal study, where the learner's performance is judged by others (teachers or peers).' The use of digital technology in assessment is variable and often inconsistent (Bennett, Dawson, Bearman, Molloy, & Boud, 2017, p. 673), however, there is 'the pervasive technology-mediated presentation of all assessments' (Bearman, Nieminen, & Ajjawi, 2022, p. 2).

The national context for online assessment changes and develops. The National Forum Enhancement Theme 2016-2018 was Assessment OF/FOR/AS Learning (National Forum, 2016), it explored assessment in Irish higher education and developed a baseline for assessment (National Forum, 2016) and a range of resources. QQI (2022) presents assessment and its associated standards.

One recent development is the QQI draft guidelines for digital education (QQI, 2023). These update definitions of technology enhanced learning (UCD Teaching & Learning, 2023d). Blended learning is considered to be 'a type of education where all direct teaching takes place in-person and is blended with and enhanced by online materials and activities and synchronous interactions' (QQI, 2023, p. 8).

At UCD assessment is an 'integrated and integral part of learning and teaching' (UCD, 2021, p. 4) and is considered to be 'a systematic process for gathering and evaluating information on a student's academic progress' (UCD, 2021, p. 5) for certification, supporting student learning and quality enhancement. In addition, there is a growing emphasis on the inclusion of both a) giving students feedback (assessment for learning) and b) supporting students to self-evaluate (assessment as learning) as central to UCD's wider understanding of assessment (UCD Teaching & Learning, 2023c) (National Forum, 2019). Stakeholders in assessment range from the students to the lecturers and programme teams, the academic management at school, and college level, UCD Teaching & Learning, Assessment, UCD Registry as well as institutional administration and management.

2.1.2. Online assessment

The UCD working definition of online assessment is 'approaches that are enabled by a variety of digital technologies to include online exams, online assignments and activities, online submissions and technology-enabled feedback' (UCD Teaching & Learning, 2023a). Digital assessment can be considered as 'assessment approaches enabled by digital technologies' (Centre for Academic Practice, TCD, 2022). It can be simply 'any type of assessment mediated by technology' (Wolf, L, 2023). Online assessment is part of everyday university life; it 'now includes almost all assessment designs' (Bearman, Nieminen, & Ajjawi, 2022, p. 2). it is happening at some stage of the assessment life cycle (Jisc, 2016) e.g. the recording of grades and the presentation of assessment tasks through the VLE (UCD, 2022b).

Terminology

Other terms for online assessment are used often interchangeably (Or & Chapman, 2022, p. 15). These include computer-aided assessment (Chesney & Ginty, 2007), e-assessment (Crisp, 2007), (Jordan, 2013) and technology-enhanced assessment (Clay, 2020).

Alruwais, Wills & Wald, (2018, p. 1) state that 'e-assessment can have different forms such as, automatic administrative procedures, digitizing paper-based systems and online testing that includes multiple choice tests and assessment of problem-solving skills'. Mimirinis (2019, p. 234) defined e-assessment as 'the use of web-based technologies...in the context of university-level formal learning' and considers this term 'refers to the entire cycle of the assessment process, from designing assessment tasks to the storage and management of the assessment products' (Mimirinis, 2019, p. 234). This is echoed in an introduction to e-assessment from Heriot Watt University (Gibson) that considers e-assessment can be a 'full end-to-end assessment process of creation, delivery and marking of assessment on a computer', but notes that it can also apply to part of the process. Online assessment or e-assessment is considered by Slade et al., (2022, p. 591) to include 'summative, formative and diagnostic assessments delivered online'.

QAA (2020, p. 16) define digital assessment as 'assessment activities that involve students digitally creating, submitting or completing work'. Bearman et al., (2022, p. 2) use the term 'the digital' to encompass both the technology and digital as a social practice i.e. they note 'the duality of the digital being both a technology and a social practice'.

Given the range of terms and how they are used, the term online assessment (UCD Teaching & Learning, 2023a) will be used in this report. Where appropriate the term digital assessment may be used as well.

Electronic management of assessment (EMA)

The electronic management of assessment (EMA) is the use of technology to manage assessment and feedback including the electronic submission of assignments as well as marking and feedback (Gray, 2016). The Jisc assessment lifecycle approach (Jisc, 2016), (Gray, 2016), which considers assessment from beginning to end, makes EMA visible and is part of 'making online assessment visible' (Wolf, 2023).

Online exams

A note of caution is needed in reading the literature. There can be an underlying assumption that online assessment, e-assessment or digital assessment means online exams or tests. The national profile of assessment practices has two references to online assessment (National Forum, 2016, p. 9), both about tests or multiple-choice questions (MCQ) and none at all to digital assessment.

Gibson (p. 2) has a useful list of key terms in e-assessment that mainly refer to online exams or tests. The focus on tests and exams is also evident in considerations of assessment efficiencies, including faculty assessment time and associated assessment costs (Alruwais, Wills, & Wald, 2018, pp. 34-35). Skelton & Taylor (2020) argue convincingly for digital assessment but are essentially discussing digital exams. A student review of assessment types in higher education (Kent-Waters, Seago, Smith, & Pugh, 2018) states 'an online assessment generally consists of a series of online tests taken throughout the module, requiring typed input of an answer or selection from multiple choice' (2018, p. 60).

2.1.3. Online assessment: media & technology

Gibson (p. 1) notes that there is no difference between e-assessment and traditional assessment as the 'fundamental principle of assessing the learning outcomes remains the same'. This is true but there are differences in both the media and the technology used.

Words (written or spoken) seem to predominate in higher education. Students write exams, assignments, do projects and develop portfolios. They learn the academic conventions of referencing and citation as well as academic and other styles of writing. 'Student learning in many disciplines has traditionally been assessed through written compositions and oral presentations, often in high-stakes exam environments' (Ross, Scott Curwood, & Bell, 2020, p. 292). Akimov & Malin (2020, p. 1212) echo this as they observe that in online assessment 'the dominant form of assessment has been the written essay'.

Multimedia (Mayer, 2005), words and pictures (both static and dynamic) have become part of our daily world, as has technology. There has been a 'shift for today's students from a predominantly print focused environment to a visual, electronic, and digital one' (Cartner & Hallas, 2020, p. 133). Students often have access to a wide range of technology, such as computers, laptops and smartphones. All of these have software that works with multimedia. Jane Hart in her 16th annual survey (2022) identifies the top 100 tools for learning with YouTube as number 1 for the 7th year running.

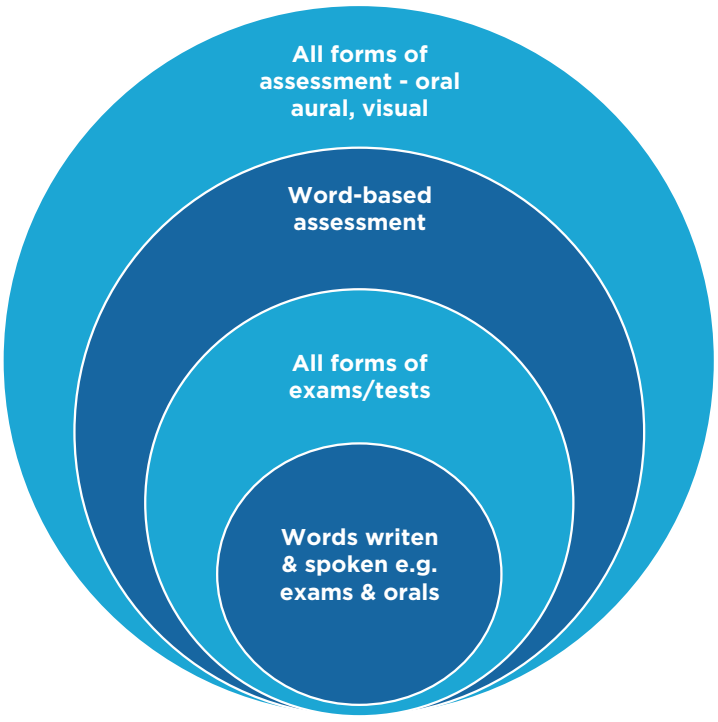

Figure 1 Media and Assessment

Assessment is often word based, as shown in Figure 1. Traditional assessment, e.g. essays, exams, portfolios, has moved online using institutional systems, such as virtual learning environments (VLE) and associated technologies. The online environment provides 'opportunities for using technologies such as video and audio feedback, quizzes, electronic submissions, and various software' (Mottiar, Byrne, Gorham, & Robinson, 2022, p. 4). Other examples of online assessment include 'virtual reality simulations, video performances or digital portfolios' (QAA, 2020, p. 16). What is possible for assessment given current and future technology has yet to be explored. Is there 'a gap between technology use for teaching and learning and the technology used in assessment' (Cartner & Hallas, 2020, p. 131)?

2.2. A summary of the brief

The provision of online assessment has gained sectoral significance following the COVID-19 pandemic, and UCD needs to develop a longer-term approach to online assessment that will support the full lifecycle of assessment from design and delivery through to marking, moderation and external examination, the transfer of marks and reporting.

The working definition of online assessment is "approaches that are enabled by a variety of digital technologies to include online exams, online assignments and activities, online submissions and technology-enabled feedback" (UCD Teaching & Learning, 2023a).

This is the research into online assessment. Through a review of academic literature on online assessment in higher education, published scholarship, the grey literature and relevant educational resources, it has gathered evidence and data relating to both the pedagogy and the operation of online assessment, to best inform approaches for its adoption in UCD. Parallel to the exploration of the literature there has been national and international review supported by the Rehill report (2022) of practice around online assessment.

The literature exploration has included a consideration of terminology and definitions of online assessment. Trends in online assessment design and delivery have been considered and the response to online assessment explored, as has the impact of the COVID-19 pandemic. This has led to an identification of some key considerations around the design and delivery of online assessment and the needs of the institution to support whatever model of online assessment is adopted.

Based on the review of the literature the report takes a holistic approach to the development of institutional capacity to implement online assessment, it offers recommendations on what needs to be put in place in terms of assessment policy/protocols; assessment design; systems and operations; training and development of faculty/staff; preparation and support for students.

3

Literature Review

A wide range of literature was reviewed; from books on assessment to scholarly publications in refereed journals, from reports and guides issued by respected national institutions to university websites and educational development resources. There were interviews with UCD experts and relevant UCD documents were consulted to provide the context for the review.

It was agreed to explore the literature mainly for the last five years i.e. 2018-2023. The COVID-19 pandemic changed assessment practices worldwide for three years from 2020 to 2022 and the impact of moving assessment online is being explored and analysed. A qualitative approach was taken to the literature review. The resources were read and coded using the bins approach (ASU Mary Lou Fulton Teachers College, 2021) and then reread, reviewed and an overview developed. The aim was to reach saturation.

The books consulted were standard texts in assessment and online assessment from 1998. Scholarly journals available through the UCD Library and online were explored and relevant articles between 2018 and 2023 were identified. Older articles are cited where appropriate. It is important to note that online assessment research is reported in assessment journals, e-learning and distance learning journals as well as those in the field of digital media. The list of journals is in Table 6.

The academic papers were a mixed bag. There were reviews and literature reviews, empirical studies and some papers provided frameworks for different aspects of online assessment. One paper was a reflection on the implementation of a digital strategy, including assessment (Visintini, 2022). Some papers were framed theoretically, however as Brady, Devitt & Keirsey (2019, p. 3093) commented that 'few papers were situated within an identified theoretical framework pertaining to assessment, digital technology, pedagogy or adoption'.

The grey literature (University of Exeter Library, 2023) was an important resource. The National Forum and QQI were important Irish resources. In the UK the QAA, Advance HE and particularly Jisc, the UK digital, data and technology agency (Jisc, n.d.), were rich sources of advice and guidance. TESQA, the Australian Quality Assurance Agency for higher education resources was also useful. Parallel to national and governmental organisations commercial software providers were useful resources e.g. the digital assessment briefing paper by Skelton & Taylor (2020).

The educational resources of UCD Teaching & Learning as well as their counterparts in Ireland, the UK, Australia and the US were also consulted for online assessment exemplars. These resources for academic staff and some for students provide a rich overview of online assessment.

There are gaps in the literature, Mimirinis (2019, p. 234) observed that 'limited work has been undertaken to transfer and apply the scholarly work on assessment for learning and formative assessment into the online context' as did Bearman, Nieminen & Ajjawi (2022). At times it was

difficult to see the technology / online assessment. In the Pitt & Quinlan (2022) Advance HE literature review of the impacts of higher education assessment and feedback policy and practice on students, there was little direct focus on technology and digital/online assessment, it was embedded throughout. This was also the case in the Leeds University student review of assessment methods (Kent-Waters, Seago, Smith, & Pugh, 2018). There is little on the student response to online assessment.

What was evident in the literature reviewed was the value of the assessment OF/FOR/AS learning framework (National Forum, 2019), (Brady, Devitt, & Kiersey, 2019) for considering assessment, whether online or not. An overview of the literature consulted & the relevant journals are in Appendix 11.3.

4

UCD and Assessment 2023

4.1. UCD – an overview

UCD Vision, Values and Strategy

UCD aims as a university to rise to the challenges of the future by enabling 'a holistic student-focused and research-led educational experience' (UCD, 2020a, p. 5). It aims to transform the student experience through digital technology (2020a, p. 13) with UCD values as the major guiding influence of UCD education (UCD, 2020b, p. 5). The university's commitment to assessment and feedback is clear:

> We will ensure that assessment is varied, that it reliably measures the expected learning outcomes, and that all students receive the feedback necessary to continue learning from assessment activities (UCD, 2020a, p. 23).

This commitment is expressed through the four high-level objectives:

1. A student-centred educational experience
2. Student Engagement, Diversity and Wellbeing
3. Education that connects, inspires
4. Technology Enhanced Learning (UCD, 2020b, pp. 8-11).

There is a specific commitment to 'facilitate greater adoption of online assessment approaches' (UCD, 2020b, p. 11) and the UCD working definition of online assessment (UCD Teaching & Learning). This sets the context for the design and implementation of online assessment and feedback at UCD.

Assessment and Feedback Policies and Practice

The principles and practices of assessment and feedback at UCD are governed by the Academic Regulations (UCD, 2022a), the Assessment Code of Practice (UCD, 2021) and the UCD VLE Standards (UCD, 2022b). UCD principles of assessment are stated in the Academic Regulations (UCD, 2022a, p. 23) and the conduct of assessment is determined by the Assessment Code of Practice (2021). This considers the conduct of online assessment (UCD, 2021, pp. 17-18) along with the conduct of a range of other assessment modes including clinical, group assessments and written timed exams. These reflect the UCD key assessment types (UCD Teaching & Learning, 2023b). The institutionally approved UCD Framework for Programme Assessment & Feedback Strategies guides programme teams in both online and face to face assessment and feedback approaches.

These policies are complemented by UCD's commitment to equality, diversity & inclusion and the associated policies.

Assessment and Feedback Support

UCD Teaching & Learning supports online assessment and feedback through advice to faculty on 'How to assess?; Key Assessment Types; How to grade students; How to give feedback to students; its clear overview of the educational technologies (UCD Teaching & Learning, 2023d), (UCD Teaching & Learning, 2023e) and its support for technology enhanced feedback (UCD Teaching & Learning, 2023c). UCD has also developed a VLE Standards Policy (UCD, 2022b).

The key assessment types are shown in Table 1.

Assignment (including Essay)	Portfolio
Exam (In person)	Practical Skills Assessment
Exam (Online)	Quizzes/Short Exercises
Exam (Open Book)	Reflective Assignment
Exam (Take-Home)	Report(s)
Group Work Assignment	Student Negotiated or Choice of Assessment
Individual Project	Thesis/Dissertation
Participation in Learning Activities	Viva Voce

Table 1 UCD Key Assessment Types (UCD Teaching & Learning, 2023b)

UCD Online Assessment Working Group

As part of the university's commitment to online assessment, an Online Assessment Working Group was set up to oversee an institutional initiative on this theme (UCD Teaching & Learning, 2023a). The latter is supported through SATLE Funding from the National Forum for the Enhancement of Teaching and Learning / Higher Education Authority. The Working Group is chaired by the Dean of Undergraduate Studies and its membership is drawn from the academic community, relevant support functions and UCD Students' Union. The Working Group has oversight of a comprehensive programme of work with a focus on informing university-wide policy on online assessment.

The Working Group has access to the reports of various university pilots including a bring your own device (BYOD) exams pilot and an eproctoring pilot. In terms of BYOD exams, the report recommended that online and open book exams be considered in module and programme assessment design. There was a review of online assessment practice (Rehill, 2022) to support the Working Group.

The Working Group reviewed the assessment data drawn from its curriculum and assessment systems and Virtual Learning Environment (Brightspace by D2L) (UCD Online Assessment Working Group, 2023). There were diverse assessment types. Exam components decreased from 39% in 2017/2018 to 29% in 2020/2021 probably due to the pandemic. There was a small rise evident in the last academic year 2021/2022.

4.2. UCD and online assessment

In terms of assessment, UCD offers the following core educational technologies:

- Student response system /class polls (Poll Everywhere)
- A virtual learning management system (VLE) (Brightspace) that supports 'tests and quizzes for formative and summative assessment' (QQI, 2023, p. 13).
- An eportfolio tool within the VLE to support formative assessment.
- Peer Scholar to support peer review.
- Originality checking tool (Ouriginal by Turnitin) where 'Assessment submitted, often checked for originally through a plagiarism detection platform, then marked and returned to learners with feedback through electronic or other media.' (QQI, 2023, p. 13).

The use of technology in assessment varies. UCD key assessment types (UCD Teaching & Learning, 2023b) were reviewed in terms of their use of technology and placed on a spectrum from minimal use of technology to maximum use of technology as shown in Figure 2.[1] During the COVID-19 pandemic practical skills assessments and viva voce were done online, although they are usually in person assessments. Figure 2 identifies aspects of the electronic management of assessment (EMA) and of student technology use.

This analysis suggests that, along with the VLE Standards Policy (UCD, 2022b), UCD, in its approach to assessment, meets the 2023 (draft) definition of blended learning (QQI, 2023, p. 8).

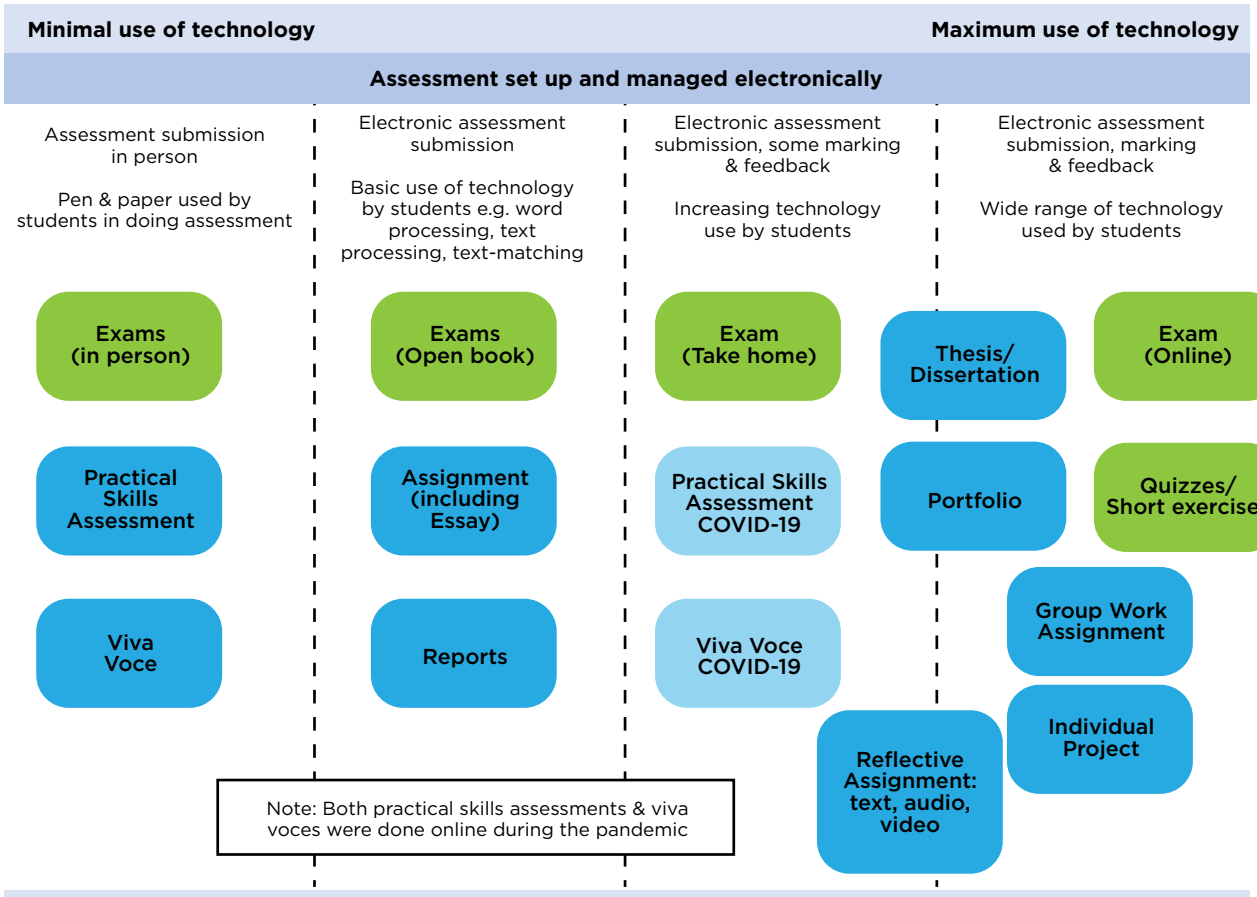

Figure 2 UCD Online Assessment: Assessment types (UCD Teaching & Learning, 2023)

[1] Student Negotiated / Choice of assignment and Participation in learning activities are omitted.

Figure 3 shows the UCD Assessment Process from the specification of assessment in a programme to the completion of assessment in a trimester and its evaluation. This shows the assessment lifecycle.

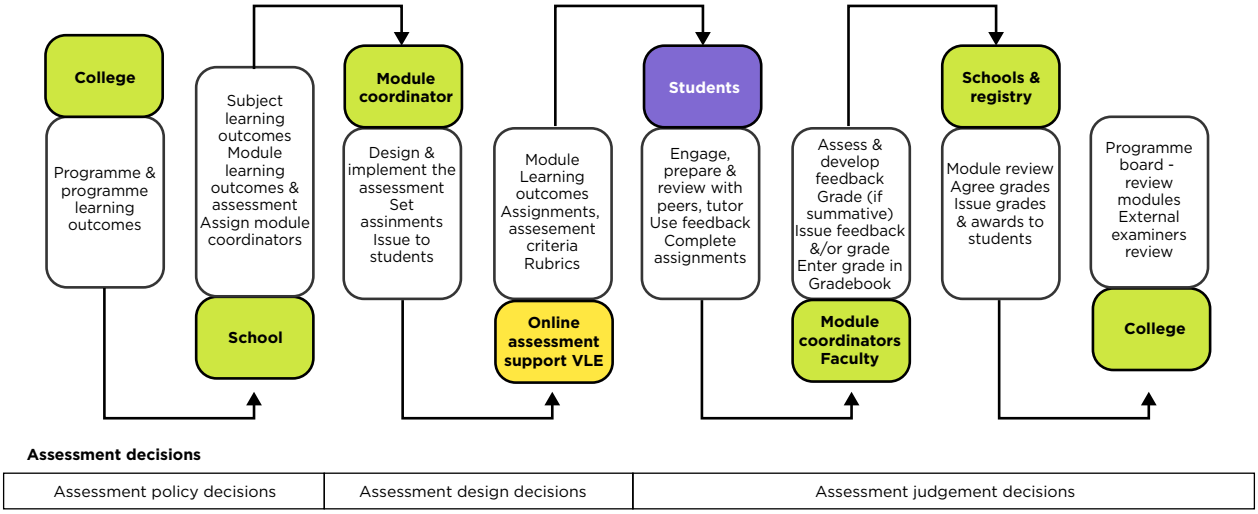

Figure 3 UCD Assessment Process – an overview

4.3. UCD and the electronic management of assessment

Assessment decisions are made by a range of stakeholders. At the institutional level, Academic Council and its subcommittees develop and monitor implementation of assessment policies such as the Academic Regulations (UCD, 2022a) and the Assessment Code of Practice (UCD, 2021) and this is implemented at college and school level by module coordinators and faculty. Students and external examiners contribute to the review and evaluation of assessment. The management of assessment is shown in Figure 3.

Many of the assessment processes are done electronically and embed UCD's principles of assessment (UCD, 2022a, p. 21) as follows:

- Assessment is central to curriculum design and learning and is evident in the module information communicated to students both via Curriculum Manager and Brightspace (UCD, 2022b).
- There are a variety of assessment approaches in the modules.
- There is alignment between module (expected) learning outcomes and assessment.

At the specifying stage, the learning outcomes and the assessment and feedback strategy for a programme or module are detailed and approved. This is documented for the university, students and staff. In UCD, Registry manages the curriculum and publishes the programmes and courses. This is all managed online.

At the next stage, module coordinators interpret the module descriptors to develop the assessment for a module e.g. an exam paper, an assignment brief or quizzes/tests. It will be accompanied by information about topics, deadlines, learning outcomes assessed, marking criteria, and feedback arrangements (Jisc, 2016). This may include setting up elements of the assessment in Brightspace the UCD VLE e.g. a rubric and/or feedback (UCD Teaching & Learning, 2023c). This is done digitally and communicated to students via Brightspace (UCD, 2022b). This is the pre-assessment stage (UCD, 2021, pp. 11-13).

During a trimester students do their work and are supported through the Assessment 'section' in the Brightspace module (UCD, 2022b) as well as by the module coordinator and faculty. When complete the assessment element is submitted. There are a range of submission options. There can be paper submissions e.g. exam scripts handed up at the end of an in-person exam or essays left in a school drop box. There is increasing electronic submission of assignments e.g. assignments may be emailed to faculty or submitted using the assignment tool in Brightspace. This is the assessment stage and the conduct of assessment is guided by the UCD Assessment Code of Practice (2021, pp 14-23).

What happens next depends on the assessment method. For online quizzes and tests, the marking is automated, and students may, at the discretion of the module coordinator, get both the results and feedback online immediately. Grades (if summative) are automatically recorded. For assignments submitted electronically faculty access the assignments and assess them online e.g. they may use the rubric tool in Brightspace. For paper submission, faculty assess the scripts or assignments according to the marking schemes/solutions and assessment criteria. As the assessment is marked, the grades (if summative) are recorded and student feedback is prepared, as specified, for the module.

At the post-assessment stage (UCD, 2021, pp. 24-31) student feedback is issued and grades are approved and released to students. Final module results are issued by the University (UCD, 2021, p. 29). Student feedback may be issued electronically or in person. Audio and video feedback functionalities are available in Brightspace. The management of grades and the issuing of results is managed online with formal decision-making meetings as required. The management of the University's grading, assessment and examination operations is by Assessment, UCD Registry.

5

Online Assessment

There is a range of online (digital) assessment approaches; some assessments are 'digitally inflected' such as essays (and other traditional assessment practices) enabled by technology; other assessments 'are defined through their use of digital technology' (Centre for Academic Practice, TCD, 2021, p. 1). There are multimodal assessments (Ross, Scott Curwood, & Bell, 2020), (Reyna J., 2021).

This section of the review explores different aspects of online assessment. Initially, the electronic management of assessment is discussed. Then exams, particularly online exams, are reviewed. Assessment design for online assessment is considered as are new types of online assessment. Technology support for online assessment is then the focus of the discussion and this is followed by a consideration of the benefits of online assessment as the 'expansion in the options available for testing student knowledge has resulted in both benefits and challenges for the assessment of learning in the online environment' (Akimov & Malin, 2020, p. 1207).

5.1. Electronic management of assessment

The electronic management of assessment (EMA) uses technology (digital tools) to manage the assessment process from pre-assessment, through the assessment to post-assessment (UCD, 2021). This can include online (electronic) submission of an assignment for marking, the automatic marking of online quizzes or audio feedback on an assignment (Jordan, 2013, p. 88). 'Many universities and colleges are seeing benefits and cost savings from using technology to support and to streamline these processes' (Gray, 2016).

The Jisc EMA guide (Gray, 2016), now archived, used a lifecycle approach to explore how assessment can be supported by technology. It identified stages in the assessment and feedback process as shown in Figure 4.

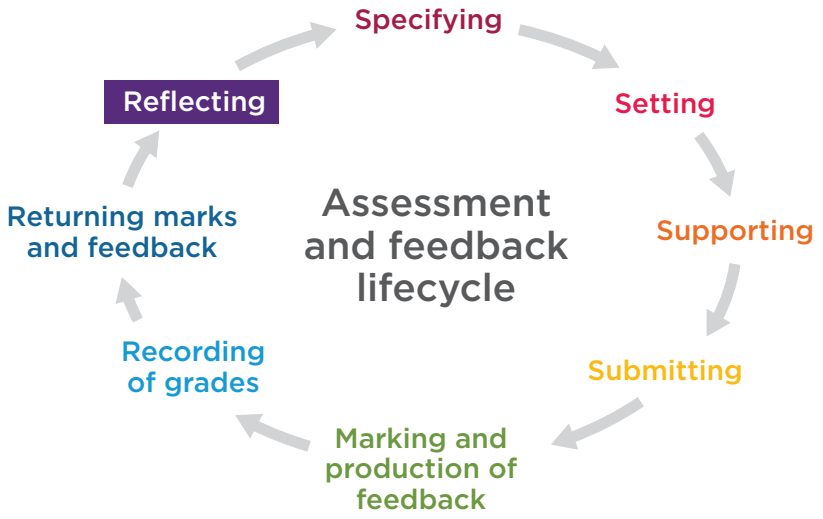

Figure 4 The Assessment Lifecycle (Jisc, 2016)

Bearman, Nieminen & Ajjawi (2022, p. 3) argue that EMA is widespread as 'almost all university assessment and grading relies on software and hardware platforms'. EMA is easy to apply to traditional forms of assessment such as essays. However disciplines differ; submitting and marking assignments that include notation e.g. mathematical formulae or musical notation is a challenge as are performances in the creative arts (Gray, 2016). There are options, for example the University of British Columbia developed Webwork, an online tool for numeric problems and equations, accessed through their VLE Canva.

A Jisc 2021 UK higher education assessment & feedback survey (Knight & Ferrall, 2022) explored the institutional approach to the management of assessment and feedback. It was variable with about a third of participating institutions being highly standardised in terms of policies and procedures, a third allowing some local variation and the remaining institutions allowing considerable local variation (Knight & Ferrall, 2022, p. 4).

In terms of EMA, the survey reported that most of the participating universities (54%) required online submission of student work and another 44% reported that online submission is widely used (Knight & Ferrall, 2022, p. 5). Online marking was reported by 86% of the respondents with 32% reporting it was required by their institutions (2022, p. 5). The use of technology to support feedback was high with 91% using technology tools for the process. However, it was evident that peer review and group work are poorly supported by technology tools (Knight & Ferrall, 2022, p. 5).

Munster Technological University Teaching & Learning Unit (2023) noted that 'many instructors already collect work electronically'. At the University of Amsterdam (University of Amsterdam Teaching & Learning Centre, n.d.), staff are advised that the easiest way for students to submit assignments is through the assignment tool in the VLE Canvas. Faculty can assess submitted work and provide feedback using the SpeedGrader tool there. At the University of Sussex assessment processes, particularly submission and feedback, are managed electronically (University of Sussex Staff Hub, 2022).

The technical challenges of EMA are clear (Knight & Ferrall, 2022, p. 8). Managing assessment requires a range of digital tools, and how they work together (their interoperability) was a concern for 83 % of the respondents. Staff and student digital skills were considered challenges as were the functionality of marking and feedback tools. Given that staff marking online and students accessing feedback are key elements of EMA this is surprising. These technical challenges highlight the complexity of EMA (Mayhew, 2018).

The JISC EMA guide (Gray, 2016) argued for the benefits of EMA to students. It noted that research indicated student preference for EMA and stated that few needed training in its introduction. Pitt & Quinlan (2022, p. 39) argued that for students 'in addition to immediate feedback, automated assessments can offer students multiple attempts, which may support their longer-term performance'. However, it should be noted that 'the shift from offline to online submission and feedback is only part of the student assessment experience' (Mayhew, 2018, p. 7).

Gray (2016) argues that EMA has both pedagogic and administrative benefits for staff, despite some resistance, but that most benefit occurs when 'both marking and feedback are carried out electronically'. She reports the benefits include the clarity and transparency of marking and feedback, the convenience of lack of paper and electronic filing as well as reduced workload and administrative burden.

UNSW Teaching (2023) cautions faculty about using digital technology mainly to improve assessment management but does note that approaches, such as online quizzes with automatic making & feedback, can support student learning while reducing staff workload. Management of assessment at UCD was reviewed in Section 4.1. However, what is unclear is to what extent practices such as online submission, marking and feedback are taking place.

5.1.1. EMA and the literature

There is little scholarly work on the electronic management of assessment and apart from the Jisc guides (Jisc, 2016), (Gray, 2016) there is little in the grey literature or educational resources although it is considered by Skelton & Taylor (2020).

Bennett et al.'s study (2017) identified that 'the "economics" of assessment drove adoption of technology to support assessment' (p. 675). EMA experience was evident in the participants in Mimininis's study (Mimirinis, 2019) and this experience supported his development of categories of lecturer's responses to online assessment discussed in section 6.

Mayhew's review of EMA implementation in UK universities (2018, p. 1) explored the 'adoption of online submission and feedback for formative and summative assessment' and she echoes the challenges of EMA adoption identified by Jisc (Gray, 2016) as do Skelton & Taylor (2020). Mayhew (2018, p. 1) identifies 'four key challenges surrounding change design, stakeholder management, policy and process as well as technical integration'. These are discussed later in the report.

5.1.2. Online marking

Online marking seems to be a considerable challenge. There are several approaches. It can be automated using appropriate software with its algorithms. Tests and quizzes usually have automated marking as the answers and feedback comments are uploaded with the questions. Jordan (2013) was hopeful about automated marking for STEM subjects, although this does not seem to have been fulfilled (Or & Chapman, 2022) and computer marking of open-ended students' responses is a challenge (Alruwais, Wills, & Wald, 2018, p. 36).

For staff online marking, particularly when it is automated with quizzes and tests, saves time and effort and helps improve feedback (Alruwais, Wills, & Wald, 2018, p. 35). EMA can also help monitor student performance and in this way can help manage large classes (Alruwais, Wills, & Wald, 2018, p. 35). Where automated marking (and feedback) is not possible there are alternatives. Faculty can assess student work using tablets or computers. Rubrics are available in VLEs and their use is advised (University of Amsterdam Teaching & Learning Centre, n.d.).

One study of online marking is considered as 'there is very little research published after 2013 exploring the staff experience of online marking' (Mayhew, Holmes, Davies, & Dimitriadi, 2022, p. 3). As part of a full EMA approach in an English university, assignments were submitted electronically and marked online in the University VLE with the support of 'a bank of frequently used comments that can be reused when marking'. Overall, the 'majority of survey responders expressed strong satisfaction with the overall experience of marking online' (Mayhew, Holmes, Davies, & Dimitriadi, 2022, p. 5).

There were considerable changes in the move to online marking. 'The transition from physical marking to online marking involves working, literally, in a new space' (Mayhew, Holmes, Davies, & Dimitriadi, 2022, p. 6) and with it the need to become familiar with the online system and fit their marking approach in it and while training helps there is a need for 'practice and a sense of familiarity produced by experience' (2022, p. 7). Through this, the participants developed confidence in new online spaces (2022, pp. 6-7).

There were positive impacts of the move to online marking. The reduced use of paper was welcome (Mayhew, Holmes, Davies, & Dimitriadi, 2022, p. 6) for both staff and students, as was remote access to student work, although it needs reliable marking tools and a reliable Internet connection (2022, p. 8).

There was loss as well (2022, pp. 6-12), loss of physical interaction with paper and with it a loss of personal connection with the student. Some missed marking opportunities away from IT equipment e.g. in the garden (2022, p. 8). For some, there was a loss of marking quality and a move to more generalised feedback (Mayhew, Holmes, Davies, & Dimitriadi, 2022, p. 10).

The study 'suggests that online marking enables or encourages markers to do different things. This may include achieving greater marking consistency and improvements to the clarity of feedback through the use of rubrics' (Mayhew, Holmes, Davies, & Dimitriadi, 2022, p. 9) and the bank of frequently used comments. One school developed a set of discipline-specific feedback comments, and another approach was a set of feedback comments that were agreed by a faculty (Mayhew, Holmes, Davies, & Dimitriadi, 2022, p. 9). This approach ensured a 'consistent assessment process for students and paid due attention to the pedagogy underpinning assessment practice' (Mayhew, Holmes, Davies, & Dimitriadi, 2022, p. 9). The conversations about online marking and feedback echo the benefits of EMA cited by Gray (2016) and are evidence of the development of a digital identify and community (Mimirinis, 2019, pp. 238-239). The study concluded that 'online marking is not a unified practice but is instead a set of varied and rich approaches, heavily influenced by previous experiences' (Mayhew, Holmes, Davies, & Dimitriadi, 2022, p. 12).

EMA, particularly online submission, marking and feedback, seems to vary with the institution, the technology tools available, how they work together, as well as staff and student digital skills. Overall, Mayhew's (2018, p. 10) argument that 'the institutionalisation of online submission and feedback remains complex, demanding' seems to be substantiated.

5.2. Exams

5.2.1. Traditional exams

Written examinations are almost a rite of passage in education. Freeman & Lewis (1998, pp. 176-190) summarise key features of exams as written, summative, taken at the end of a course with questions on the whole course (or aimed at all the learning outcomes), the outcome is a mark or grade and there is little or no formative feedback. Students can view their exam script after marking (UCD, 2021, p. 25). Butler-Henderson & Crawford argue that their main purpose is to 'authenticate learning' (2020, p. 2).

There are four main types of exams: closed-book, open-book, take-away topics and take-away questions[2] (Freeman & Lewis, 1998, p. 177). Exams are supervised, invigilated or proctored, that is the examination room is managed by people who check the identities of the students, issue and collect exam papers and scripts; monitor and manage the exam hall.

There are many reasons for using exams, e.g. we can be certain that it is the learner's work (Freeman & Lewis, 1998, p. 178). In the past, they were economical as a small number of people could supervise a large hall full of students. However, the number of students requiring special support is increasing and they often need individual supervision which adds to the costs.

5.2.2. Online exams

With the advent of computers online or digital exams offered an alternative to traditional exams (Butler-Henderson & Crawford, 2020, p. 2). The University of Glasgow (n.d.) has four types of online exams –an open exam within 24 hours, a timed exam within 24 hours, a timed exam with a fixed start time and a seen exam with 24 hours to submit. These exams use Moodle and Turnitin. The University of Melbourne (n.d.) has a range of on-campus and off-campus digital exams. The off-campus options are mainly open book exams but there are LMS (VLE) quizzes and video exam options. The university exams portal offers a range of online exams, test and quizzes (The University of Melbourne, n.d.).

In their systematic review of the literature (2009-2018), Butler-Henderson & Crawford (2020) noted that once-experienced students preferred online exams and there seemed to be little difference in student performance between proctored and non-proctored exams (2020, p. 5).

Students acknowledged that it was easier to cheat in online exams (p. 6). Staff perception was also positive, they liked the ease and timesaving in marking, once their concern about the reliability of the technology was assuaged (p. 6).

Butler-Henderson & Crawford (2020, p. 8) argue that 'online examinations need to accessible, need to be able to distinguish a true pass from a true fail, secure, minimize opportunities for cheating, accurately authenticates the student, reduce marking time, and designed to be agile in software or technological failure'.

5.2.3. Online invigilated exams

Online invigilated exams are supervised computer-based assessments that aim to replicate face-to-face exam conditions in students' own locations (Dawson, 2022) (Giller, 2021). They are also called remote proctored exams or supervised online exams. The main approaches to online supervision are lockdown, authentication and monitoring (Dawson, 2022, p. 1). These are available in remote proctoring tools, usually by third-party commercial providers (Skelton & Taylor, 2020, p. 15).

There are two main types of online invigilation, real-time invigilation and recorded invigilation. 'In real-time invigilation, students are monitored in as they do the exam' (Dawson, 2022, p. 2) while in recorded invigilation the student's work is recorded and reviewed later. Supervision can be either by people or by artificial intelligence (AI).

2 Closed book exam – fixed time period, no use of books, notes, choice of questions. Open-book exam – fixed time period, use of books & notes, choice of questions. Take-away topics – topic set, allows for preparation. Take-away questions – questions set in advance allows for preparation (Freeman & Lewis, 1998, p. 177).

An empirical study (Woldeab & Brothen, 2019) explored online proctored assessments and test anxiety and noted that 'one of the main concerns students have about online proctoring is proctor intrusiveness' (Woldeab & Brothen, 2019, p. 4). These concerns about remote proctoring are echoed by the National Forum (2021) and QQI (Giller, 2021).

Dawson (2022, pp. 2-3) presents the arguments for and against online invigilated exams, particularly in terms of cheating or academic integrity. He outlines their benefits and opportunities (including for students) as 'online exams allow for a richer range of task types and media to be used than traditional pen-and-paper; they allow for immediate feedback on some question types; and the invigilation can be used to understand students' work processes' (pp. 3-4).

The benefits for students include typing rather than writing, the comfort of taking an exam in their preferred environment with their equipment and without having to travel to an exam centre. For institutions, it enables flexible exam scheduling and reduces the need for exam venues (Dawson, 2022). He suggests online invigilated exams might be appropriate when required by a professional body, where greater detail about student work is required and when there are concerns about plagiarism, collusion or cheating (Dawson, 2022, p. 5).

5.2.4. Other types of online exams

Bearman et al., (2020, p. 6) suggest that some exams, such as take-home and open book (now also open-web) exams translate easily to the online environment. Tam (2022, p. 487) agrees in terms of take-home examinations and argued that 'take-home examinations assess higher-level knowledge and skills such as applications of theory being put into practice' (Tam, 2022, p. 487). It seems that exam formats 'that involve unique answers, creativity and problem-solving' (Bearman, Dawson, O'Donnell, Tai, & Jorre de St Jorre, 2020, p. 6) can run well as take-home exams without invigilation.

5.2.5. Exams and authentic assessment

The increasing focus on authentic assessment poses a challenge to exams (Ferrall & Knight, 2022). Sotiriadou, Logan, Daly & Guest (2020, p. 2134) state that 'authentic assessment focuses on learners using and applying knowledge and skills in real-life settings.' Akimov & Malin (2020, p. 1207) note that supporters of online exams 'argue that higher-order thinking skills can be tested via scenario-based or open-ended questions, simulations using discipline-specific professional software, and the use of multimedia' and are thus authentic forms of assessment. Butler-Henderson & Crawford (2020, p. 8) state that 'the online examination setting offers greater connectivity to the kinds of environments graduates will be expected to engage in on a regular basis' and this makes them authentic; Skelton & Taylor MBE (2020, p. 18) make a similar argument as does Cox (2019).

5.3. Assessment Design

Assessment design is complex and demanding. It means taking an assessment strategy (QQI, 2022) (in an approved programme or module document) and deciding the appropriate assessment(s) to implement the strategy that will meet the module learning outcomes. This 'is highly contextualised and influenced by local, disciplinary and institutional cultures' (Bearman, et al., 2016, p. 554). It is also guided by principles of good assessment and feedback (Ferrall & Knight, 2022).

Bearman et al., (2016, p. 548) identified three types of assessment decisions in the life of a programme. There are policy decisions made at a senior level, often by senior management or professional statutory and regulatory bodies (PSRB) e.g. exam weightings. Then there are the design decisions made by faculty responsible for a module and 'the person responsible for designing the assessment...was rarely the person who developed the original paperwork for the unit to be approved '(Bearman, et al., 2016, p. 550). The final type of assessment decision is the judgement made about student learning. This is the day-to-day operation of assessment with students.

Faculty play 'the central role... in designing, implementing and judging assessments' (Bearman, et al., 2016, p. 545). Assessment design and development are iterative and often drawn from previous experience and not usually systematic (Bearman, et al., 2016, p. 548). Faculty capacity to change (and develop) assessment depended on the context e.g. the programme, the influence of department culture, particularly, the Head of Department. The influence of a department's disciplinary traditions is strong, yet faculty may be unaware of this influence (Bearman, et al., 2016, p. 550). Sadler & Reimann (2018, p. 132) noted that changes in assessment practice were linked with 'institutional policy initiatives such as online marking, external examiner comments and the availability of new technologies.' These findings have an impact on any move to online assessment.

There was a complex picture in terms of technology-supported assessment before COVID-19, assessment practices ranged from 'traditional generic forms like essays or multiple-choice quizzes, to traditional discipline-specific tasks like interviews or practice-based tasks, to new and often technology-enabled tasks involving media creation or online collaborative writing using wikis' (Bennett, Dawson, Bearman, Molloy, & Boud, 2017, p. 675).

5.3.1. The impact of technology on assessment design

Assessment design requires a range of decisions. One of the key decisions is about the use of technology. It can be used as part of the 'technology-mediated presentation of assessment' or it can be used intentionally as part of the assessment design (Bearman, Nieminen, & Ajjawi, 2022, p. 2).

Institutions provide a range of software and hardware platforms to support assessment, whatever the assessment design (Bearman, Nieminen, & Ajjawi, 2022, p. 4). They are part of the general assessment context as outlined for UCD. Faculty have to consider the available assessment tools and their functionality (Mimirinis, 2019, p. 243), (St-Onge, Ouellet, Lakhal, Dubé, & Marceau, 2022, pp. 358-359).

There are models of assessment design; 'technology-supported assessment designs are the product of a dynamic relationship between the academic, the technological tool and the broader context' (Bennett, Dawson, Bearman, Molloy, & Boud, 2017, p. 679). The broader context is evident when technology enhanced assessment is 'co-constructed through interactions between academics, their institutional environment, the profession or discipline-based culture and the technology' (Bennett, Dawson, Bearman, Molloy, & Boud, 2017, p. 679).

However, a systematic review of the literature did not identify 'what models of assessment design can assist academic staff to harness the potential of technology to enhance student learning' (Brady, Devitt, & Kiersey, 2019, p. 3089). Yet, the integration of technology use into the overall pedagogic framework was not explicitly considered when introducing technology into assessment (Brady, Devitt, & Kiersey, 2019, p. 3081)

What is clear is that support is needed for such assessment designs (St-Onge, Ouellet, Lakhal, Dubé, & Marceau, 2022). Inadequate support hinders the integration of technology into assessment (Bennett, Dawson, Bearman, Molloy, & Boud, 2017, p. 678). 'The lack of…resources was seen as a barrier' in assessment design (St-Onge, Ouellet, Lakhal, Dubé, & Marceau, 2022, p. 359).

This is supported by the 'findings highlighted a complex interplay of challenges both during initial set-up and the ongoing support needed in terms of time, resources and training' (Brady, Devitt, & Kiersey, 2019, p. 3091). This is echoed in the development and implementation of interactive oral assessments (Sotiriadou, Logan, Daly, & Guest, 2020, p. 2145); academic policies, processes and facilities must be aligned to support this type of assessment (Sotiriadou, Logan, Daly, & Guest, 2020, p. 2146).

There can be issues with the technology itself; it can be unreliable (St-Onge, Ouellet, Lakhal, Dubé, & Marceau, 2022, p. 351), and the lack of access to devices and the Internet can lead to 'digital exclusion' (Skelton & Taylor, 2020, p. 13). There are caveats about the design of online assessment; 'concerns have been raised whether e-assessment compromises the validity of the assessment process by allowing for measurement of unintended features (e.g. familiarity with, or access to, technology)' (Mimirinis, 2019, p. 234) or assessment outcomes 'may end up reflecting anxiety or ease with technology as much as, or. more than, what educators are attempting to assess per se' (St-Onge, Ouellet, Lakhal, Dubé, & Marceau, 2022, p. 351).

5.3.2. Online assessment design

There are different examples of the intentional use of technology in assessment design. Faculty 'may use the same functionality (e.g. plagiarism detection) to serve different purposes (e.g. formative feedback or penalizing students)' (Mimirinis, 2019, p. 246). Some designs focus on assessment efficiencies e.g. online quizzes with their automated marking and feedback to students or video for the assessment of practical competencies (Bennett, Dawson, Bearman, Molloy, & Boud, 2017, p. 675). Online quizzes and tests can be used by faculty to support student learning (Mimirinis, 2019, p. 238).

Akimov & Malin, noting the dominance of online written assessments suggest that 'an assessment strategy should incorporate other types of assessment, for example, oral assessments, to test the learning outcomes that written assignments cannot address' (2020, p. 1212). Oral interactive assessments (Sotiriadou, Logan, Daly, & Guest, 2020) can be considered an authentic online assessment approach.

The multiple modes (multimodal) of words and pictures (Mayer, 2005) available using technology are part of the consideration of using technology in assessment. Assessment tasks can require students to produce digital artefacts such as 'podcasts, digital stories, animations, video and blended media' (Reyna, Hanham, & Meier, 2018, p. 176) and this requires 'a certain set of technical, audio-visual, behavioural, critical and social skills' (p. 176). Cartner & Hallas (2020, p. 134) argue

that the 'shift to multimodal literacies and the meaning of these constructs, requires a different form of assessment'. Reyna's study (2021) explored digital media assignments in undergraduate science education and reported an 'overall positive student experience with digital media assignments' (p. 14). He identified the challenges (Reyna J., 2021) and argued for a 'practical, evidence-based approach to guide the design, development and evaluation of digital media assignments' (p. 16).

Bearman, Nieminen & Ajjawi (2022) identified a gap in literature in terms of the digital in assessment design and developed a framework for assessment design in a digital world (pp. 3-4). It identifies three purposes.

The first purpose in using digital technologies is to improve assessment & feedback such as student learning or the efficiency of assessment (2022, p. 5). The use of the technology should align with the rationale for assessment whether it is assessment OF/FOR/AS learning (National Forum, 2019). The second consideration is to consider how the technology will enhance learning and what can be done with the technology. The substitution, augmentation, medication and redefinition SAMR model (Puentedura, 2009) as shown in Figure 5 may be useful here.

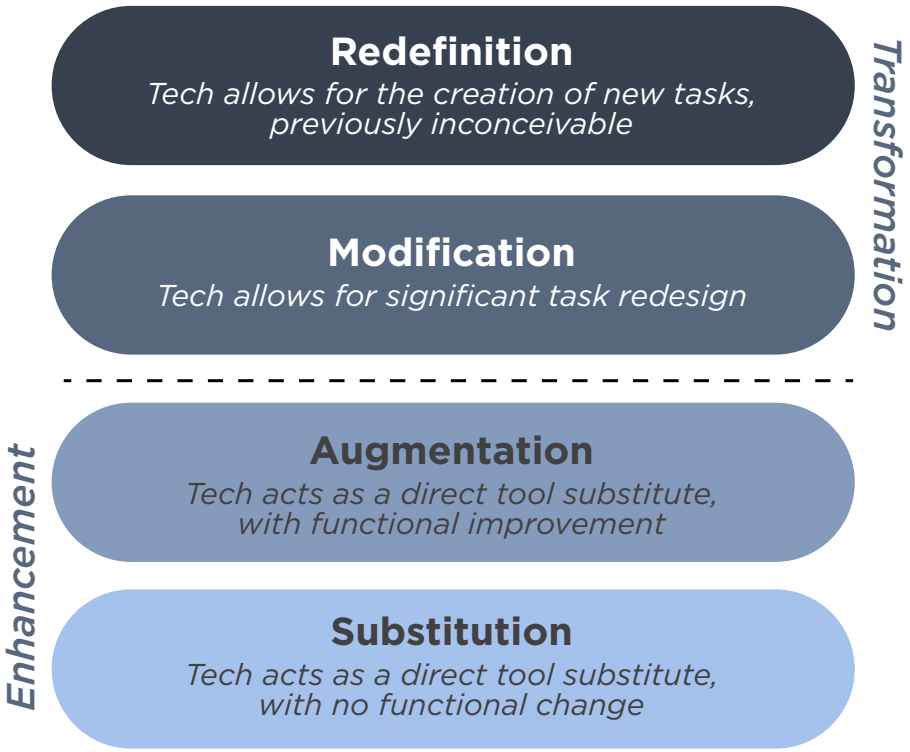

Figure 5 The SAMR model (Puentedura, 2009).

'SAMR allows educators to consider how innovative their use of the digital actually is.... to consider how new assessment designs can transform what students do' (Bearman, Nieminen, & Ajjawi, 2022, p. 6). This is echoed by Pitt & Quinlan (2022, p. 78) when they advise exploring 'whether a technology.... presents opportunities for incremental improvements through these educational principles or more radical improvements to educational processes.' There are limitations to the SAMR model (Hamilton, Rosenberg, & Akcaoglu, 2016), particularly the lack of context for the application of the technology and its focus on product (Blundell, Mukherjee, & Nykvist, 2022).

It is also important to consider any possible harms from the use of digital tools e.g. 'an online proctoring program may enhance assessment security but simultaneously negatively impact student experience through raised anxiety levels (Woldeab and Brothen 2019)' (Bearman, Nieminen, & Ajjawi, 2022, p. 6) and poor assessment designs can exclude students. Bearman, Nieminen & Ajjawi (2022, p. 6) argue that 'the second purpose for designing the digital into assessment is to promote and credential how students engage with technologies. In this instance, the assessment design is aligned with learning outcome(s) that specifically consider how students engage with digital technologies' as it is not fair to assume that students using digital technologies will develop digital skills and competencies. There are two considerations here: the development of digital skills and the development of student's critical understanding of the digital world, (Reyna, Hanham, & Meier, 2018), (Reyna J., 2021), (Cartner & Hallas, 2020). The need for digital literacy is recognised in UCD strategies (UCD, 2020a, p. 13), (UCD, 2020b, p. 11).

The third purpose for including the digital in assessment design is that of enabling students to live in a digital world (Bearman, Nieminen, & Ajjawi, 2022, p. 8). This echoes the 'Transforming through Digital Technology' theme of the current UCD strategy (UCD, 2020a, p. 13). There are almost no tasks that show this assessment purpose but Bearman, Nieminen & Ajjawi (2022, p. 9) suggest that 'every assessment task has the potential to address the complexities of learning, working and living in a digital world'. Recent work (Bearman, 2023) sees the inclusion of a fourth purpose, that of fostering a communality where students work with communities in the digital space, this echoes Mimirinis (2019, p. 241) and the theme of online assessment as a means of developing (digital) identity and the community. Again, there are very few recent examples of such assessment designs.

This framework integrates technology into assessment design and enables faculty (and other staff) to explore/evaluate the strengths and weaknesses in an assessment design.

Online assessment design: workload

Staff workload (UCD, 2021, p. 7) changes when the assessment design changes. This is evident with online assessment designs. Some assessment designs require considerable work at the pre-assessment stage of development, others at the assessment stage, when the design is implemented with students, marked and feedback prepared for students. 'The impact on academic staff workload ranged from positive to negative depending on the specific assessment design and the technology usage' (Brady, Devitt, & Kiersey, 2019, p. 3081).

For online quizzes and tests, faculty prepare and test the questions, their appropriate answer and a range of feedback responses. They can be set up for automated marking and feedback. This assessment work can be considered front-loaded. There is considerable work in ensuring the relevance, validity and reliability of these types of assessment but once completed, before use, it is done, and the quizzes and tests can be used again.

Other online assessment designs have staff workload challenges. The marking workload of a student discussion forum was unexpected and demanding (Bennett, Dawson, Bearman, Molloy, & Boud, 2017, p. 676). Brady, Devitt & Kiersey note that 'multiple technology tools afford enhancements to staff efficiencies but with the caveat that they may also increase workload via student demands or needs to moderate and monitor student work on an ongoing basis.' (2019, p. 3091). During the COVID-19 pandemic when assessment was moved online 'the resource intensive increase in workload, specifically at the development and implementation phases' was noted (St-

Onge, Ouellet, Lakhal, Dubé, & Marceau, 2022, p. 351). The workload for the development and implementation of eportfolios was seen as a barrier to their implementation in Ireland (Farrell, Buckley, Donaldson, & Farrell, 2021, p. 104).

Planning and developing online assessment requires a consideration of workload across the assessment lifecycle from preparation and planning to marking and preparing feedback. The needs of students have to be considered. Skelton & Taylor (2020, p. 19) suggest that new assessment designs are piloted 'to build experience and confidence'.

The impact of COVID-19 on online assessment design

The move to online assessment, as required during the COVID-19 pandemic was a huge shift in assessment practice. It was assessment design by necessity. In person exams were the assessment method most affected by the COVID-19 pandemic.

This prompted a range of supports for, what was termed, alternative assessments and particularly how to move face-to-face and hard copy assessments online (University of Bristol Digital Education Office, 2023). Kay Sambell and Sally Brown developed resources to support these required changes in assessment (Sambell & Brown, 2020) (Sambell & Brown, 2021b) (Sambell & Brown, 2021). This move to online (or digital) assessment expanded the repertoire of assessment methods / designs available to faculty (Centre for Academic Practice, TCD, 2021) (UCL Assessment Working Group, 2020). These resources and guides remain available.

In parallel, faculty gained immense experience in designing and implementing online assessment. Faculty considered their skills, their students and the group size as well as the available technical resources and the possible impact on their workload when making changes to the assessment (St-Onge, Ouellet, Lakhal, Dubé, & Marceau, 2022, pp. 358-359).

Thus, the COVID-19 pandemic made online (digital) assessment visible to universities, faculty and students.

Challenges to online assessment design

There are challenges to the use of technology in online assessment design. The technology can support academic integrity or enable plagiarism and cheating and there is the impact of changing and developing technology.

Software and hardware platforms do not remain static, they change, updates are added. Faculty, as well as the ICT staff, have to keep up-to-date and develop their skills and knowledge of the functionality of the available platforms. At times platforms become obsolete or the institution decides to change them e.g. in recent years UCD changed its VLE from Blackboard to Brightspace. This meant that assessment and assignments designed for Blackboard had to be changed or adapted to work in Brightspace.

A serious challenge is that of developments in technology. ChatGPT, an artificial intelligence (AI) chatbot, was launched in November 2022. It is freely available and can be used by anyone, including students. This has led to considerable debate (Heriot Watt University Learning + Teaching Academy) about AI and content creation and particularly, concern about its impact on academic integrity. Cochrane & Ryan (2023) developed guidance on ChatGPT and academic integrity in March 2023 to guide academics at Melbourne University on how to adapt assessment

to manage this risk as did the Heriot Watt Learning + Teaching Academy (n.d.). UCD Teaching & Learning developed initial guidance for faculty on Generative Artificial Intelligence in Teaching and Assessment in April 2023 (2023f). The challenges AI poses to assessment are considerable.

Online assessment design in 2023

There is an ongoing commitment to online assessment design. The resources and guides developed during COVID-19 remain available. Universities encourage and support online assessment design (UNSW Teaching, 2023) (University of Sussex Staff Hub, 2023). The benefits of online assessment are presented to students (University of Sheffield, 2023). Online assessment design is explored through blogs, such as the UCL Digital Assessment blog (UCL Digital Assessment Team, 2023).

Assessment design is complex (Bearman, et al., 2014). Online assessment design adds some additional considerations. As well as the students and the module/programme learning outcomes the purpose of the technology and digital media (Bearman, Nieminen, & Ajjawi, 2022) to be used in the assessment have to be identified and implemented. Staff workload at different stages / points of the assessment lifecycle has to be considered as well as the student workload. The reusability of the assessment, its evaluation and its development are part of the online assessment design process.

Assessment design and the associated decisions are important considerations in reviewing online assessment. Technology can integrate with assessment in three ways. It is used to present and communicate assessment (UCD, 2022b). It supports the management of assessment (EMA), for all stakeholders across an institution with the aim 'to streamline the assessment, submission, grading and feedback process' (UCD, 2020b, p. 11). It can be used intentionally in the design of assessment where it enables technology enhanced learning to have an impact on student learning (UCD, 2020b, p. 11) and help transform UCD through digital technology (UCD, 2020a, p. 13).

5.4. Online assessment and technology

Online assessment supports assessment OF learning (summative assessment), assessment FOR learning (formative assessment) and assessment AS learning (National Forum, 2019). It is argued that for some faculty 'online platforms are understood to decisively change the balance between summative and formative assessment in favour of the latter' (Mimirinis, 2019, p. 241). These dimensions of online assessment are shown in Figure 6.

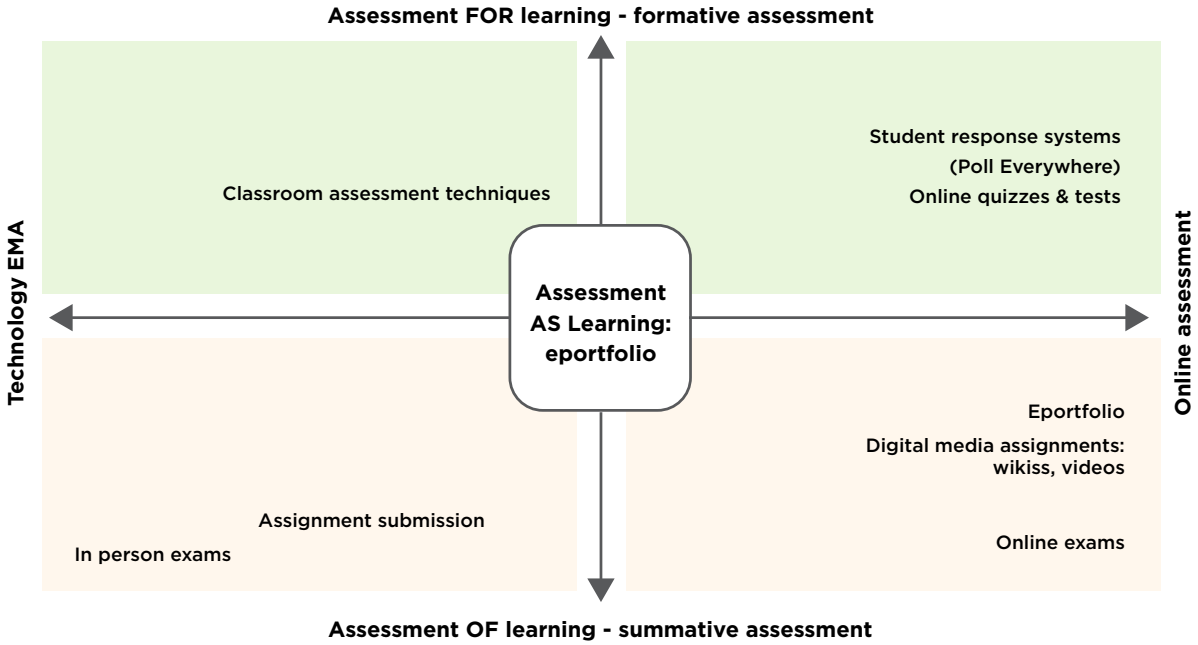

Figure 6 Dimensions of online assessment

Online assessment can improve the efficiency of assessment and feedback (Mimirinis, 2019, p. 238), e.g. digital tools for automatic grading (Bearman, Nieminen, & Ajjawi, 2022, p. 5) and feedback (Ryan, 2020). It is used to present and communicate assessment and feedback (Bearman, Nieminen, & Ajjawi, 2022) (UCD, 2022b).

How online or e-assessment supports student learning and changes student behaviour varies. For some lecturers 'online platforms allow for diversification of communication channels and for the teachers' messages to reach wider audiences' (Mimirinis, 2019, p. 240).

Technology was most often adopted for formative, low-stakes assessment rather than the summative assessment of learning (Brady, Devitt, & Kiersey, 2019, p. 3081) and there was a 'belief amongst participants that students expected and welcomed these forms of assessment, particularly online quizzes' (Bennett, Dawson, Bearman, Molloy, & Boud, 2017, p. 677).

Online assessment can support and enhance student learning (Mimirinis, 2019, p. 238), e.g. through 'digitally-mediated assessment tasks, such as e-portfolios, wikis, video tasks' (Bearman, Nieminen, & Ajjawi, 2022, p. 5). It can support group work, peer learning and peer feedback. Online assessment can be adapted to different disciplines (Pitt & Quinlan, 2022, p. 40) support collaborations e.g. collaborative writing using wikis (Bennett, Dawson, Bearman, Molloy, & Boud, 2017, p. 675) and peer feedback formative assessment through dialogue (Sadler & Reimann, 2018, p. 138).

There are many other examples of online assessment ranging from 'quizzes, discussion boards/ blogs, video presentations, peer assessments, simulations/games and essays/reports, to ePortfolios, bring-your-own-device eExams, and remote or in-house proctored eExams' (Akimov & Malin, 2020, p. 1207), (Mottiar, Byrne, Gorham, & Robinson, 2022, p. 4) (St-Onge, Ouellet,

Lakhal, Dubé, & Marceau, 2022, pp. 350-351), (University of Sheffield, 2023). Online exams can use 'scenario-based or open-ended questions, simulations using discipline-specific professional software, and…multimedia' (Akimov & Malin, 2020, p. 1207). Other examples of online assessment include 'virtual reality simulations, video performances or digital portfolios' (QAA, 2020, p. 16).

There are collections of online assessment examples (Centre for Academic Practice, TCD, 2021), (Sambell & Brown, 2021b), (Sambell & Brown, 2020), (UCL Assessment Working Group, 2020), (Sambell & Brown, 2021) (UNSW Teaching, 2023). The restricted meaning of online assessment, mentioned earlier, is evident at times (Kent-Waters, Seago, Smith, & Pugh, 2018). In this compendium, there are examples of online assessment, such as, collaborative wikis /blogs (p. 15) but the term online assessment (p. 60) is used for online tests.

5.4.1. Integrating technology with assessment

Bearman, Nieminen & Ajjawi (2022, p. 5) use the SAMR model (Puentedura, 2009) to explore assessment. This approach is evident in UCD Teaching & Learning's advice on assessment (UCD Teaching & Learning, 2023b) and feedback, particularly technology enhanced feedback (UCD Teaching & Learning, 2023c). In Table 2 the SAMR approach shows that many online assessment methods are modifications of in person assessments.

Media (Mayer, 2005)	Assessment method	Technology element	Management of assessment	SAMR (Puentedura, 2009)
Written word	Essay / Report	Word processing tools Google docs	Online submission (marking & feedback e.g. use of rubrics)	Substitution (for traditional pen & paper assignment) The use of rubrics augments the assessment
	Discussion boards / blogs	Brightspace VLE	Managed electronically	Modification/ redesign of traditional writing tasks
	Wikis	Software e.g. Google docs	EMA Submission, marking & feedback	Modification of a written word task
	Online exams	Word processing tools Browser locks Proctoring tools	EMA submission, online marking, viewing of online scripts	Modification of an in-person exam
Spoken word	Viva Voce	Zoom Video recording software Yuja	Managed electronically – either a live session or live & recorded	The live approach augments traditional viva voce Recorded viva voce modifies it
	Interactive oral exam (Akimov & Malin, 2020)	Zoom	Recorded,	Modification of viva voce
Static pictures	Posters and infographics	Software e.g. Google slides	EMA submission, online marking and feedback	Modification / redefinition of a paper & pen task
Dynamic pictures	Video presentations	Video recording software Yuja	Managed electronically	Modifications of traditional presentations
Multimedia – words & pictures (all types)	ePortfolio	Brightspace eportfolio tool	Managed electronically	Modification of a traditional portfolio task
	Quizzes & tests	Brightspace VLE tools Poll Everywhere	Managed electronically, questions, answers & feedback prepared in advance & run automatically	Modification of classroom tests and quizzes
	Digital media assignments	All available tools – may require digital media skills (Reyna, Hanham, & Meier, 2018), (Reyna J., 2021)	Managed electronically	Redefinition – these are new assessment tasks

Table 2 Analysis of online assessment SAMR model

An eportfolio is an interesting assessment design. It 'enables students to demonstrate their learning in diverse and multimodal ways (e.g. text, video, images)' (Bearman, Nieminen, & Ajjawi, 2022, p. 10). Their adoption in Ireland has been uneven (Farrell, Buckley, Donaldson, & Farrell, 2021, p. 103) and most eportfolio practice is not being evaluated (Farrell, Buckley, Donaldson, & Farrell, 2021, p. 105).

The possibilities offered by digital media assignments are yet to be explored; Ross, Scott Curwood & Bell (2020, p. 303) argue that 'digital practices help to bridge the gap between academic knowledge representation and the creative, personal and highly social modes prevalent in web-based communication' used by students and faculty.

5.4.2. Technology Tools for Assessment

There are many technology tools to support online assessment as shown in Figure 7.

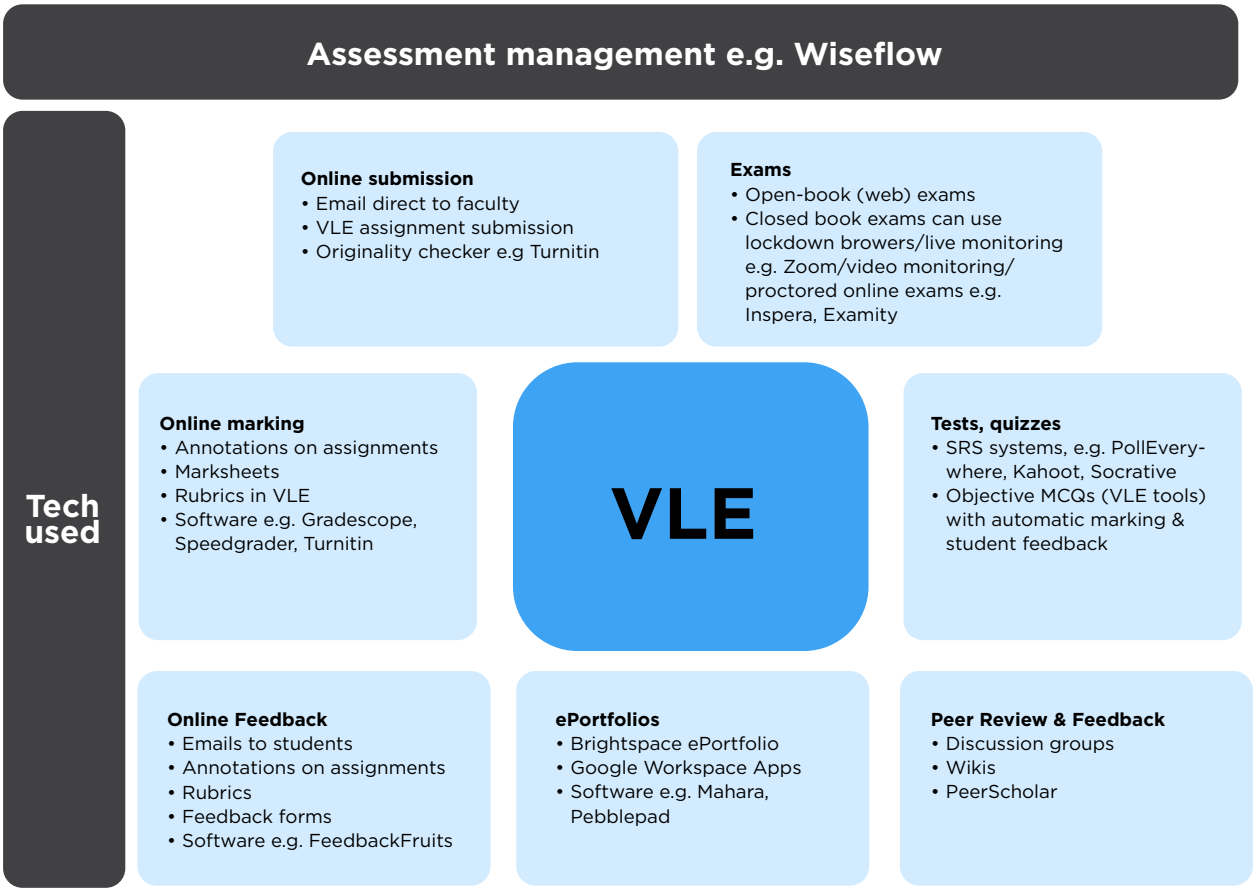

Figure 7 Online assessment & technology

The major tool is the VLE/LMS. Many online assessment activities are provided in the institutional VLE and associated technologies (UNSW Teaching, 2023), (UCD Teaching & Learning, 2023e). There is technology for doing online tests and exams, for marking and feedback and for managing the whole assessment process online (Wiseflow, n.d.).

The challenge for faculty is to develop an understanding of the available tools and how to use them in assessment. Haipinge et al., (2022) outline how the University of Namibia plans to develop digital assessment as shown in Figure 8 below.

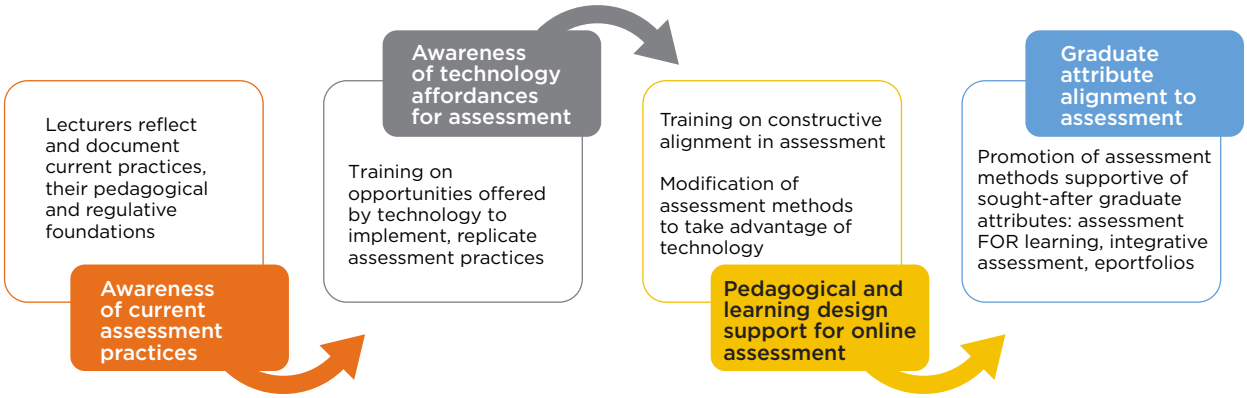

Figure 8 Digital assessment model University of Namibia

This model 'offers ways to make assessment more authentic' (Cartner & Hallas, 2020, p. 133).

5.5. Benefits of online assessment

There are different arguments about the benefits of online assessment. For online tests and quizzes there is the immediate feedback to students thus supporting their learning (Or & Chapman, 2022, pp. 15-16). Online tests & quizzes can have a range of questions and can adapt to students' responses (Alruwais, Wills, & Wald, 2018, p. 35) thus making them more relevant for student personal learning (Ferrall & Knight, 2022). They also support student learning, formative assessment (and practice) before summative assessment (Jurāne-Brēmane, 2023).

Alruwais, Wills & Wald (2018, p. 35) argue that online assessment (mainly online testing) can support higher-order thinking skills and support problem-solving. It also offers 'opportunities for different assessment formats: individualization; student self-assessment and evaluation and collaborative learning from peer assessment' (Jurāne-Brēmane, 2023, p. 8) and as technology can enable students to take part in assessment (self and/or peer) as well as be the recipients of assessment that it 'contributes to higher learning outcomes through better learner engagement'. (Jurāne-Brēmane, 2023, p. 2). Clay (2020) agrees that online (digital) assessment can enhance the student learning experience.

The second benefit is to make assessment more efficient and reliable (Or & Chapman, 2022, pp. 15-16). It supports fast and accurate assessment for large numbers of students (Alruwais, Wills, & Wald, 2018, p. 35) and can support the security of assessment and in this way reduce student cheating. In terms of digital (online) exams Skelton & Taylor (2020, p. 18) argue that lecturers benefit from digital exams through the quicker reading of typed scripts, no struggle with student handwriting, and use of appropriate systems that can speed up marking and student feedback.

The costs, in assessment time and resources e.g. paper, of traditional assessment are significant. Skelton & Taylor (2020, p. 18) argue digital assessment reduces the environmental impact and leads to a more efficient assessment process. It is argued that the cost of assessment led to the use of technology (Bennett, Dawson, Bearman, Molloy, & Boud, 2017, p. 675).

6

Responses to online assessment

This section reviews responses to online assessment; initially institutional responses, then the responses of lecturers, the responses of students and finally it considers the challenges of online assessment. While there have been moves to online assessment, particularly EMA (Gray, 2016), the adoption has been inconsistent (Bennett, Dawson, Bearman, Molloy, & Boud, 2017, p. 672).

6.1. Institutional responses

Institutions have responded very differently to online assessment. Some encouraged and supported online assessment through digital education policies, digital champions, support and exemplars, such as the University of Bristol and its Digital Education Office (Visintini, 2022). Others moved to digital exams, well before the pandemic, such as Brunel University (Gray, 2016). Knight & Ferrall's survey report (2022) identified the range of institutional approaches to online assessment.

6.2. Faculty response to online assessment

Lecturers have been using technology to support and do assessment for many years (Freeman & Lewis, 1998, p. 133). The introduction of learning management systems (LMS) and virtual learning environments (VLEs) in the early 2000s (Weller, 2020) provided a new way to manage and do assessment and feedback.

Over the same period, from the early 2000s, there has been a considerable shift in assessment practice. There was the introduction of learning outcomes and the move to align assessment with teaching and learning, as well as diversify assessment (Mimirinis, 2019, p. 245).

Faculty perception of online assessment is explored in the literature through literature reviews (Brady, Devitt, & Kiersey, 2019) (Pitt & Quinlan, 2022), empirical studies with lecturers (Bennett, Dawson, Bearman, Molloy, & Boud, 2017) (Mimirinis, 2019) and the exploration of specific areas such as online marking (Mayhew, Holmes, Davies, & Dimitriadi, 2022) as discussed earlier. The responses of lecturers from the two main empirical studies are shown in Table 3.

Overall response to online assessment	Bennett, Dawson, Bearman, Molloy, Boud (2017) Themes	Mimirinis (2019) Categories of e-assessment
Efficient management of assessment	Theme 1: The "economics" of assessment drove adoption of technology to support assessment' time and money (2017, p. 675	Category A: e-assessment as a means of efficiently managing and streamlining the assessment process (2019, p. 240)
Supporting students & enhancing learning	Theme 3: Technology-based assessment designs aimed to shape, and were shaped by, student behavior (sic) (2017, p. 677)	Category B: e-assessment as a means of facilitating dialogue and student engagement (2019, p. 240) Category C: e-assessment as a means of enhancing learning (2019, p. 240)
Online assessment is contemporary & innovative, develops digital identity	Theme 2: Technology-supported assessment is considered contemporary and innovative' (2017, p. 676) and indeed inevitable (p. 677).	Category D: e-assessment as a means of developing (digital) identity and the community (2019, p. 241)
Supporting online assessment	Theme 4: Implementing technology-supported assessment requires support and compromise (2017, p. 678)	'How these conceptions are enacted, ... relies ..... institutional support' (2019, p. 246)

Table 3 Lecturers' conceptions of online assessment

The efficient management of assessment reflects some of the previous discussions of EMA and is echoed in a Portuguese study (Rolim & Isaias, 2019). Brady, Devitt & Kiersey (2019, p. 3090) noted that 'workload efficiencies are mostly evident in systems that incorporate automated feedback'. The use of a bank of frequently used comments for feedback when marking online was considered to improve marking efficiency (Mayhew, Holmes, Davies, & Dimitriadi, 2022, p. 9).

Assessment, whether online or not, needs to be practical and efficient (UCD, 2021, p. 7). Staff across the Irish higher education sector were, in the main, neutral about online systems for marking and feedback. Nearly half (46%) reported that they used a digital system to give personalised feedback monthly or less and over one-third of staff reported that they never gave feedback online (National Forum, 2020, p. 39). Bennett et al (2017) noted that 'assessment designs supported by technology were often adapted or abandoned in the next iteration of a unit' (Bennett, Dawson, Bearman, Molloy, & Boud, 2017, p. 680), (Bund, 2023). Rolim & Isaias (2019, p. 1786) conclude 'that distrust in the use of e-assessment systems, the fear of technical issues and the lack of knowledge prevent some teachers from resorting to e-assessment'.

The contemporary, innovative nature of online assessment was evident in both studies. The participants in Bennett et al., (2017, p. 677) 'regarded technology as modern, challenging, innovative, imperfect, and inevitable' while in the Mimirinis study, some participants saw e-assessment as 'a means of developing (digital) identity and the community' (Mimirinis, 2019, p. 239). These provide a context for the UCD strategic theme of 'transforming through digital technology' (UCD, 2020a, p. 13).

The need for institutional support for the use of technology in assessment was identified by Brady, Devitt & Kiersey (2019) and echoes Bennett et al., (2017, p. 678). However, it is not clear which institutional environment best supports its adoption (Brady, Devitt, & Kiersey, 2019, p. 3081). Mayhew, Holmes, Davies & Dimitriadi argue that 'training activities need to be well-pitched, focused and time efficient in order to be of value' (2022, p. 12). Slade et al., (2022, p. 591) note that 'articles sharing practice examples of transforming traditional assessment online, for example, the introduction of online oral examinations (Akimov and Malin 2020), would seem to offer an obvious resource for guidance'. Faculty's experience with online assessment is evident in case studies of practice (Centre for Academic Practice, TCD, 2022), (UNSW Teaching, 2021).

Much of this research was before the COVID-19 pandemic and there have been considerable changes in lecturers' experience of assessment in the last three years. This is considered later.

6.3. Students' responses to online assessment

It is difficult to identify students' responses to online assessment. Students experience a wide range of assessment techniques (Diffley, Devenney, Cunningham, & O'Rourke, 2021) e.g. 'varied assignments and coursework submitted in different ways, reports, blogs, prototypes, screencasts' (2021, p. 26). Student voices are evident on the TCD Digital Gateway website (Centre for Academic Practice, TCD, 2022). Often the benefits of online assessment are presented to students (University of Sheffield, 2023) or argued for them (Alruwais, Wills, & Wald, 2018, p. 35).

However, the interpretation of online assessment as online tests (Kent-Waters, Seago, Smith, & Pugh, 2018, p. 60) can limit student voices in the literature. Student preference for online assessment is noted in some papers (Alruwais, Wills, & Wald, 2018), (Butler-Henderson & Crawford, 2020). The negative impact of online proctored exams on students is reported by Woldeab & Brothen (2019). Pitt & Quinlan (2022, p. 40) reported that students seem satisfied with formative quizzes & tests, 'particularly if there is a small amount of credit provided for completion and it offers multiple submission opportunities.' (p. 40) but caution the 'effects of formative quizzes on subsequent exam performance are mixed'.

Skelton & Taylor (2020, p. 18) argue that students benefit from digital assessment (exams) through more inclusive assessment, the use of standard software and access to timely feedback, this echoes the findings of the Rolim & Isaias survey (2019). However, Bangladeshi students 'voiced concerns about the fairness and effectiveness of online assessments' (Khan, Basu, Bashir, & Uddin, 2021, p. 14).

Dawson (2022, p. 4) presents a range of benefits for students of online exams including increased flexibility in exam scheduling. In terms of take-home exams Tam (2022, p. 482) reports that students were concerned about technical issues e.g. scanning & uploading of answer sheets as well as the format of the exam papers.

In the 2019 Irish INDEX survey (National Forum, 2020, p. 39) students were asked about the management of online assessments and just over 50% agreed they were managed well. Or & Chapman (2022, pp. 16-17) report that most studies suggest that students respond positively to online assessment (mainly testing), others have more mixed findings and suggest that student response depends on the online assessment approach used.

Digital media assignments are newer types of assessment enabled by the online environment. Reyna (2021, p. 14) reports 'overall positive student experience with digital media assignments'. However, in a study of the eportfolio software Mahara in a postgraduate course Flavin observed (2021, p. 10) that 'few students used its capability to incorporate audio-visual material. Instead, the new technology was used to facilitate a traditional assessment'. He concludes (2021, p. 1) that 'students are capable of undertaking a range of online assessments but are, in general, reluctant to utilise the innovative possibilities of different forms of online assessment' and argues that 'students opt for simple, convenient and easy to use technologies' (2021, p. 11). He comments that 'students are undertaking online assessment but are not demanding innovative online assessment methodologies' (Flavin, 2021, p. 12). This is echoed in a study of digital games in engineering education (Udeozor, Russo-Abegão, & Glassey, 2023, pp. 13-14) where students had 'overall positive perceptions towards games for learning' and their strong 'negative opinions towards the use of games for assessment were attributed to reasons such as increased anxiety, changes to the old ways of studying and gaming skills interference' (Udeozor, Russo-Abegão, & Glassey, 2023, p. 16).

McCashin & Boyd (2021, pp. 18-19) reported that Irish students preferred continuous, formative assessment to end-of-semester exams and 'students emphasised the importance of feedback from academic staff as a crucial element in keeping them engaged with their course because it allowed them to maintain motivation and understand where to improve' (2021, p. 18). Secondly, students valued 'online learning, technology-supported learning' (2021, p. 19). These preferences are well supported by online assessment and feedback.

Online assessment provides a range of feedback mechanisms e.g. annotations, digital recordings and emails (Ryan, Henderson, & Phillips, 2019). ElShaer et al., (2020) observe that 'students prefer emails as the main electronic feedback modality' (p. 591) and that the 'perceived value of electronic feedback varies within the discipline of study' (p. 591). There is a 'growing body of evidence supporting the effectiveness of digital recordings for the provision of assessment feedback' (Ryan, Henderson, & Phillips, 2019, p. 1519).

Video feedback (straight to camera, screencast and /or a combination of both) and its possibilities are explored (Mahoney, Macfarlane, & Ajjawi, 2019) and noted 'the medium of video feedback has a generally high level of acceptability to students and markers, it has not yet been established whether the format improves students' learning and performance' (Mahoney, Macfarlane, & Ajjawi, 2019, p. 173). However, they note that, although novel, it is also an information transmission approach to feedback (p. 173). Pitt & Quinlan (2022, p. 5) note that 'video and screencast feedback from teachers seems to promote more learning than written feedback because feedback is often more personal, expansive and elaborative in that format' (p. 5).

Jensen, Bearman & Boud (2021) explore online assessment in the literature and develop a range of metaphors that reflect feedback concepts. These are 'feedback is a treatment; a costly commodity; coaching; a command; a learner tool; a dialogue' (Jurāne-Brēmane, 2023, p. 2). Jensen, Bearman & Boud (2021, p. 11) caution that not all these metaphors reflect an understanding of feedback in terms of assessment OF/AS learning; that some online feedback models reinforce traditional models of assessment and feedback.

Peer assessment and peer feedback are two areas of assessment and feedback that are supported by technology but there is little in the literature about students' responses apart from 'web-based platforms can facilitate dialogue between peers about quality and standards. Technology affords anonymity in peer exchanges that helps students feel more comfortable offering critical comments, especially if they are new to giving feedback' (Pitt & Quinlan, 2022, p. 5). Laflen (2020) presents one model of peer review and feedback for online courses.

6.4. Challenges to online assessment

Challenges to online assessment include the scaling up across an institution and student difficulties in finding appropriate places to take 'online exams and assessments' (Clay, 2020). This echoes some of the challenges Skelton & Taylor (2020, p. 13) identify for digital exams. One of the key challenges for students and online (digital) assessment, evident during the recent pandemic, was the accessibility of computers and the internet for students (Alruwais, Wills, & Wald, 2018, p. 35), (Khan, Basu, Bashir, & Uddin, 2021). This 'digital exclusion' (Skelton & Taylor, 2020, p. 13) was a major concern as is poor technical infrastructure (Alruwais, Wills, & Wald, 2018, p. 35).

Flavin (2021, p. 12) argues that the 'development of online assessment in higher education provides more of a pedagogical than technological challenge, a challenge which may need to be addressed on an institutional level'. Some of these challenges identified (Knight & Ferrall, 2022, p. 6), include accessibility /inclusivity (51% of respondents), the need (and demands) of rethinking assessment practice and academic integrity. Other issues include over-assessment and assessment bunching (a significant issue for 35% of respondents) and 30% identified an over-reliance on exams. Student feedback is also a challenge (Knight & Ferrall, 2022, p. 7).

The development of digital skills for faculty and students (Jurāne-Brēmane, 2023, p. 10) remains a challenge as does the meaningful selection of appropriate technologies with clear assessment criteria. One study showed the 'complexity of multimodal assignments' (Ross, Scott Curwood, & Bell, 2020, p. 299). Hiller (2023) argues that students and faculty now need AI literacy.

The cultural challenges of online assessment are considerable. Skelton & Taylor (2020, p. 5) note the 'great cultural significance in university final examinations.' This is evident In the Jisc survey (Knight & Ferrall, 2022, p. 10) which shows staff resistance to change as persistent. Notably student resistance to change is less. Other cultural challenges include students not engaging with feedback and not liking group/peer work as well the issue of academic integrity.

7

COVID-19 & Assessment

COVID-19 disrupted the 2019-2020, the 2020-2021 and the 2021-2022 academic years in Irish higher education. It was similar in the UK, Europe and North America. In Australia, it disrupted the 2020, 2021 and 2022 academic years.

In March 2020 there was a 'rapid shift to online assessment, with very limited time for pedagogical adjustments' (Slade, et al., 2022, p. 588). At this time assessment had to be managed for students while meeting learning outcomes (National Forum, 2020b), (National Forum, 2020a) and keeping assessment accessible and inclusive (National Forum and AHEAD, 2020c). Quality assurance agencies, such as QQI (2021), developed guidance to manage online assessment aimed at balancing the integrity of the assessment in an awards system in higher education with the difficult situation and supporting institutions, students and lecturers. The QAA in the UK had a similar approach (QAA, n.d.).

At the institutional level, universities aimed to balance assessment requirements (and quality assurance) with the working conditions of students and lecturers (at home, in very varied circumstances and digital connections) while the well-being of students and issues of access and inclusion remained a concern (Heriot Watt University Learning + Teaching Academy). The main impact seems to have been on face-to-face examinations and in parallel there was a move to the full electronic management of assessment (EMA).

Continuity measures were developed (Crawford, et al., 2020, p. 26), for example, UC David (2023) considered remote assessment and testing options. The advice was to explore all assessment options, promote academic integrity, use alternative assessment and then the strengths and limits of remotely proctored assessments were presented if they were required (UC Davis, 2023). Chan (2022, p. 9) noted that changes in assessment policies were 'mainly focused on 'flexibility', 'empathy' and 'fairness' for both students and teachers' and they did not focus on the alignment of assessment and learning outcomes.

Parallel to the institutional approach Sally Brown and Kay Sambell (2020) explored 'how university assessment may be adjusted and reimagined in the context of the pandemic' (Sambell & Brown, 2020). This was informal work by two experts in assessment that was a great support to lecturers and institutions.

At the micro level, within institutions, academics adapted their existing assessment, often examinations, for online delivery (Slade, et al., 2022, p. 602). There were clear disciplinary practices in the retained assessments but there was also a loss, such as, 'academics perceived difficulty in translating active face-to-face collaborative group tasks into an online environment' (Slade, et al., 2022, p. 601).

7.1. Exams and COVID-19

The COVID-19 pandemic and the closure of universities meant that traditional exams could not take place. The initial response was to postpone exams (Butler-Henderson & Crawford, 2020, p. 1), and then there were online invigilated exams and take-home exams (Butler-Henderson & Crawford, 2020, p. 9). Some switched to online timed take-home exams (Tam, 2022, p. 477). Others switched to open-book exams where students were able to access reference materials (Skelton & Taylor, 2020, p. 6). Slade et al. noted the agency of lecturers e.g., they could opt into invigilated end-of-semester exams in 2020 (2022, p. 592).

Gopalan and Chatley (2023) report on moving computing exams online in March 2020; they were run as open-book timed assessments using the Imperial College London (ICL) VLE. They echo Bearman et al., (2020, p. 6) on the need to work with students as they do exams in new formats. In another ICL pandemic case study, Pereira, Mura and White (2023) review moving a closed-book exam for a blended learning elective module online using the ICL VLE. They adapted the exam to an online closed-book time-restricted assessment (TRA). The team learned that students seem to need more time for online exams and that the way the exam is presented makes a difference in students' exam stress. However, it was very easy and quicker to mark the typed online scripts, easier to exchange scripts and moderate and on the whole, the lecturers preferred the online TRA (Pereira, Mura, & White, 2023).

Online proctored/invigilated exams existed before the COVID-19 pandemic. Zhang et al., (2022, p. 634) observed that during the pandemic 'a large number of universities used online proctoring systems '. At UC Davis (2023) these included remotely proctored exams using Examity and video monitored exams using Zoom. In a Korean research study Lee & Fanguy (2022) state that 'online exam proctoring technologies are deeply rooted in…teacher-centred knowledge transmission' (Lee & Fanguy, 2022, p. 486). They argue that their use was highly problematic and that their introduction harmed students and their learning (Lee & Fanguy, 2022, p. 476).

Many of these issues were considered in the redesign of a foundation chemistry exam for large classes (Schultz & Callahan, 2022). They identified the weaknesses of traditional exams and used the opportunity to redevelop the curriculum and its assessment (Schultz & Callahan, 2022, p. 300). They plan to retain the new exam approach even if there is a return to in-person exams (Schultz & Callahan, 2022, p. 299).

7.2. Concerns about academic integrity

Initially, academic integrity and cheating were not a concern (Slade, et al., 2022, p. 598) yet it was noted that 'lecturers' online assessment strategies may not always balance academic integrity with test validity' (Koh & Daniel, 2022, p. 11) and that 'lecturers had to devise strategies to maintain online assessment integrity, primarily through different ways of preventing cheating' (Koh & Daniel, 2022, p. 7). Faculty in Canada noted that 'when students can access the Internet during their assessment, there is no limit to the information they can use to complete their assessment' (St-Onge, Ouellet, Lakhal, Dubé, & Marceau, 2022, p. 357) and strategies were adopted to limit cheating and to detect cheating during the correction.

Concerns about the academic integrity of online assessment grew during the pandemic and a 'need to design assessment to improve academic integrity' (Sotiriadou, Logan, Daly, & Guest, 2020, p. 2132) was identified. This has led to the design of new assessments such as interactive oral assessments.

7.3. Review of the initial stages of the pandemic

After the first hectic months, the complexity of online assessment became evident; 'authentic assessment in some subject areas, such as medicine, teaching, sport science, and design, suffered as a result of the move to online/remote learning, while authentic assessment in other subject areas, such as computing and communications, were less impacted' (National Forum, 2020d, p. 6). Many lecturers were not prepared for this shift to online assessment (Montenegro-Rueda, Luque-de la Rosa, Sanchez-Serrano, & Fernández-Cerero, 2021, p. 9) and did not have appropriate training (2021, p. 1). There were mixed views about online assessment (National Forum, 2020d, p. 8), it was more demanding in terms of preparation and working with students (St-Onge, Ouellet, Lakhal, Dubé, & Marceau, 2022, p. 360) and marking (Mottiar, Byrne, Gorham, & Robinson, 2022, p. 10). However, the experience of online assessment did lead to a rethinking of traditional assessment approaches (National Forum, 2020d, p. 8).

The concern for students and the impact of the change to online assessment was evident (St-Onge, Ouellet, Lakhal, Dubé, & Marceau, 2022, p. 357). Faculty aimed to make their assessment practices more flexible. At times they reduced the assessment and 'what emerged was a connection between learning outcomes and assessment' (Slade, et al., 2022, p. 602). The digital divide, the lack of computers and access to the internet, was also noted (Montenegro-Rueda, Luque-de la Rosa, Sanchez-Serrano, & Fernández-Cerero, 2021, p. 9).

However, less than one-third of faculty in a Bangladesh study believed that online assessment could be fair (Khan, Basu, Bashir, & Uddin, 2021, p. 11). Only a third of the lecturers considered that online assessment could measure student learning outcomes (Khan, Basu, Bashir, & Uddin, 2021, p. 11) and 'teachers shared a concern that over-dependence on short questions, quizzes, assignments, and presentations would not yield enough information on learners' performance or achievement' (Khan, Basu, Bashir, & Uddin, 2021, p. 14).

Later in the pandemic, Mottiar, Byrne, Gorham & Robinson (2022) surveyed TU Dublin academics and 95% of the respondents indicated that they had changed their assessment during the pandemic (p. 7). Changes included the introduction of quizzes, moves to open-book exams or 100% continuous assessment. Open-book exams were seen, by some respondents, as 'a much better reflection of what happens in the real world and real-world examples facilitate the linkage of learning outcomes to future work experiences' (Mottiar, Byrne, Gorham, & Robinson, 2022, p. 7). In terms of assessment feedback, there was a shift to using rubrics in the VLE (Mottiar, Byrne, Gorham, & Robinson, 2022, p. 11).

They (Mottiar, Byrne, Gorham, & Robinson, 2022, pp. 12-15) developed a typology of assessment responses to COVID-19 (TARC) by the lecturers in the study, in which they identified four types. Some 'reactors', made minimal changes and just moved their assessments online. 'Adaptive responders' made necessary changes to their assessment in the online environment e.g. they adapted an invigilated exam to an open-book format. A third group, 'opportunistic innovators',

used the more flexible assessment environment to trial new assessment approaches and the final group, 'committed innovators', continued to develop and change their assessment as they had been doing before the pandemic.

Mottiar, Byrne, Gorham & Robinson (2022, p. 14) suggest that the long-term impact of the pandemic will be different for each of the four groups of lecturers. Some, the reactors and adaptive responders, may revert to their original assessment practices although they may retain changes that worked well. It would be interesting to see in 2023 if this has happened.

7.4. Exams in 2023

The outcome in terms of exams seems to vary considerably. First of all, there was a backlash against online invigilated exams (National Forum, 2021) (Lee & Fanguy, 2022) and their cost (Chan, 2022). The University of Edinburgh Information Services (2023) ran an online invigilation pilot (using the platform Examity) in 2021-2023 but is not now proceeding with an online invigilation service. This is similar to UCD who completed a pilot (using Integrity Advocate) but have not continued use of such as service. It seems that many institutions are taking Dawson's advice (2022, pp. 5-8) to use online invigilated exams as a last resort.

Over the last two years UCD has returned to in person exams. In May 2021 all exams were online, in May 2022 27% of exams were online and 73% were in person and by May 2023 only 10.6% of exams were online (Assessment, UCD Registry, 2023).

In the 2022-2023 academic year University College London has retained online exams (UCL, 2023) unless other modes are required and approved as have some, mainly, Australian and New Zealand universities. Brunel University (2023) has a mix of exam types, 'some are 'at home', via WISEflow, and some on campus. On campus exams may be on WISEflow or via traditional paper examination'. On campus exams are invigilated and students using computers require a lockdown browser (Brunel University, 2023). The University of Glasgow (2023) in April/May 2023 had 469 on campus face-to-face exams, 632 online and 18 digital on-campus exams. At the University of Melbourne, there are on-campus written exams, on-campus digital exams and online unsupervised open-book exams but most exams are moving back to campus later this year (The University of Melbourne, 2023).

Following the pandemic, lecturers and students have experience of alternative types of exams and assessment (Pereira, Mura, & White, 2023). Partnership with students has emerged as a key theme (Gopalan & Chatley, 2023) (Pereira, Mura, & White, 2023) (Bearman, Dawson, O'Donnell, Tai, & Jorre de St Jorre, 2020) (National Forum, 2021).

Changes in exam practice over the COVID-19 pandemic affected institutions at all levels. At national level, the role of the final exam is being questioned (National Forum, 2021) (QQI, 2021). Moving back to on-campus, face-to-face exams seem to depend on the institution, as does the range of exam options (on-campus and online) available.

Most of the research on exams, both empirical and literature reviews, seems to be at the module level and to focus on the response of lecturers and students. The use of exams depends on the options available and this is decided at the institutional level. Institutions can move back to fully

on-campus written exams, retain a mix of written exams with some of the online options explored and developed during the pandemic or stay fully online.

7.5. The impact of the COVID-19 pandemic

O'Neill, McEvoy & Maguire (2023, p. 2) captured the impact of the pandemic on assessment:

> Those unused to the online context queried basic questions such as the difference between a take home exam and an open book exam or whether an online assessment meant an assessment completed online or merely submitted online, as well as more complex topics such as how to maintain the integrity of assessments within a remote context.

This focus on assessment in the online/digital world required staff and students to develop new knowledge and skills in assessment (O'Neill, McEvoy, & Maguire, 2023, p. 2). It also led to the development of alternative forms of assessment. From an early stage in the pandemic, Sambell and Brown (2020) argued that 'some of the alternatives that universities have put in place for the coronavirus contingency should be made permanent, and that we should use this as an opportunity to make some radical and substantial reconfigurations to assessment in the future to make it more authentic'.

Mottiar, Byrne, Gorham & Robinson (2022, pp. 15-16) think that long-term changes to assessment and feedback may emerge from the pandemic e.g. 'the shift away from paper-based assessment submission, for some a move away from exams, the more extensive use of marking rubrics and small formative assessments, such as quizzes and discussion boards.'

Koh and Daniel (2022, p. 11) argue that 'dexterity with online assessment is also essential. Besides preventing cheating, lecturers need to ensure that online assessments retain test validity, improve learning processes and are effective for performance evaluation'. They (Koh & Daniel, 2022, p. 12) consider that designing and implementing online assessment, particularly online examinations, is one of the outstanding issues of the pandemic. This is echoed by Slade et al., (2022, p. 602) in their recommendations for disciplinary support for online assessment and student feedback. In their 2021 reviews of the impact of the COVID-19 pandemic on assessment both QQI (2021) and the National Forum (2021) think the culture around assessment needs to change and the system needs to 'expand the repertoire of approaches to the assessment of students for better learning and teaching' (QQI, 2021). They identify many of the issues in assessment e.g. over-assessment and the reliance on exams (National Forum, 2021), (QQI, 2021), and suggest priorities for the future development of assessment e.g. partnership with students and diversifying assessment (National Forum, 2021) (QQI, 2021).

Similarly in the UK, the QAA noted 'several providers have reported that they believe changes to assessment practices have had a positive impact on student attainment. This includes moving away from reliance on high-stakes final exams, with greater use of formative assessment, and redesign of assessment instruments to test understanding and skill rather than recall, underpinned by the use of digital tools' (QAA, 2021a, p. 9).

Finally, St-Onge, Ouellet, Lakhal, Dubé, & Marceau (2022, pp. 359-360) think that COVID-19 is 'the tipping point for integrating e-assessment in higher education practice and Mottiar, Byrne, Gorham & Robinson (2022, p. 14) agree.

8

Institutional capacity for online assessment

If COVID-19 is a tipping point, then institutional capacity for online assessment has to be considered and it is complex. There can be 'mixed messages within institutions about efficiency and innovation' (Bennett, Dawson, Bearman, Molloy, & Boud, 2017). At all levels within the institution, online assessment and its impact has to be considered and appropriate capacity developed.

8.1. Vision for online assessment

Assessment is part of the university teaching and learning fabric; it has its rhythm in the academic year and has several, at times, competing purposes (UCD, 021, p. 5). It is a means of expressing the university's values (UCD, 2020b, pp. 4-5) as it implements its transformation through digital technology (UCD, 2020a, p. 13) by placing students at the centre of 'a holistic student-focused and research-led educational experience' (UCD, 2020a, p. 5). In a technology-rich environment online assessment (UCD Teaching & Learning, 2023a) seems an excellent fit.

However, given the many aspects of online assessment, what does online assessment look like in UCD and how can the university develop and implement it for all the stakeholders? What is the university's vision for online assessment and what will it look like in the medium and the long term (Clay, 2020)? Clay suggests that Jisc's five principles of authentic, accessible, automated, continuous and secure (Jisc, 2020, p. 25) are suitable targets for institutional change and development in assessment.

Is online assessment about streamlining 'the assessment, submission, grading and feedback process' (EMA) (UCD, 2020b, p. 11), or 'digital exams' (Skelton & Taylor, 2020)? Bearman, Nieminen & Ajjawi (2022) identify this purpose of online assessment as 'digital tools for a better assessment' and, as discussed earlier, identify three considerations: assessment rationales, level of digital enhancement and potential harms. UCD is well placed in terms of this purpose of assessment. It is part of the vision and strategy; it has explored aspects such as eproctoring and online exams and has the experience and resources to implement this purpose of online assessment. In fact, much of the assessment lifecycle (Jisc, 2016) is managed electronically as shown earlier in Figure 2.

There are other possible purposes of online assessment (Bearman, Nieminen, & Ajjawi, 2022, p. 6). It can promote and credential how students engage with technologies. There are two key considerations here: mastery and evaluation and critique (2022, p. 7). In terms of digital transformation (UCD, 2020a, p. 13) what can UCD students (graduates) do digitally and how are their digital skills recognised and rewarded? How can the mastery of digital literacies (2022, p. 7) be embedded in student learning and assessed appropriately? The evaluation and critique of the digital world is becoming an essential skill for all at the university, with developments in technology such as ChatGPT. Across the university disciplines, how will students examine and articulate the impact of the digital and how will assessment value these critical insights is a key question (2022, p. 7). One of the difficulties of this purpose for online assessment is imagining and developing appropriate assessment designs.

Online assessment can also explore 'human capabilities for a digital world' (Bearman, Nieminen, & Ajjawi, 2022, p. 8) and 'fostering a communality' (Bearman, 2023). These purposes provide a framework within which UCD could explore online assessment and how it can contribute to the transformation of the university through digital technology (UCD, 2020a). This framework could enable UCD to develop a unique and student-centred approach to online assessment.

The cultural challenges of online assessment (Knight & Ferrall, 2022, pp. 10-11) have also to be considered. Mimirinis (2019, p. 245) noted that 'the relationship between teaching/learning on the one hand, and assessment on the other has been at the core of rethinking university teaching as exemplified in the rationale for constructive alignment, assessment for learning and the efforts to promote assessment literacy' as shown in Figure 9. This approach is evident in UCD (2022a, p. 21), (UCD, 2021, p. 7).

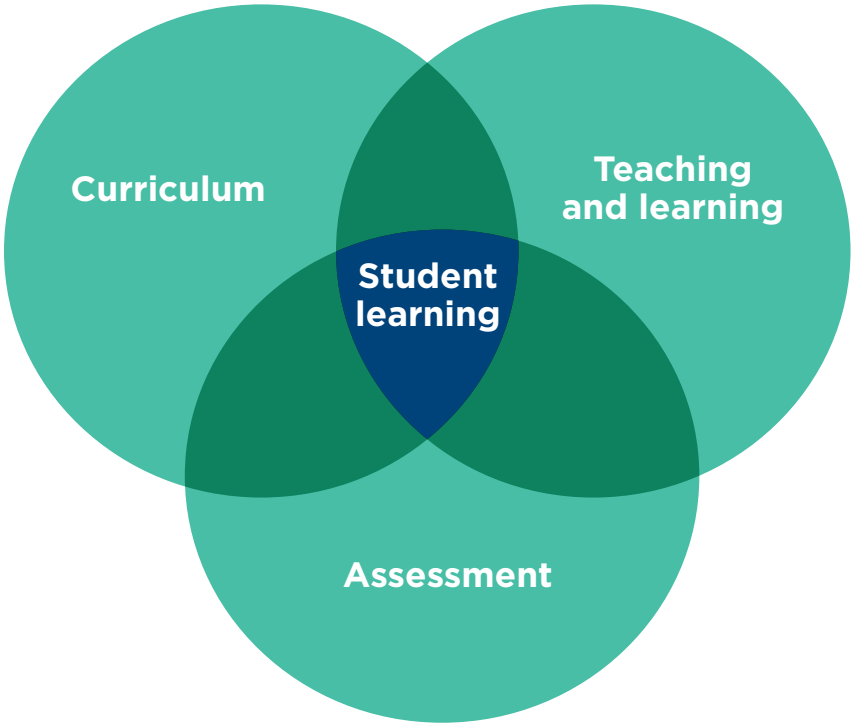

Figure 9 A view of student learning

However, Mimirinis (2019, p. 245) observed that the separation of teaching /learning and assessment 'continues to exist within newly formed, technology-rich educational milieus such as online systems facilitating formative and summative assessments.' Slade et al. (2022) concur, noting the issue 'of assessment being separated from pedagogy in everyday teaching practice of university academics' (p. 602). Student reluctance to use feedback (Knight & Ferrall, 2022, p. 10) and to explore the affordances of digital technology (Flavin, 2021, p. 11), (Udeozor, Russo-Abegão, & Glassey, 2023) was evident in the literature.

Developing a vision for online assessment at UCD means reimagining assessment and what it can be in a digital world and then exploring its impact across the university.

8.2. Online assessment, policy and quality assurance

Implementing a bold vision for online assessment will require policy review and revision. Certainly, all university policies should use a standard meaning of the term online assessment.

There are overarching policy issues e.g. how will equality, diversity and inclusivity for students be considered as a result of a move to online assessment (Attewell, Iosad, & Pauli, 2020, p. 30). Clay (2020) advises the updating of institutional policies (e.g. GDPR, online safety, accessibility, inclusion, complaints and wellbeing) to reflect any changes in assessment. Skelton & Taylor (2020, p. 12) similarly advise that policies on extenuating circumstances may need to consider technical issues such as computer problems and poor connections (Attewell, Iosad, & Pauli, 2020, p. 30). Skelton & Taylor also argue that 'technical regulations concerning hardware and software to support special needs in assessment should be expanded to cover all students using digital devices in assessment' (Skelton & Taylor, 2020, p. 12).

Bennett et al., (2017, p. 680) consider that changes in assessment approach 'raise issues for institutional policies and practice, particularly those that determine how time is allocated within teaching workloads, how teaching and technical support services function, and how new teaching technologies are introduced'. Mayhew (2018, p. 8) notes that 'existing policy assuming offline, hard copy submission and feedback is unlikely to provide sufficient guidance for colleagues to respond to a broad range of scenarios. These might include the submission of files containing a virus, inaccessible file or large-scale systems failure'. Similarly, 'policy should be implemented....to support teachers and other staff members to effectively embrace and adopt the use of electronic assessment' (Rolim & Isaias, 2019, p. 1786).

Other considerations include the disciplines across the university. ElShaer et al., (2020, p. 591) argue that 'standard policies for electronic assessment and feedback do not fit all disciplines. Schools and departments within universities should apply a degree of adaptation to each discipline allowing a closer alignment with the learning and teaching process' (p. 591).

Other possible policy changes could include a move from handwritten exams to typed exams. Chan's comprehensive review (2023) assesses the challenges and opportunities of each exam format and enables institutions to make informed decisions. Chan (2023, p. 14) argues that with careful planning and consultation with stakeholders, institutions can benefit from typed exams and they can contribute to a 'more efficient, fair and inclusive assessment environment for all students and faculty'.

A shift in assessment approach and culture will have an impact on quality assurance. Skelton & Taylor (2020, p. 12) suggest that 'adoption of digital assessment mechanisms may require modules and programmes to be revalidated' (2020, p. 12). UCD already meets the draft QQI (2023, p. 8) definition of blended learning. The QQI digital education draft guidelines are a useful resource to explore best practices for assessment and feedback in blended learning (QQI, 2023, pp. 38-40).

8.3. Stakeholder engagement

Stakeholders in UCD assessment range from the students to the lecturers and programme teams, particularly module coordinators, the academic management at school, and college level, UCD Teaching & Learning as well as institutional administration and management. The literature advises 'engage and communicate carefully with all stakeholders' (Skelton & Taylor, 2020, p. 19), (Mayhew, 2018, p. 5). The UCD Online Assessment Working Group is one of the means of stakeholder engagement.

In terms of any online assessment policy, the role each stakeholder plays is critical. Mayhew, Holmes., Davies & Dimitriadi (2022, p. 3) observe that 'academics play a major role in implementing institutional assessment change and have traditionally enjoyed high levels of marking autonomy'. Thus the 'value of supporting academic colleagues to use the full functionality of new marking tools and of running online assessment change programmes' (Mayhew, 2018, p. 7) is well argued.

The role of the student union in securing engagement 'with any changes in assessment practice' is understood and acknowledged (Attewell, Iosad, & Pauli, 2020, p. 30). Mayhew (2018, p. 7) noted that 'students have tended to be highly supportive, and this has been helpful for many institutions in terms of supporting change.' What role will students play in developing online assessment, will they be partners in the process or passive recipients of the university decisions? They are partners in the university.

Mayhew (2018, p. 5) identified useful approaches to stakeholder engagement 'from programme focus groups, interviews, surveys and breakfast meetings to show and tell events' and Visintini (2022, p. 10) concurs.

8.4. Impact of online assessment

The impact of online assessment (in whatever guise) on students will be an important consideration. There has already been a shift to the electronic management of assessment (EMA) and students seem to manage that well (Gray, 2016). Students in Mayhew's study were supportive of the move to online submission and marking, however, 'the shift from offline to online submission and feedback is only part of the student assessment experience.' (Mayhew, 2018, p. 7). A move to an online assessment framework may be more demanding.

Whatever model of online assessment is adopted the key advice from the literature is to give students extensive practice with feedback on all the methods they will experience (Freeman & Lewis, 1998, pp. 281-288), and 'prepare students for new assessment demands. Students are often nervous when facing new types of assessments; they benefit from early, low-stakes exposure and preparation' (Pitt & Quinlan, 2022, p. 5) and provision of a range of supports.

Changing assessment practices is as demanding on faculty as learning them in the first place. Mayhew et al., (2022, p. 13) observed that 'the move from offline to online marking is not a single institutional change process but thousands of individual change processes.' The impact on faculty, while considerable, will vary from individual to individual. For some 'it may, for example, be desirable to devote more time to assessment design and provision of formative feedback, and less

to content preparation and presentations' (Bennett, Dawson, Bearman, Molloy, & Boud, 2017, p. 680). Others will have to learn how to 'deploy technology as an integral part of their educational design rather than as an afterthought or a quick fix solution to specific problems' (Brady, Devitt, & Kiersey, 2019, p. 3081). The literature suggests a need to 'focus on developing guidelines and best practices that can assist implementation efforts.....educators should be guided towards training programs to increase their knowledge of and confidence in e-assessment tools' (Rolim & Isaias, 2019, p. 1786).

At the university level Brady, Devitt & Kiersey (2019, p. 3094) observed that online assessment was at an early stage of adoption but 'there was a lack of quantification in terms of design, set-up and ongoing maintenance, time and resource costs or gains'. This meant 'there was limited insight into the type or scale of resources and institutional structures that could best support and drive adoption' (Brady, Devitt, & Kiersey, 2019, p. 3094) and they recommend the resources implications of online assessment are carefully considered (Brady, Devitt, & Kiersey, 2019, p. 3081).

8.5. Change management

Visintini (2022) reflects on her work as a digital education academic leader at the University of Bristol. She identified key elements of the digital education discourse e.g. at an institutional level there was the VLE (from 2005) and a support team. This was complemented by policy development (a TEL policy in 2013 and an education policy in 2017), investment in technology and staff and the development of online courses for students (Visintini, 2022, pp. 3-4).

However, this did not change teaching practice (Visintini, 2022, p. 4); she argues that it is 'unrealistic to expect teaching staff to update their teaching methods simply because they can access new technologies and central support or training' (Visintini, 2022, p. 10). As a digital education academic leader, at school and faculty level from 2011 to 2022, she supported changes in assessment such as the move to online marking and then to online exams during the pandemic (Visintini, 2022, pp. 7-8). She argues that digital 'transformation needs dedicated digital education agents who are familiar with the digital education discourse and who can lead on and develop those practices' (Visintini, 2022, p. 10). She suggests that 'universities might also want to think about what digital education academic leadership is needed at the university level' (Visintini, 2022, p. 10).

Visintini's reflection (2022) suggests that change takes time and the proposed change, in this case to online assessment, will need to be a clear part of the university discourse on assessment. It also needs joined-up thinking, a supportive leadership team and a 'partnership approach between academic faculties and a large number of professional services (academic registry, IT, and the centre for learning & teaching)' (Skelton & Taylor, 2020, p. 19) (Visintini, 2022, p. 6).

Thus change management will be essential in any move to an online assessment model, this is argued by Skelton & Taylor (2020, p. 17) and they advise a clear vision for the change and its benefits (Skelton & Taylor, 2020, p. 19). Mayhew (2018, p. 4) identifies a range of approaches to change and argues that 'staged approaches allow space for organic change driven by enthusiasts but they also allow institutions to better understand the technical, policy, process and pedagogical requirements at an early stage and address issues ahead of broader roll-out.' (Mayhew, 2018, p. 4). Mandatory change was evident in the Jisc 2021 survey (Knight & Ferrall,

2022) and is used, for example, in the University of Sussex permitted modes of assessment (University of Sussex Staff Hub, 2022). Skelton & Taylor (2020, p. 19) provide practical advice on developing institutional capacity for online assessment:

- Set out the institutional principles and policies that underlie assessment and then allow the colleges and schools to develop their own discipline-specific variations.
- 'Pilot, pilot, & pilot to build experience and confidence'. Start with low-stakes assessment before moving to more high-stakes assessment.
- 'Understand your institution's risk appetite. Accept that some things will go wrong, and that is ok. Paper-based assessment is not perfect either.' (p. 19)

Farrell et al., (2021, p. 104) note for eportfolios that the 'buy-in and championing at the macro level of senior management, the meso level of schools/departments and the micro level of programmes and modules was a key ingredient for successful eportfolio implementation'. This applies, more generally, to online assessment.

8.6. Action plan for online assessment

Developing an action plan for online assessment starts with developing the UCD vision for online assessment, what purpose it serves and what it looks like today and then reviewing the associated policies to reflect this vision and ensuring that online assessment meets the requirements of UCD quality assurance.

In terms of university assessment practices Dawson et al. (2014) suggest these actions:

- Identifying local exemplars both rewards innovators and assists to normalise good practice.
- Identify the supports and resources required for successful assessment within a department, faculty or institution.
- Enable appropriate amounts of formal and informal opportunities for peer review.
- Communication between educators and those responsible for policy/procedures can assist in ensuring the right balance between quality regulation and responsiveness.
- Value local L&T leadership and identify ways for these leaders to improve assessment in their faculty/department. (Dawson, et al., 2014). This reflects Visintini's advice about digital education academic leadership.

The implementation of online assessment needs careful planning (Gray, 2016), (Mayhew, 2018) and this is determined by the chosen approach to change.

Table 4 shows a range of implementation approaches (Farrell, Buckley, Donaldson, & Farrell, 2021, p. 92) and (Stevens, 2020, p. 46).

Implementation approach	Aspects
Bottom-up (micro)	A bottom-up approach is organic and is usually driven by staff in the form of early adopters who diffuse the assessment innovation and practice through the institution.
Top-down (macro)	This approach is led by the institution's senior management and is part of the strategic plan, it is a formal mandated programme.
Technology-driven	This approach centres around the acquisition of an online assessment platform / solutions and may involve consultation with stakeholders, user testing and needs analysis phases.
Middle-tier (meso)	In the middle-tier approach, champions in schools and

Table 4 Approaches to online assessment implementation

The complexity of online assessment is evident from the literature. UCD is well-positioned to implement some or many aspects of online assessment.

9

Discussion and conclusions

This is a review of the literature on online (digital) assessment. Key themes/areas evident included the electronic management of assessment (EMA), how institutions, faculty and students responded to online assessment and the impact of the COVID-19 pandemic. Internationally, the main experience of online assessment was from 2020 to 2022, due to the COVID-19 pandemic. One underlying assumption in the literature is that online assessment means online tests and exams.

The value of the assessment OF/FOR/AS learning framework (National Forum, 2019), (Brady, Devitt, & Kiersey, 2019) for online assessment was evident. Ferrall & Knight (2022) argue that 'assessment and feedback practice has been on a trajectory away from assessment of learning to what is termed assessment for learning' (2022) and that current assessment and feedback approaches use an assessment AS learning approach, i.e., doing the assessment and using feedback to improve is a part of the learning process. Cartner & Hallas (2020, p. 133) argue that 'technology-based assessment can work "for" and "as" learning and indeed offers ways to make assessment more authentic'.

It is difficult to see clear trends in online assessment design. Technology is embedded in assessment; it is used to present assessment (Bearman, Nieminen, & Ajjawi, 2022, p. 2) and to communicate assessment (UCD, 2022b). EMA is widespread (Knight & Ferrall, 2022) and is used through most of the UCD assessment lifecycle (Figure 3) but it is unclear to what level there is online marking and online feedback to students.

Online exams and tests were explored during the pandemic. While students seem to like formative quizzes, their impact on overall learning is questioned (Pitt & Quinlan, 2022, p. 40), (Khan, Basu, Bashir, & Uddin, 2021, p. 14). There was a worldwide negative response to online invigilated exams (Lee & Fanguy, 2022), (National Forum, 2021). Much of the use of exams (and associated technology) during the pandemic was prompted by concerns with academic integrity.

The development of online assessment design to support student learning is at an early stage. Assessments can be adapted, modified and developed from in person assessment and there is assessment now possible because of technology / digital media (Table 2). Digital media assignments bring their demands and rewards (Reyna, Hanham, & Meier, 2018), (Reyna J. , 2021), (Cartner & Hallas, 2020) and (Ross, Scott Curwood, & Bell, 2020).

There are issues, new assessment designs can be problematic. There can be poor student response (Bund, 2023) or students can fail to use the technology fully (Flavin, 2021) or dislike the assessment approach (Udeozor, Russo-Abegão, & Glassey, 2023). Even if students respond well to a new assessment, it can have a considerable impact on staff workload (Brady, Devitt, & Kiersey, 2019) and new assessment approaches can be abandoned (Bennett, Dawson, Bearman, Molloy, & Boud, 2017).

What is clear is that faculty, particularly, module coordinators make assessment design decisions about assessment supported by academic leaders at the school and college level. The role of students in assessment design is less clear although their response impacts assessment (Bund, 2023) and they contribute to the evaluation of assessment (Figure 3) and through the student union to university policy on assessment.

There seem to be three trends in online assessment delivery. The first is the central role of the VLE as shown in Figure 7. Faculty use it to communicate assessment to students and to set up assessment for students. Sometimes faculty use it to mark /grade assessment and it is often used for student feedback. Students use it to submit assignments, do quizzes, take tests and do online assignments, such as developing an eportfolio. It is used for formative assessment (assessment for learning), assessment as learning and for summative assessment (assessment of learning). The impact of technology on UCD assessment is evident in Figure 2.

The VLE is complemented by a range of technology tools (UNSW Teaching, 2021). This is the second trend. There are tools to develop online exams and quizzes, as well as the VLE tools. There are lockdown browsers for online tests and exams as well as tools for online monitoring and invigilation. There are originality checkers for student work, marking and grading software as well as technology that supports the preparation and issue of student feedback.

There is software for student assessment tasks including eportfolios, group work with peer assessment and feedback and there are discipline-specific technologies that enable students to show evidence of their disciplinary learning. These are generally provided by the institution and determine the available online assessment options. Standard digital media applications are also used as is social media.

The third trend is for technology that manages the assessment process from the start of an assignment to its completion. This approach focuses on the security of assessment and manages it from end-to-end, however, the underlying assumption that online or digital assessment means digital exams is evident (Wiseflow, n.d.).

At this stage, there are some clear themes in online assessment. The first is streamlining assessment and managing it efficiently (EMA), (Gray, 2016), (Bennett, Dawson, Bearman, Molloy, & Boud, 2017, p. 675), (Mimirinis, 2019, p. 240). With online assessment clearer communication, more assessment options, easier marking for faculty (sometimes automated) and quicker feedback to students are among the benefits. These benefits apply at all levels, at the micro level of modules and faculty, at the meso level of schools or college and at the macro level of the university itself. This theme reflects the ‘digital tools’ purpose in Bearman, Nieminen & Ajjawi’s assessment design framework (2022, pp. 4-5).

The impact of the COVID-19 pandemic is evident. Faculty and students now have experience with alternative types of exams and assessment (Pereira, Mura, & White, 2023) (O’Neill, McEvoy, & Maguire, 2023). Online assessment is seen as a means of supporting and enhancing student learning, (Mimirinis, 2019, p. 240) (Bennett, Dawson, Bearman, Molloy, & Boud, 2017, p. 677).

There are caveats. Students may not have the digital skills for online assessment and may not be sufficiently critical of the digital technologies they use. Digital media assignments require appropriate scaffolding and support (Cartner & Hallas, 2020), (Reyna, Hanham, & Meier, 2018),

(Reyna J., 2021). This supports the 'digital literacies' purpose of the Bearman, Nieminen & Ajjawi's assessment design framework (2022, pp. 6-8). This is challenging for faculty who may not have the required literacies and for the institution to provide and support suitable technology and professional development.

Online assessment is seen as contemporary, innovative and inevitable (Bennett, Dawson, Bearman, Molloy, & Boud, 2017, pp. 676-677). Mimirinis (2019, p. 241) argues that online assessment is a means of developing (digital) identity and the community, it enables the development of the human in a digital world (Bearman, Nieminen, & Ajjawi, 2022, pp. 8-9), (Bearman, 2023) and there are online assessment possibilities not yet identified. This challenges the narrow meaning of online assessment as online exams and tests and enables higher education to respond to developments such as ChatGPT.

However, there are gaps in the scholarly literature. As noted in 2019, many of the online assessment studies are small-scale studies of faculty, often by early adopters (Brady, Devitt, & Kiersey, 2019, p. 3093) and 'sufficient studies of effective enduring integration of educational technologies by academics are not yet in evidence' (p. 3093). The pandemic, in the intervening years, has exacerbated this gap. Brady, Devitt & Kiersey (2019, p. 3093) argued that online assessment needs further study 'into the required operational costs, time and resource' for faculty. The student voice and responses to online assessment is a key gap in the literature. A few studies note that students can be conservative in their approach to assessment, other studies indicate that students like online exams. In terms of online assessment student performance, there is little in the literature. Clay (2020) identifies a possible improvement in student outcomes and the QAA (UK) noted that 'digital assessment.....can be associated with high levels of engagement and, in at least some cases, apparent benefits for student performance' (QAA, 2021a, p. 9).

The grey literature and educational resources (mainly developed during the pandemic) have contributed to the debate about online assessment with the caveat that it must be examined carefully to identify the underlying meaning of online assessment.

9.1. Conclusions

This leads to some key considerations around the design and delivery of online assessment; these are institutional support, accommodation to the disciplines and the engagement of students and faculty. The literature concurs that online assessment requires institutional support (Bennett, Dawson, Bearman, Molloy, & Boud, 2017, p. 678), (Mimirinis, 2019, p. 246).

Or and Chapman argue that 'the success of any shift to online assessment will require 'buy-in' from both the students and the teachers. The level of buy-in seen from teachers is likely to be a product of myriad factors, including the nature of the technology, the organisational context, and the model used to manage the change process' (2022, p. 19). This is evident in the adoption of eportfolios as such 'initiatives need to be underpinned with adequate financial, human, technical and pedagogical resources and support' (Farrell, Buckley, Donaldson, & Farrell, 2021, p. 105).

This means that as well as the technology which the institution has to provide, there is a need to consider the totality of academic work to ensure that assessment work is a full and valued part of faculty work rather than a separate add-on (Mimirinis, 2019) (Slade, et al., 2022). Using

technology for assessment requires learning and 'appropriate professional development in the use of online assessment tools with different levels tailored to the users' (Or & Chapman, 2022, p. 20) and that 'the additional initial learning requirements are factored into teachers' workloads' (Or & Chapman, 2022, p. 20).

In terms of the disciplines Slade et al., (2022, p. 602) suggest 'the development of a suite of effective e-assessment platforms and tools with discipline-specific learning outcomes', this complements ElShaer et al (ElShaer, Casanova, Freestone, & Calabrese, 2020) advice. This links to Or & Chapman's (2022, p. 20) suggestion that the introduction of online assessment is scaffolded for faculty and indeed students as partnership with students is key to the development of online assessment (Gopalan & Chatley, 2023) (Pereira, Mura, & White, 2023) (Bearman, Dawson, O'Donnell, Tai, & Jorre de St Jorre, 2020) (National Forum, 2021).

Online assessment has considerable potential to transform assessment and feedback (Jurāne-Brēmane, 2023, p. 10). Knight & Ferrell (2022, p. 11) argue that there is a 'sound body of evidence of good pedagogic practice….'. We now have tools that can work seamlessly together and support good pedagogic practice at scale. Students and teachers have been exposed to different ways of doing things and are better able to contribute to dialogue about what works and what doesn't.' Finally, whatever decisions are made about online assessment, UCD is committed to 'a holistic student-focused and research-led educational experience' (UCD, 2020a, p. 5).

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11. Appendices

11.1. Acronyms

AI	Artificial intelligence
BYOD	Bring your own device (usually a laptop or tablet)
CAA	Computer-aided assessment / computer-assisted assessment
CMS	Content management system
EDI	Equality, diversity and inclusion
EMA	Electronic management of assessment
LMS	Learning management system
MCQ	Multiple choice question
SAMR	Substitution, augmentation, modification, redefinition model of technology use (Puentedura, 2009).
TEL	Technology enhanced learning
TRA	Time-restricted assessment
PSRB	Professional Statutory and Regulatory Bodies
VLE	Virtual learning environment

11.2. Glossary

Term	Definition/explanation
Assessment	Assessment
Assessment literacy	Assessment literacy
Authentic assessment (Authenticity)	Authentic assessment (Authenticity)
Computer-aided assessment (CAA)	Computer-aided assessment (CAA)
Digital assessment	A range of activities, from scanning and workflow of exam scripts through to use of simulation, virtual reality and artificial intelligence in the grading process. (Attewell, Iosad, & Pauli, 2020, p. 4)
Electronic management of assessment (EMA)	The way technology can support the management of the entire life cycle of assessment and feedback activity, including the electronic submission of assignments, marking, feedback and the return of marks and feedback to students (Jisc, 2016)
Multimedia	Any material that contains words and graphics. Words are text printed on a screen or spoken. Graphics are also called pictures. Static items are illustrations, drawings, charts, maps, photographs and dynamic items are animation and video (Mayer, 2005).
Technology enhanced learning	Technology enhanced learning (TEL) is used to describe learning that is enhanced, supported, mediated or assessed by the use of educational technologies (UCD Teaching & Learning, 2023d).
Online assessment	Assessment 'approaches that are enabled by a variety of digital technologies to include online exams, online assignments and activities, online submissions and technology-enabled feedback' (UCD Teaching & Learning, 2023a)
Online invigilated exams	These are supervised computer-based assessments that aim to replicate face-to-face exam conditions in students' own locations. (Dawson, 2022). Also called remote proctored exams, supervised online exams.
Virtual learning environment (VLE)	This is the core element of technology enhanced learning. It enables students to access and use learning resources, engage in learning activities and assessment.

11.3. Literature Review Overview & Journals

Literature	Overview	Number
Books or book chapters	Books and chapters on assessment.	6
Journal articles	Articles from the journals listed below.	49
Grey literature	National & commercial resources.	31
Educational resources	Higher education websites & resources	45
UCD resources	Policy documents, reports and UCD website resources	16

Table 5 A summary of the literature consulted for the review

Assessment & Evaluation in Higher Education
British Journal of Educational Technology
Computers & Education
Creative Education
Education Sciences
E-Learning and Digital Media
European Journal of Higher Education
International Journal of Educational Technology in Higher Education
International Journal of E-Learning & Distance Education
International Journal of Information and Education Technology
Irish Educational Studies
Irish Journal of Technology Enhanced Learning
Journal of Applied Learning & Teaching
Nature Reviews: Chemistry
New Directions
Research in Learning Technology
Sustainability
Teaching in Higher Education

Table 6 Journals cited

Rialtas na hÉireann
Government of Ireland