

Building Academic Integrity and Capacity in Digital Assessment in Higher Education

By Lorraine Bennett & Ali Abusalem[‡]*

The rapid spread of the COVID-19 pandemic in the first half of 2020 disrupted and changed higher education across the world, and into the future. Campuses were shut down, almost overnight. International and State borders were closed and business models that relied heavily on high-paying international students collapsed. University leaders and academics were forced to find new ways of attracting, engaging with, and retaining students. This paper describes a project that was undertaken in Australia in 2021 which investigated the implications of, and scope for online assessment in this ‘new virtual world’ of learning and teaching in higher education. After extensive research and consultation, the project developed a Digital Assessment Framework dubbed DASH C21, which stands for Digital Assessment Stretching Horizons for the 21st Century. The Framework is based on a set of underpinning principles and values; the Inputs. The Inputs feed into four Dimensions. These Dimensions are Practices and Pedagogies, Strategies, Emerging Technologies and Stretching Horizons. The Outputs are a series of authentic, innovative, experiential and forward looking, digital assessments, reinforced by academic integrity values. This paper will be of particular interest to higher education senior managers, academics, learning and teaching specialists, staff professional developers and curriculum designers.

Keywords: Digital Assessment Framework

Introduction

This paper describes a project that was developed in Australia in response to the pandemic and its disruption of, and impact on, the higher education sector worldwide. In Australia, as in most other countries, the rapid spread of the COVID-19 virus in 2020 caught education institutions by surprise. Universities and independent providers of higher education were ordered to close their campuses, almost overnight, and were forced to replace face-to-face delivery of courses with remote and online delivery models. While some universities had previously started to experiment with various modes of off-campus delivery using contemporary digital technologies, most were underprepared and under-resourced for the speed and extent of the change required to effectively transition exclusively to remote and online teaching and learning.

One aspect of online delivery that was particularly challenging for academics and curriculum designers, as well as being under-researched, was online assessment. The search for and creation of a theoretical framework to inform and support

*Managing Director, Lorraine Bennett Learning and Teaching Consultancy, Australia.

[‡]Course Coordinator-Business and Higher Education Lecturer, Kent Institute, Australia.

online assessment approaches and practices was the focus of the project reported in this paper.

Aim

The aim of the project was to develop a framework based on a sound vision and pedagogy that could be used as a guide to design, develop and implement online assessments which would provide a valid and reliable measure of a student's academic performance as well as promote learning.

Scope

The project was funded through a small competitive grant from the Australia English Fund. The objective of the special funding was to promote and support English Language Colleges and Higher Education Providers transition to online delivery modes of teaching to enable them to continue to attract and retain international students.

The grant was provided to an independent higher education provider in Australia. It was led by an external consultant with years of senior academic experience leading and working in university-wide centres for learning and teaching, supported by an academic colleague, with specialised skills in the application of advanced technologies in higher education contexts.

While the initial focus was on developing an online assessment framework for the provider institute, and subsequently other Australian-based higher education institutes, the Framework, has potential to be used universally. Its application to other countries and contexts is recommended as an extension to the project, along with further monitoring, evaluation and refinement of the Framework's potential to build academic integrity and capacity in digital assessment in a range of higher education environments.

Research Question

The central research question addressed in this project was: Drawing upon sound pedagogy, lived-academic-experience, research and knowledge of contemporary digital technologies, is it possible to develop a 'fit for purpose' Digital Assessment Framework to guide and support the design of authentic, innovative, valid and reliable online assessment practices for the higher education sector?

Paper Outline

The paper contains the following areas:

- a brief description of the context in which the project was undertaken;
- a review of literature which researched assessment approaches and protocols more broadly before focussing on digital and online assessment, as well as key literature on pedagogy and best practice in assessment;
- a section on the methodology used in the project to incrementally develop and review the emerging assessment framework;
- a description of the ultimate Digital Assessment Framework (DASH C21), highlighting the key inputs, dimensions and outputs of the Framework;
- an outline of the dissemination artefacts of the project which are based on four, narrated slide presentations converted to MP4s;
- the staff professional development workshops and toolkit developed to support the implementation of the Framework and finally,
- recommendations for the application of the Framework and future developments followed by a project conclusion and list of references.

Context

The project was undertaken over a four month period at a time when the impact of the pandemic in Australia had almost brought life as we knew it, to a standstill. Cities, workplaces, restaurants, sporting and entertainment venues and education facilities were closed. All but essentials workers were confined to their homes. University management scrambled to keep Institutes operating through remote and online modes of delivery. Many higher education providers, especially small providers, found that they did not have the inhouse expertise or resources to instantly flip to online delivery of courses. Designing and administering appropriate online assessments was particaulty challenging for many higher education operators, especially in courses that relied heavily upon examinations and essays for assessments. The atmosphere, reported by staff and students across the sector, was peppered with confusion, uncertainty, high workloads often resulting in added stress and pressure. Reports of mental health issues rose as staff were forced to redesign their curriculum for online learning and grapple with new technologies to deliver their courses.

Accessing staff across the sector to provide input and feedback on the project phases was often difficult due to their added workload. However, the willingness of many assessment specialists to provide feedback and comment contributed significantly to the final framework outcome.

Review of Literature

The review of literature utilised an iterative approach whereby each phase in the project led to examining further studies or articles related to the challenges faced in designing the online assessment framework. Initially, the scan for scholarly texts, research papers and journal articles adopted a wide lens to capture seminal and recent studies on assessment theories and practices in higher education

more broadly. Subsequent scans zoomed in on emerging trends in online assessment constructs, practices and research across the sector. The methodology involved identifying and analysing examples of best practice in online assessment which were evidence-based and well documented. Limitations of the review of literature are that it focused on accessible web-based sources from publications written in English. It is acknowledged that the literature identified and analysed represents a narrow slice of what might be available. However, it was considered to be sufficient to identify key themes relevant to the central research question.

The main themes identified in the literature on assessment and, particularly online and digital assessment, informed the structure and content of the final Digital Assessment Stretching Horizons Framework for the 21st Century (DASH C21) developed in this project. The following sub-sections describe these main themes.

Assessment Philosophy and Concepts

Initially, the review focused on literature and research related to assessment philosophy, protocols, principles, and concepts. One of the most informative studies was a Learning and Teaching Project undertaken by a team of Australian-based academics funded by a grant from the Australian Learning and Teaching Council (ALTC). The project, entitled *Assessment 2020 Seven propositions for assessment reform in higher education* (Boud and Associates, 2010), drew upon the expertise and experience of researchers, academics, learning and teaching specialists and senior academic managers across several universities. This project focused on the need to reconceptualise and redevelop assessment practices in higher education and strongly promoted the concept that while assessment needs to measure learning achievements, in addition, assessment should be about how to improve learning and performance and grow from assessment outcomes and feedback (Boud and Associates, 2010).

The seven propositions identified in the ALTC project were:

- assessment is used to engage students in learning that is productive;
- feedback is used to actively improve student learning;
- students and teachers become responsible partners in learning and assessment;
- students are inducted into the assessment practices and cultures of higher education;
- assessment for learning is placed at the centre of subject and program design;
- assessment for learning is a focus for staff and institutional development;
- and
- assessment provides inclusive and trustworthy representation of student achievement (Boud and Associates, 2010, pp. 1-4).

The ALTC project invited academics to use the seven propositions to stimulate further thinking on how to redesign assessment in higher education to meet current and future needs and provide valuable learning experiences. While

the rationale and seven propositions did not directly reference online assessment, they became an important starting point for the development of an early iteration of the digital assessment framework created in this DASH C21 project. In particular, the seven propositions informed the 'Principles' identified within the initial draft Online Assessment Framework. This draft framework was circulated to selected domestic and international academic and curriculum experts for comment and feedback.

The Seven Propositions project, discussed above, inspired the establishment of the Centre for Research in Assessment and Digital Learning (CRADLE) at Deakin University in Australia. The website reports that currently researchers at this Centre are investigating improvements in higher education assessment in the context of a rapidly expanding digital environment (CRADLE). The Centre has a strong focus on scholarship and research and offers doctoral studies in assessment related areas such as 'the digital world and its impact on learning and teaching', 'feedback and feedback practices' and 'assessment security and academic integrity'.

A recent publication from the Centre, entitled *Re-imagining University Assessment in a Digital World* (Bearman et al., 2020), draws attention to the exciting possibilities that to date, are largely under-utilised, to refresh and reenergise assessment by drawing upon contemporary technologies to contribute to digital assessment design and implementation. This observation helped shape the 'stretching horizons' dimension within the DASH C21 Framework.

In search of an international perspective, a recent article by Shea, Richardson, and Swan (2022) highlighted that fact that due to the rapid transition to online learning forced on higher education institutions around the world, many institutions lacked conceptual, empirical and practical knowledge and experience in designing and implementing online learning activities. This article recommends a more mainstream focus on online pedagogy, bringing together learning and teaching, educational technology, and educational psychology communities, with a view to a joint understanding and collaborative model of online learning. It recommends as a priority, a framework explicitly for the purpose of guiding online teaching and learning design, implementation, and research.

Approaches to Online Assessment

The review of early studies on the adoption of online assessment identified standardised online assessments requiring responses to true/false, yes/no or multiple choice questions. These early adapters were confident that using technology to elicit quantitative responses would provide valid and reliable measures of knowledge (Gikandi, Morrow & Davis, 2011). However, even where the use of standardised online assessments were widespread, there were serious doubts amongst academics as to whether these simple approaches to assessment design result in an accurate measure of the desired learning outcomes (Banta, 2007). In contrast, a study undertaken by Rezaei (2015) found that when students are exposed to weekly quizzes, their conceptual learning improves and they perform much better in summative assessments.

Online assessments have also been used for some time for personality and psychological assessment. A quick web search reveals that several online assessment tools are readily available for assessment of skills and knowledge, for self-assessment, for 360 degree assessment, for personality and aptitude testing and for individual development. Buchanan (2002) and Chuah, Drasgow, and Roberts (2006) reported that practitioners are less confident about the validity and reliability of using technology tools to assess qualitative measures such as attitudes, opinions and ethical views.

The findings from a study by Bennett et al. (2017) conducted pre-pandemic, which interviewed 33 academics with respect to their experience with 'technology-supported' assessment reported mixed success, with one of the key challenges being the desirability of pedagogical guidance early in the assessment design process and preparedness to work through an iterative design process.

The message taken from this feedback and later studies on the introduction of digital assessment is that a technology should not drive the assessment design but be selected based on the assessment context and its capability to accurately assess the level of a student's academic achievement and support positive learning (Anderson, 2016).

The Pedagogy of Online Assessment

The rapid transition to remote and online teaching, due to the forced closure of university campuses in 2020-2021, resulted in the research spotlight being sharply focused on the pedagogy of online learning and assessment. Some of the research themes and questions explored and reported in recent scholarly literature on online pedagogy include:

- the impact of online delivery and assessment on the quality of learning;
- how to engage effectively with students online;
- how to design pedagogically sound online activities and assessments;
- how to support student online learning; and,
- how to ensure academic integrity of assessments and assessment processes (Martin & Borup, 2022).

Another approach which is also relevant to online assessment is the notion of teaching through assessment (Edwards, 2010). In this approach assessment design starts with identification of the learning outcomes and aligned online assessment tasks and the curriculum and teaching strategies are selected to achieve the assessment requirements.

A study by Archambault, Leary, and Rice (2022), stresses the importance of blending content knowledge with engaging learning activities leveraged by contemporary technologies. The five foundational pillars of online pedagogy identified in this article include the ability to: 'build relationships and community, incorporate active learning, leverage learner agency, embrace mastery learning, and personalize the learning process' (p. 1).

The importance of foundation pillars for effective learning such as establishing student attention and retaining engagement, providing active learning tasks, scaffolding learning, promoting time for practice and mastery of skills and designing personal and authentic learning and assessment activities are reinforced in academic literature which references contemporary neuroscience research (Willis, 2006; 2007; Jensen, 2008; Sousa, 2011; Hardiman, 2012; Weinstein & Sumeracki, 2018).

These scholars also acknowledge the importance of minimising barriers to learning such as avoiding cognitive overload, providing culturally appropriate learning activities, designing incremental learning activities and taking into consideration environmental and resource constraints such as access to technology and internet services when designing learning activities and assessment tasks (Sweller, Ayres, & Kalyuga, 2011; Hardiman, 2012).

Assessment Practices Powered by Academic Integrity

More recently, studies and reviews on online assessment have focused on academic integrity and how to mitigate academic dishonesty and misconduct such as cheating, contracting out assessment tasks and student collusion (Green et al., 2010; Holden, Norris & Kuhlmeier, 2021). With the pandemic forcing all courses to move to remote or online delivery and assessment, the potential and opportunities for cheating are thought to be rising (Down, 2022). However, as suggested in the recent literature further fine-grained research is required to confirm whether academic misconduct is more prevalent in online assessment and whether it is across the board or correlates more highly with certain discipline areas, levels of study and student demographics (Newton, 2018).

In Australia, the higher education regulator the Tertiary Education Quality and Standards Agency (TEQSA) has recognised academic integrity as a priority area and, as a result has funded projects and sponsored and published specific Guidelines on Academic Integrity and the implications for Online assessment.

The Australian Government's publication, TEQSA Guidance Note on Academic Integrity (2019) specifically refers to the International Centre for Academic Integrity's definition of academic integrity cited on the ICAI's website: 'a commitment, even in the face of adversity, to six fundamental values: honesty, trust, fairness, respect, responsibility, and courage. From these values flow principles of behaviour that enable academic communities to translate ideals to action'.

The Australian Government funded Academic integrity toolkit (Bretag, Curtis, Slade, & McNeil, 2020) provides a series of useful resources, a professional development workshop with slides and case studies, policies and benchmarking studies to assist and support staff in designing and managing online assessment. One of the main messages promoted by the academic integrity team is the importance of 'taking an educative, rather than punitive, approach to dealing with academic integrity breaches'.

A recent article in an Australia newspaper reports the account of a 'whistle-blower' who claims that large numbers of students in major Australian Universities

have used illegal out-sourcing services to engage in academic misconduct and contract cheating (Down, 2022). The claims, verified by the reporter, sound a warning to higher education institutes across the nation and internationally, reaffirming the importance of guarding the academic reputation and standing of the sector.

The TEQSA Guidance note also reinforces a statement frequently found in the literature that upholding academic integrity is central to quality across the sector and that reputational damage to even one provider, can impact the reputation of the entire sector (Bretag et al., 2011).

The need to develop a digital assessment framework based on academic integrity principles and values was foremost in this project and was a key consideration in the design and development of the DASH C21 Framework and why the Outputs are informed by, and enveloped in, 'Academic Integrity'.

Online Assessment Challenges

An interesting international perspective on the challenges faced in designing and implementing online assessment is reported in a study conducted at Sultan Qaboos University in Oman (Al-Maqbali & Raja Hussain, 2022). This study analysed the data collected from 60 academic staff surveys and from, semi-structured, follow-up interview with four respondents.

Challenges of online assessment that directly impacted on the academics included large class sizes, the time required to design appropriate online assessment instruments, and the need to develop strategies for assessing group work and practical assessments. Challenges that impacted upon the quality and academic integrity of online assessment outcomes included students refusing to turn on cameras, incidents of cheating and incident of imposters impersonating students.

The study concluded that the challenges threaten the academic integrity of online assessment and the principles of validity, efficiency, fairness, reliability and variability. The authors recommended further investigation of each of these challenges and the exploration and development of alternative, flexible assessment strategies linked more closely to the online curriculum and learning activities. They suggested more scrutiny of students' performance and progress throughout the semester to build up their knowledge of a student's capability. In addition, they recommended that further thought be given to avoiding single, heavily-weighted online assessments.

Systems and Platforms which Support Online Assessment

Not only did the pandemic force academics to quickly reconceptualise and redesign their assessment for online contexts, in many cases it also forced IT managers to review the capacity of their Institute's Learning Management System (LMS) and to audit the installed features of this platform to optimise online assessment processes. A study by Topuz, Saka, Fatsa, and Kurun (2022), aimed to identify the main characteristics of online assessment systems and platforms by

systematically analysing online assessment studies indexed by Google Scholar in 2020. The analysis focused on supported IT platforms, the security features and the overall common features of the online assessment systems.

The findings of this analysis revealed that some of the online assessment systems were not mobile-friendly and did not provide for smooth transition of student data. It was proposed that the ideal platform was one that supported mobile devices but also enabled integration of e-Learning data. With respect to security, the analysis identified the use of security features such as authentication of students through ID cards, disabling copy and paste functions, using semi-automatic monitoring functions, and analysing video, image, voice and screen records. The common features of online assessment platforms identified by Topuz, Saka, Fatsa, and Kurun (2022), included applications that supported multiple choice and true/false questions, and 'Frequently Asked Questions' (FAQ), 'Help' and 'Technical Support' modules. The basic tools required to engage with online assessment platform were a webcam, microphone and internet and data sharing method.

The recommendations are silent on two important factors related to the effective use of online assessment platforms. Firstly, there is no mention of the need to provide academic staff with professional development to build their capacity to maximise the engagement and feedback features available to them on the platform and second there is no mention of the potential of well-crafted online assessment design to minimise cheating. However, the Topuz report does refer to the importance of listening to the student voice and taking into consideration students' needs and concerns regarding online assessment platforms.

Other studies into IT systems and platforms which support online assessment refer to the importance of features such as assessment Drop Boxes which assist in submitting and tracking assignments, systems which allow students to run their work through Turn-it-in to pick up and rectify unintentional instances of plagiarism prior to final submission and a range of feedback features such as Chat, and synchronous and asynchronous audio and video feedback (Chang & Kuo, 2022; Majid, 2020).

Online Assessment Opportunities for Innovation and Creativity

Another cluster of articles which examine online assessment are those which recognise the growing opportunity to expand the variety of assessment tasks using online tools. These articles explore the added opportunities for innovation and creativity provided by the application of contemporary technologies. These opportunities include submission of pre-recorded audio and video files, photographic files, digital posters, narrated slide presentations, computer generated proformas and models, to name just a few. Twenty years ago, in an article by Robles and Braathen (2002), the authors provide several pedagogically-sound techniques for designing innovative online assessments. However, they also recognise that online assessment presents its own challenges and that lecturers need to work hard to engage with students, monitor progress from afar and ensure that students are not disadvantaged due to limited access to advanced technologies and the internet.

A more recent educational psychology journal that dedicated an issue to *Diverse Lenses on Improving Online Learning Theory, Research, and Practice* contains a series of articles which investigate the challenges and opportunities of online learning (Educational Psychologist, 2022). Greenhow, Graham, and Koehler (2022) adopted an interdisciplinary approach to research into online learning by drawing upon educational technology, educational psychology and the learning sciences. They explore the challenges that are faced by academics using digital and internet-based technology to mediate learning interactions and they also recognise the new opportunities for learning and assessment made more accessible through contemporary technologies. Their research lenses for innovative online assessment include *community, engagement, pedagogy, equity, and design-based research*.

Other new trends in online assessment identified in the literature include a preference for authentic assessments. A useful working definition of authentic assessment, found on New Jersey Institute of Technology's website, is 'authentic assessment designed to measure whether a student can successfully transfer the knowledge and skills gained in lectures to various contexts, scenarios, and situations' (NJIT, 2022).

Activity-based online assessment, often referred to as experiential assessment based on Kolbs' (1984), approach to experiential learning is also encouraged. This assessment format is thought to keep students motivated and physically engaged in the assessment process and allows students to explore and reflect upon the assessment topic using emerging digital tools (Anderson, Gupta, Buenfil, & Verinder, 2022; Kolb & Kolb, 2018; Murphy, Fox, Freeman, & Hughes, 2017).

Forward Looking Assessment

The Output section of the DASH C21 Framework provides a wide range of digital assessment formats and approaches which push the conventional essay and examination pattern to also include interactive presentations, visual and audio presentations as well as text-based assessments. In the Framework these assessments are captured by the themes of innovation, experiential, authentic and forward looking. The notion of forward-looking is to equip students with the knowledge and skills that they will need in 21st Century workplaces. The concept of deploying contemporary technologies in learning and assessment activities in line with workplace and social spaces is strongly supported in Australia by leading academics such as Hillier (2019) and Crisp (2012).

Online Assessment Design

Initially, the literature review into what factors contribute significantly to the effective design of online assessments revisited the research and studies which draw upon contemporary neuroscience on how the brain learns, and how it stores and retrieves information to inform their practice. Factors which promote learning and lead to high levels of academic performance frequently referenced include the

desirability of immediate engagement with the topic, scaffolding learning through incremental activities, providing choice, ensuring frequent opportunities for practice and mastery, setting achievable tasks, and acknowledging and celebrating achievements.

The value of incorporating these features into online assessment design seem obvious, starting with encouraging student input into how they wish to demonstrate their achievement of learning outcomes. This is sometimes referred to as co-creation of assessment and assessment rubrics, and while initially, for some academics it may be disempowering, most who engage in this approach report very positive outcomes. Students appear to be more motivated and are clearer about the assessment expectations (Doyle, Buckley, & Whelan, 2019; Deeley & Bovill, 2017).

Another reported advantage of reconceptualising assessment design, whether it is for face-to-face or online assessment is that clever design can assist in minimising opportunities for cheating and academic misconduct (Wehlburg, 2022). For example, assessments which involve staged submissions such as a phase 1 submission of a marketing proposal, phase 2 submission of a marketing plan and stage 3 implementation of the plan enable the student's progress to be monitored and question along the way. Assessment designs which required students to draw upon personal experience and personal activities can also be easily verified through knowledge of that student, or through follow up discussion with the student. When pre-recorded audio or video presentations are set as assessment tasks a requirement for the student to appear in the video as the presenter is another way assessment design can reinforce authenticity (Darby, 2020).

Online Assessment Aligned with Learning Outcomes

In 2009 The European Centre for Development and Vocational Training (Cedefop), defined learning outcomes as 'statements of what a learner knows, understands and is able to do after completion of learning' (p. 9). Educators around the world, including those in the higher education sector, have responded to this shift in educational philosophy and practice by placing the learner (student) at the centre of learning rather than the content.

The importance of demonstrating that the set assessment effectively demonstrates the desired learning outcomes is a relatively new concept in academia. For many years, the traditional forms of assessment were examinations and essays and in some discipline areas, laboratory or practical work. Students prepared for assessment by attending lectures and tutorials and practising old examination papers.

With the expansion of assessment formats such as partner and group assignments, project plans and reports, oral presentations, journal reflections and posters, the need to explicitly align these forms of assessment with learning outcomes became apparent. This need is reinforced even further as contemporary technologies offer further opportunities for online assessment such as ePortfolios, recorded video and audio presentations, eJournals and ePosters.

Learning outcomes should drive assessment design and need to be determined prior to establishing the assessment tasks. A valuable way of verifying whether learning outcomes have been achieved and at what level, is using an assessment rubric.

The Value of Assessment Rubrics

The provision of an Assessment Rubric services two key purposes. Firstly, it enables the assessment designer to reaffirm that the assessment task aligns with the learning outcomes by ensuring that the criteria identified in the learning outcomes are embedded in the assessment task and reflected rubric (Bennett et al., 2017).

The second benefit of an Assessment Rubric is that it minimises the uncertainty and stress for students as it provide a clear picture of what is required in the task and how it will be assessed. Lack of clarity around assessment is acknowledged as one of the key barriers to effective learning and assessment performance (Willis, 2006; 2007; Hardiman, 2012).

The transference of this fundamental insight into online assessment suggests the importance of developing Assessment Rubrics which are transparent, easy to follow and clearly convey the desired learning outcomes and what the assessor is looking for.

Brookhart (2018) in a study, which involved a literature review of articles on the use of assessment rubrics in higher education from 2005 to 2017, noted surprising, that only 56% of the studies reported using assessment rubrics with students. They identified a range of descriptors from generalised statements to ones which were helpful for learning and hypothesised that the effectiveness of the rubric, largely depended on the criteria descriptors. In an earlier section of this review, reference is made to the importance of the descriptors being aligned with, and informed by, the learning outcomes.

Assessment Feedback

Throughout the literature on assessment the importance of providing students with constructive information on their performance is a constant theme (Boud & Molloy, 2013; Carless & Winstone, 2019). Frequent reference is made of the value of conducting diagnostic and formative assessment within the first three weeks of a course to obtain a measure of a student's knowledge of discipline content and academic skills. This process enables students to identify areas for improvement and also, enables staff to learn about each student's writing styles, capacity for analysis and higher order thinking, which is helpful in monitoring academic integrity and future incidents of cheating.

While diagnostic and formative assessments are frequently recommended, the practice in higher education institutes is less clear. A recent review and analysis of 188 studies identified in key academic databases reported by Morris, Perry, and Wardle (2021), suggested that few higher education providers have embedded formative assessment into their culture and practices, apart from the low-stake quizzes. They acknowledged that while formative assessment appears to be a

valuable approach to supporting student performance, higher education practitioners well might benefit from the evidence-based assessment currently being rolled out in the compulsory school sector of education.

The importance of timely feedback is another regular theme referred to within the broad discussion on feedback (Hattie & Timperley, 2007). Timeliness is discussed in term of providing feedback in sufficient time for a student to incorporate that advice into their next assessment tasks. The timeliness of feedback is also linked to research on memory and retention. The Ebbinghaus Forgetting Curve suggests that new information is more easily remembered and recalled if it is refreshed within the first twenty-four hours and that after seven days only 25% will be recalled and after one month only 10% will be recalled if the material has not been revisited (Shrestha, 2017).

The importance of providing accurate feedback on how to improve performance is another frequent theme within the literature on assessment feedback (Al-Bashir, Kabir, & Rahman, 2016; Hardavella, Aamli-Gagnat, Saad, & Sreter, 2017). The recommendation is that feedback should provide specific advice on how to improve performance such as 'this report would have been improved if the link between theory and practice was more explicit' or 'greater reference to case studies would have improved this report' or next time' make sure that you include a conclusion which summaries your main findings'.

Online platforms provide several advantages when considering how to provide timely and accurate feedback. Most platforms or LMSs contain features that allow confidential written feedback on assessments to be posted. In addition, most enable both synchronous and asynchronous audio and video feedback. These sessions can be generic and provided to groups of students or personalised to a specific student (Al-Bashir, Kabir, & Rahman, 2016).

Giving effective feedback can be challenging and some academic staff benefit from professional development sessions and feedback tools to help them frame assessment advice. One such tool currently being trialled is the Feedback Handprint tool (Bennett, 2021). This artefact is based on an acronym inspired by the hand - **T**humb, **I**ndex finger, **M**iddle finger, **R**ing finger and **P**inky finger. The **T** is a reminder to provide *Timely* feedback, the **I** reinforces the need to focus on feedback which leads to *Improvement*, the **M** is a prompt to provide feedback, which is *Meaningful*, the **R** is a reminder to use an Assessment *Rubric*, and the **P** stresses that the feedback should be *Personalised* to the individual student's assessment and previous performance level.

Peer and Self-Assessment

In more recent times, self and peer assessment, which can be considered another important form of feedback, has been introduced into many higher education courses. Self-assessment and co-creation of assessment tasks in linked to the notion of shared responsibility for learning whereby the lecturer and student are viewed as partners in the learning process (Adachi, Tai, & Dawson, 2018).

Studies suggest that when students are involved in designing the assessment and/or self-assessing they are more committed to the process and develop a deeper

understanding of the material (Deeley & Bovill, 2017; Adachi, Tai, & Dawson, 2018).

The value of peer-assessment and team-based assessment is also reported in the educational literature. By assessing a fellow student's work and working in teams it is suggested that students are forced to think more deeply about the assessment tasks and the qualities to look for. This process adds to their learning and overall knowledge about assessment expectations (Vogler & Robinson, 2016; Zhang, 2018).

Online assessment lends itself to self and peer assessment as many features within a regular LMS facilitate the ability to make anonymous assessments accessible to other students for feedback. The feedback is easy to record and track and can be in various forms such as written feedback, audio feedback or visual feedback. A recent study of Spanish university students (Pérez, Vidal-Puga, & Pino Juste, 2020) reported that anonymous peer assessment, using online feedback tools was valuable for learning and correlated highly with lecturers' assessments.

Summary of Literature Review

To provide some structure to the vast body of literature on assessment and specifically, on online assessment, the literature review section was signposted with the main themes to emerge from the review. These themes provided the backbone and substance for the DASH C21 Framework eventually developed in this project. The key findings from the literature review informed the Inputs, Dimensions and Outputs of the framework. As indicated, the review of literature was iterative and additional studies and resources were examined and re-examined as issues and challenges arose throughout the development of the framework.

Methodology

This project utilised a mixed research, development and collaborative approach to the design of a digital online assessment framework. It was based on a series of iterative phases which continuously informed and refined the framework which ultimately became the DASH C21 Framework.

Phase 1 – Review of Literature

This phase involved a substantial review of academic and research literature on assessment and online assessment in the higher education sector. These scholarly studies spanned a range of related themes including assessment philosophy, protocols and practices, the impact of emerging technologies on assessment design, the role of assessment feedback in learning, and the potential impact of web-based cheating and assessment outsourcing sites on academic integrity and the reputation of higher education qualifications. Initially, the review focussed on the Australian studies but expanded to international research in search

of verification and points of difference. The review of literature provided the foundations for the subsequent phases and the development of the ultimate Digital Assessment Framework (DASH C21).

Phase 2 – Preliminary Framework Concept

In this phase, an initial draft Online Assessment Framework diagram, based on the growing review of literature was created as a starting point. The framework was informed primarily, by the Seven Propositions reported in the Australian collaboration (Boud and Associates, 2010).

The preliminary framework consisted of a two dimensional matrix. On the bottom axis were seven foundational assessment *Principles* representing the principles of: engagement, feedback, collaboration, culture, learner-centred, professional development and trustworthiness. These *Principles* fed into the next layer of the matrix which contained corresponding *Practices*. The third layer identified *Implementation* strategies for the each of the Principles and Practices and the top layer offered suggestions for *Stretching Horizons* and exposing assessment design and management to new possibilities through emerging technologies and through reimagining assessment and its role in developing a culture of life-long learning.

The vertical axis of the matrix depicted cycles of quality assurance through continuous monitoring, evaluating, improving and reviewing of the framework. The quality assurance processes recommended included seeking feedback from critical friends and experts on assessment, consulting with academic colleagues, trialling aspects of the framework, seeking student feedback, undertaking data analysis, and engaging in assessment moderation and benchmarking activities.

Phase 3 – Consultation and Collaboration

Seeking external, independent advice and feedback early in the project was a deliberate strategy. It was designed to ‘test’ the perceived value of the initial draft framework, and at least, the concept of an Online Assessment Framework, and to elicit some guidance and direction for the subsequent project phases. The original preliminary draft Framework and a one-page concept paper was distributed to 32 people, selected by their academic profile and interest in assessment in higher education. Respondents were invited to respond to the questions in an attached survey or, if they preferred, to provide general feedback and comment. The target groups for the survey included: international learning and teaching scholars; academics working in universities within Australia; academics working in independent higher education providers in Australia; and education consultants working in the higher education sector.

The survey remained open for almost three weeks and a reminder was sent four days prior to the closure date. Of those invited to respond to the survey, 65.4% per cent provided feedback by the deadline. For reporting purposes, the number of potential respondents was adjusted to 26 people (due to outdated or wrong email addresses). Not everyone responded to every question in the survey

and some respondents simply provided an overall response, as they were invited to do, if they found this more convenient.

The respondents confirmed that whilst the pandemic had precipitated the move to online learning and assessment, the overall view was that even when the pandemic is under control, online learning will remain popular along with a shift in curriculum more focused on creativity and innovation, flexibility, problem solving, agility, critical analysis, digital communication skills and teamwork. There was general affirmation of the need to be looking forward and designing digital assessments in line with future knowledge and skill requirements and emerging technologies.

As a result of the analysis of the survey responses the following changes were made to the draft Framework:

- a new visual diagram of the graphic was designed which provided greater clarity on each of the elements and their connection with each other;
- the foundational layer, ‘Principles’, was expanded to ‘Principles and Values’;
- the number of ‘Principles and Values’ was increased from seven to ten with the addition of the three new Principles: ‘Context’, ‘Pedagogy-driven Technologies’ and ‘Quality Assurance’;
- all ‘Principles and Values’ were explicitly linked to Assessment;
- the initial ‘Practices’ layer was expanded to ‘Practices and Pedagogy’;
- the ‘Implementation’ layer was renamed ‘Strategies’;
- a new layer ‘Emerging Technologies’ was added to the Framework.

Phase 4 – Consolidating the Refined DASH C21 Framework

On the advice of the survey respondents, a new visual graphic of the Framework was created which provided greater clarity on the structure and function of the Framework. The new Framework structure made clear the *Inputs*, the *Dimensions* and the *Outputs*.

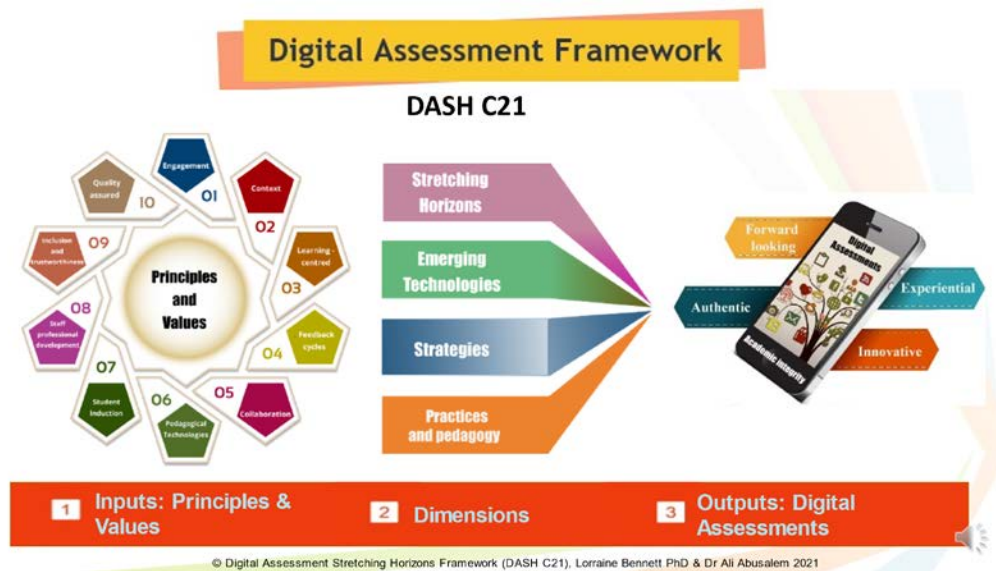
The Inputs that drive the Framework and provide the building blocks are the ten *Principles and Values*. These Qualities and Values stress the importance of *Engagement, Context, Learning-centred, Feedback cycles, Collaboration, Pedagogy informed technologies, student induction, Staff professional development, Inclusion and trustworthiness and Quality assurance*, in the design, management and implementation of effective digital assessments.

The Framework’s four *Dimensions* are *Practices and Pedagogies, Strategies, Emerging Technologies* and *Stretching Horizons* (a nod to the future). They guide the application of the *Principles and Values* and inform the *Outputs* of the Framework.

The Outputs are digital assessments designed for their *Innovative* (foster creative thinking), *Authentic* (related to real-world situations), *Experiential* (involve active engagement), *Forward looking* (preparation for future workplaces/lifestyle challenges and *Academic integrity* focus and qualities).

The visual representation of the DASH C21 Framework is provided in Figure 1.

Figure 1. DASH C21



An example of how to use the Framework is described in Table 1 by applying *Context* as the example *Principle and Value*.

Table 1. Application of DASH C21

Input - Principle and Value Context	Dimensions	Output
<p>The <i>Context Principle and Value</i> is a reminder that it is important to consider the background of your students and the prior knowledge, skills, experiences and attitudes they bring to the learning environment. Students will be more motivated and likely to perform better if the assessment has scope for them to build upon existing skills, knowledge and interests.</p>	<p><i>Practices and Pedagogies</i> Implementation of pedagogies that consider the background, interests and level of a student’s knowledge, skills and cultural background is important when selecting case studies and business scenarios for analysis. Students need to be familiar with the context and not be put into situations of cultural tension where they feel uncomfortable or unfamiliar with the situation.</p> <p><i>Strategies</i> When considering <i>Context</i>, assessment design and requirements need to set interesting tasks which are attainable but challenge and extend the learner.</p> <p><i>Emerging technologies</i> Many contemporary students have high level digital technology skills and interests. Designing innovative assessment tasks which encourage use of visual and audio technologies as alternative modes of demonstrating and communicating learning, motivates students and fosters</p>	<p>The type of digital assessments that align with the Principle of Context are ones where students can draw upon prior interests, knowledge and skills. In some cases, the assessment task may be designed to challenge or justify existing attitudes and interpretations.</p>

	<p>sustained engagement in learning.</p> <p><i>Stretching Horizons</i></p> <p>This dimension promotes opportunities to embed choice and flexibility into assessment formats. It is about exploring new assessment pathways, building confidence and encouraging creativity. It suggests experimenting with assessments formats such as video and audio pre-recorded presentations, narrated slide presentations, digital posters, diagrams, flow charts, debates, plays and poems.</p>	
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Phase 5 - Project Artefacts and Dissemination

One of the key challenges in introducing change into higher education culture and learning and teaching practice is how best to engage with staff and disseminate new information. This is sometimes referred to as bridging the gap between theory and practice or transforming project outcomes into practice. Effective dissemination is often an overlooked phase of project development.

A useful working definition of dissemination is that it is ‘the planned process of understanding potential adopters and engaging with them throughout the life of the project to facilitate commitment to sustained change’ (ALTC, 2011).

To support the dissemination of the DASH C21 Framework, several project artefacts were developed, the key ones being four narrated slide presentations, which have been converted to MP4 files. The presentations address the following topics:

- an introduction to the background and methodology of the online assessment framework project;
- an overview of the Digital Assessment Stretching Horizons Framework for the Twenty-First Century (DASH C21) with a focus on the Inputs, the ten Principles and Values;
- a description of the four dimensions of the Framework - the Practices and Pedagogies, the Strategies, the Emerging Technologies and Stretching Horizons which encourage staff and students to deepen their thinking and learning, to develop learning and assessments artefacts which look ‘outside the box’;
- a presentation on the Framework’s Outputs which consist of a series of sample digital assessments which align with the Principles and Values and Dimension contained in the Framework. These examples include digital assessments which are experiential, innovative, authentic, forward looking and adhere to academic integrity policies, protocols and practices. The presentation provides several digital assessment formats which can be easily customised for use in a range of discipline units and course levels. Each assessment is underpinned by one or more of the principles and

values, and dimensions embedded in the DASH C21 Framework and highlights the potential link to sample Unit Learning Outcomes.

Phase 6 – Staff Professional Development Toolkit and Workshops

To support the dissemination of the DASH C21 Framework and to assist staff to embed the framework into practice, a DASH C21 Toolkit was also developed. The Toolkit provides a range of useful resources which can be used in staff professional development sessions or for individual self-paced learning. The intention is to continue to add to the Toolkit as new ideas and resources are identified. The Toolkit consists of two folders. The main folder contains a copy of the DASH C21 Framework, an introductory Flyer and the four narrated slide presentations specifically related to the DASH C21 Framework and the elements within the Framework.

The supplementary folder contains resources such as: ‘Ice breaker’ activities; a ‘Feedback Handprint’ tool; an original poem ‘Living, learning and leading university reform in the pandemic shadow’ (Bennett, 2021); a sample Assessment Rubric built around Learning Outcomes; annotated references: useful websites; and other professional development materials which can be used to support DASH C21 professional development workshops or as a catalyst to spark discussion on creative approaches to digital assessment.

Recommendations

This project set out to create a resource with the potential to bridge the gap between online assessment theory and practice and to provide some tangible, digital assessment strategies and ideas. Due to the pandemic, and even prior to its impact, higher education Institutes across the world had been experimenting with, and trialling various forms of online assessment. Investigation of assessment research and studies, including online assessment, revealed that there is a growing recognition and acceptance of the notion that learning is an essential component of assessment, and that agreement on the learning outcomes should be a starting point for curriculum and assessment design. The following recommendations provide some ideas on how to implement the DASH C21 Framework effectively and areas that need further exploration.

Recommendation 1

That the implementation of the Framework is supported by extensive digital dissemination strategies, adequate investment in infrastructure and a variety of staff professional development activities and resources.

Recommendation 2

That the Framework is trialled and tested in a range of contexts, such as undergraduate and post graduate courses, across diverse discipline areas and in different cultural and socio-economic settings.

Recommendation 3

That the Framework be viewed as an evolving, dynamic Framework which will need to be modified, added to and customised to different learning environments and contexts.

Recommendation 4

That as part of ongoing quality assurance of the Framework, a wide reaching strategy is developed to capture feedback regularly on the effectiveness of the Framework from all key stakeholders. This should include feedback from students, academic staff, course-co-ordinators, IT staff, curriculum designers, learning and teaching specialists and student support staff.

Conclusion

The central research question addressed in this project was: Drawing upon sound pedagogy, lived-academic-experience, research and knowledge of contemporary digital technologies, is it possible to develop a 'fit for purpose' Digital Assessment Framework to guide and support the design of authentic, innovative, valid and reliable online assessment practices for the higher education sector?

History shows that the pandemic accelerated the transition to online learning, teaching and assessment in higher education. However, before the impact of the COVID-19 virus, academic leaders were reporting problems with traditional modes of operating within the sector. A significant book entitled: *The University Challenge: Changing Universities in a Changing World* (Byrne & Clarke, 2020), published just prior to the pandemic advocates for urgent reform of the sector. Their recommendations for change include greater application of online and digital approaches to teaching and engagement with students, more flexibility through the provision of synchronous and non-synchronous learning opportunities, a move away from invigilated examinations, greater emphasis on project and group work and assessment portfolios as evidence of learning.

The DASH C21 Framework is an attempt to support the reform agenda recommended for the higher education sector by addressing the central research question identified in this project. The findings recognise that regardless of the impact of the pandemic, the trend and appetite for digital technologies in learning and assessment practices, has gathered momentum. Like any change that happen quickly, the policies, processes and infrastructure to support the transition to digital

assessment practices and to optimise the benefits of the change, are lagging the practice. Hopefully, the DASH C21 Framework will provide some structure and direction to guide digital assessment practices based on learning outcomes.

The Framework is clearly informed by sound pedagogy, lived-academic-experience, research and knowledge of contemporary digital technologies. Whether it proves to be 'fit for purpose' and how well it supports the design of authentic, innovative, valid and reliable online assessment practices needs further testing. However, the feedback to date is very promising and it is anticipated that as the Framework is implemented and evaluated further, it will lend itself to being customised to suit the needs of a range of users across the higher education sector.

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