

The future of assessment: five principles, five targets for 2025

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Contents

Background to the report	4
Contributors	5
Introduction	6
The five principles	8
Principle one: Authentic assessment	9
How is technology being used?	10
Peer and self assessment	10
Immersive technologies	10
Video	10
Conclusion	11
Principle two: Accessible assessment	12
How is technology being used?	12
Conclusion	13
Principle three: Appropriately automated assessment	14
How is technology being used?	15
Instant marking and feedback	15
Adaptive comparative judgment	16
Conclusion	16
Principle four: Continuous assessment	17
How is technology being used?	17
Learning analytics	18
Digital qualifications	18
Artificial intelligence	18
Conclusion	18
Principle five: Secure assessment	19
How is technology being used?	20
Educational data forensics	20
Essay mills and contract cheating	21
Online invigilation	21
Conclusion	21
Targets and recommendations	22
Five targets for the next five years	23
How could we meet the targets?	24
Conclusion	26

Background to the report

In 2019 Jisc convened a group of experts for a day-long meeting to explore the future of assessment in universities and colleges and how technology could be used to help address some of the challenges and opportunities we face.

This report is the result of that meeting and follow-up interviews with a wide range of contributors. The work is part of Jisc's Education 4.0 vision to explore how emerging technology may change education. We are keen to hear from anyone interested in discussing the issues in the report and how we might work together to meet the five targets for 2025. Please get in touch at innovation@jisc.ac.uk

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Introduction

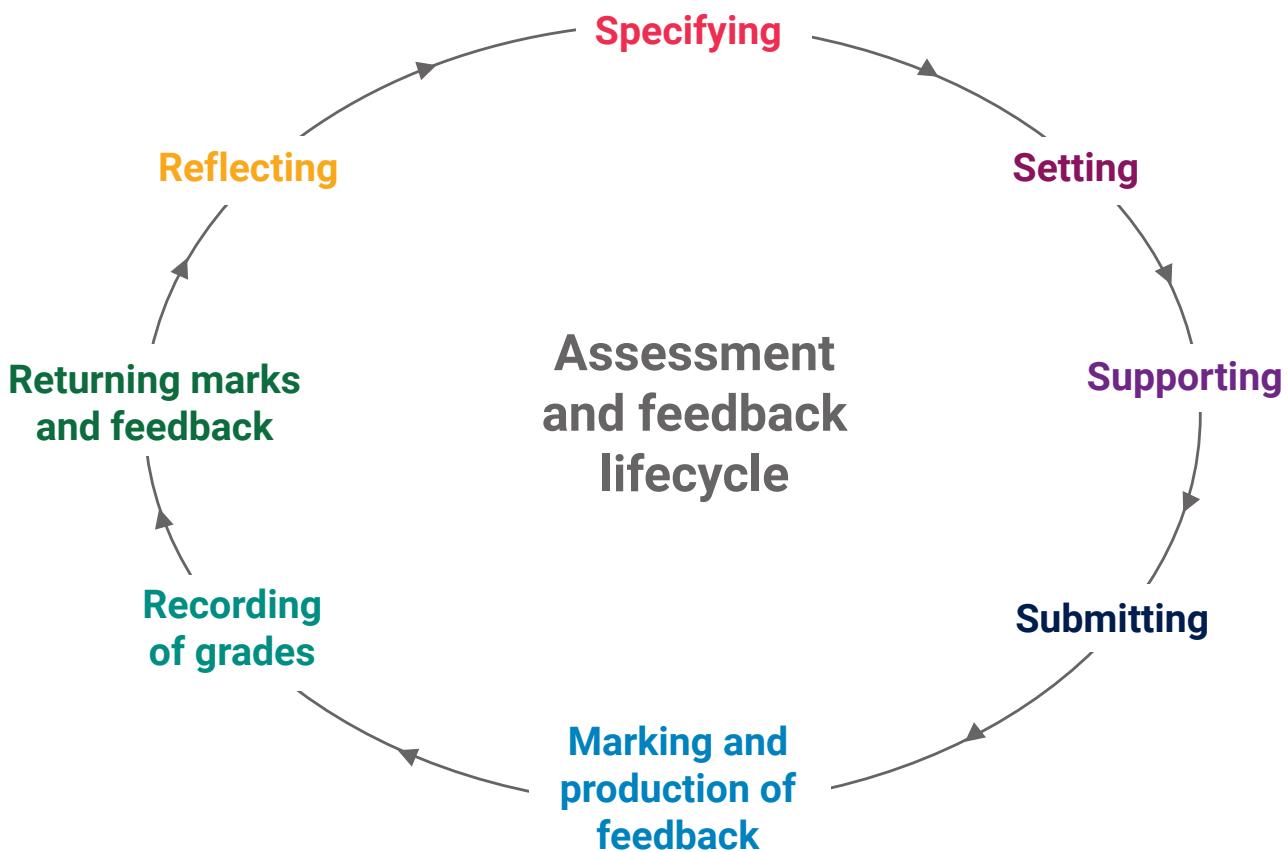
Assessment is crucial to the educational process. Done properly, it drives improvement, shapes learner behaviour and provides accountability to employers and others.

It can also be a source of dissatisfaction, frustration and anxiety. Does it assess the right things? Is it getting the best from learners? Does it take place at the right points in the learning journey? Is it susceptible to cheating? Does it involve a sustainable workload?

Existing and emerging technologies are starting to play a role in changing assessment and could help address these issues, both today and looking further ahead into the future, to make assessment smarter, faster, fairer and more effective.

'Assessment' is a broad term and we take a broad approach to it in this report. We consider formative, summative and other types of assessment across FE and HE and over many of the areas covered in the Jisc assessment lifecycle model (jisc.ac.uk/guides/transforming-assessment-and-feedback/lifecycle)¹.

¹ The model (2016) shows a high-level view of the academic processes involved in assessment and feedback, and applies to formative and summative assessment and to any scale of learning from a full degree to a short course. It was originally developed by Manchester Metropolitan University and has been used and adapted by many other educational organisations since.



We argue that universities and colleges could use technology to transform assessment by making it more:

Authentic: preparing the learner for what they are going to do next, meeting employer needs and testing knowledge and skills in a more realistic, contextualised and motivating way.

Accessible: designed throughout to be usable by everyone to the greatest possible extent, including those who have a long-term disability, a short-term injury or a mental health challenge.

Appropriately automated: easing teachers' marking and feedback workload, and providing quicker, more detailed and more actionable feedback for students.

Continuous: rich in practice opportunities and reflecting the fact that students today need to be capable of lifelong learning, to adapt to changes in the world of work and across their lives rather than succeeding at one high-stakes, high-stress exam.

Secure: ensuring that the right student is taking the right assessment and that the work they are submitting is their own and abides by the rules.

Taken together, these five principles, underpinned by enhanced digital skills, practices and confidence for staff, offer a holistic approach to more effective assessment that also drives learning, supporting students to identify their strengths and weaknesses and to direct their future work.

However, while there is an appetite for change in UK education, in reality the pace of this change is slow. Much of the good practice we highlight in this report still seems to be in small-scale pockets of activity rather than organisation-wide examples.

This is not altogether surprising given the challenges in this area. Organisational culture and readiness are key for the kind of transformational programmes required to change assessment. They are inevitably linked to staff time, resource and willingness to engage, along with inspiring staff to

understand what is possible. However, in the Jisc digital experience insights survey 2019, only 34% of HE teaching staff and 36% of FE teaching staff said they were offered regular opportunities to develop their digital skills and only 13% and 15% were given time and support to innovate².

The various needs and practices of different disciplines cannot be discounted. Innovation can also be stifled by education policies that focus on high-stakes, end-point assessments, particularly in FE. The maturity and suitability of the technology is not yet a given in all areas. Logistical difficulties should not be underestimated. With summative assessment, the scheduling and logistical challenges of securely testing thousands of students over a short period, especially in subjects with large cohorts, are enormous. The logistical implications of even a move from pen and paper to digital devices are not trivial. It will take time and investment to create an environment where new forms of assessment can be introduced and scaled up.

And yet there is clear evidence of large-scale change when it comes to active learning and blended approaches, which face many of the same kinds of challenges. Some European universities are using technologies far more than their UK counterparts³ and are sending very strong messages about constructive alignment: if you digitise teaching and learning, you need to digitise assessment and vice versa. Digital technologies offer the possibility of making assessment more authentic and less burdensome for all involved. Indeed, there is a risk that the sector faces being rapidly left behind if we do not start preparing to tackle assessment in significantly different ways.

To achieve the necessary change, in the second part of the report we suggest five targets for the next five years, which relate to each of the principles, and we offer recommendations for next steps towards meeting these targets.

²<https://digitalinsights.jisc.ac.uk/our-service/our-reports/>

³ Newcastle University is understood to be one of the institutions conducting the most digital exams of any UK HEI, with about 10% of exams (around 170 exams involving 15,000 students) being digital in 2018. In the Netherlands and Norway a number of institutions are close to exams being 100% digital.

The five principles



Principle one: Authentic assessment

"When students are completing all their formative work digitally it's rather bizarre to be expecting them to sit under examination conditions for three hours or more doing handwritten examinations."
Richard Walker, head of programme design and learning technology,
University of York

Authentic assessment lets the learner express themselves in ways which feel natural to them and prepares them for what they are going to do next. Technology offers opportunities to test knowledge and skills in a more realistic and motivating way than pen and paper tests, which can appear irrelevant outside the academic world. More authentic assessment also encourages the learner to integrate knowledge and skills, and act on knowledge. It develops deeper, more integrative personal learning and knowing.

In a move away from the traditional essay or exam, assessments are building in authenticity by asking students to develop websites, set up online profiles, shoot and edit videos, and use social media. Crucially, assessment design encompasses the process as well as the end-product, giving students experience of working in teams and in ways they are likely to meet in industry. This is only going to become more important given that, according to the Jisc digital experience insights survey 2019, only 40% of FE students and 42% of HE students believe that their course prepares them for the digital workplace⁴.

⁴ [http://repository.jisc.ac.uk/7671/1/32323h2_JISC_DEI_StudentReport'19_A4_HR_\(Web\).pdf](http://repository.jisc.ac.uk/7671/1/32323h2_JISC_DEI_StudentReport'19_A4_HR_(Web).pdf)

"We're using GitHub Classroom because it effectively mirrors the workflow that the professional developer would undertake but GitHub Classroom is beautifully supplied to do that in an educational context. We're getting people to engage in authentic real-world tasks in an online environment which they would do as a professional developer."

James Trueman, academic lead: assessment,
Anglia Ruskin University

How is technology being used?

Peer and self assessment

PeerWise (<https://peerwise.cs.auckland.ac.nz>) is a free tool used by many universities to allow students to create questions for formative peer testing. Recent research⁵ shows that while writing questions helps student performance, it is even more enhanced when they also comment on posts by other students..

Pitch2Peer (pitch2peer.com) was created by Dutch universities to enable students to learn from each other's work and feedback. Following an assignment, students submit their 'pitches' – videos, photos, posters, slideshows, animations and text – to Pitch2Peer. The students can then reflect on their own work as well as review their peers' pitches. The tool has been embedded into a range of commercial VLEs.

Peergrade (peergrade.io) is a Danish platform that allows students to give each other anonymous feedback on assignments set by a teacher.

WebPA (<https://webpaproject.lboro.ac.uk/welcome/what-is-webpa>), at Loughborough University, is an older, well-established online peer-moderated marking system, designed for teams of students doing group work. In some universities it is being replaced by **Buddycheck** (buddycheck.io/).

Immersive technologies

"We're starting to see people exploring the potential of virtual reality approaches and not just for assessing pilots and tank commanders, but for assessing learners in more mainstream educational settings."

Martyn Ware, head of assessment futures,
Scottish Qualifications Authority

There are many good examples of virtual and augmented reality (VR / AR) being used to deliver authentic learning experiences by allowing learners to make mistakes without suffering real-world consequences. Assessing topics such as health and safety can be done far more effectively when learners are working in virtual representations of real environments such as a factory, milking parlour or construction site. Immersive technologies can also be used to assess a real-world event. See case study opposite.

Video

The Open University of the Netherlands has experimented with using technology to support role-play situations where students practice responding to others rather than simply delivering a presentation. The **i-SPOT** (<https://library.iated.org/view/KUNTZE2017ISP>) application allows students to respond to short video clips via a webcam, view and change their responses, compare themselves to expert responses and see common mistakes. Once a student is satisfied with their response, they can share their video with other students and/or the lecturer to receive feedback. They can also give feedback to others.

⁵Duret, D., Christley, R., Denny, P., and Senior, A. (2018) Collaborative learning with PeerWise. *Research in Learning Technology*, 26. <https://doi.org/10.25304/rlt.v26.1979>

The video discussion platform **Flipgrid** (<https://flipgrid.com/>) is also gaining traction.

"You have to think about your learners. If you've got Performing Arts students, and you're asking them to write an essay, they're like little jumping beans. They want to be up and about performing. So, give them a tool that allows them to demonstrate those strengths and their knowledge. Flipgrid is ideal for learners who like being in front of a camera."

Deborah Millar, group executive director of digital learning technology, Grimsby Institute

Conclusion

"The university needs to send a clear signal that redesigning assessment to support student learning is one of the most important things they want programme teams to be doing."

Sarah Davies, director of education innovation,
University of Bristol

While there are pockets of authentic assessment and some disciplines are making great strides, there is little evidence of concerted strategic moves to make assessment more authentic across institutions and more coherent across programmes of study.

Good assessment design is the foundation of authentic assessment and it requires strategies and roadmaps. Institutions need to ensure that staff are aware of a wide range of assessment types and able to judge what type of assessment best suits a particular learning outcome and where technology can add value. Trade-offs may be necessary with other principles, such as secure assessment. For example, few real-world working practices would ask somebody to undertake a task without access to sources of reference information, so 'open book' exams are clearly more authentic but may also be less secure.

360° review at Preston's College



Preston's College in Lancashire has been using immersive technology in formative and summative assessment. The dance studio has been using a 360° camera in class, placing it in the middle of a set of dancers so that they can look fully at how they move through space, their technique and how they relate to each other in different directions – and using it as a reviewable resource for learners and tutors. In the School of Music, a 360° camera was placed on stage where learners were being assessed for a live performance. The 360° video footage was then embedded into a platform which allowed comments and feedback to be placed over the screen at crucial points in the performance.

"What's different about 360° is that you can walk around yourself and the review possibilities are magnified. And it's great if you use the Google glass settings as well so you can put it on YouTube and walk around the stage," says Frank McHale, Preston's e-learning developer.

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Frank McHale, Preston's e-learning developer.



Principle two: Accessible assessment

Assessment must become more accessible and inclusive. While accessibility has always been important for ethical and equity reasons, there is now also a legal requirement for UK public sector websites and mobile applications to achieve specific accessibility standards, due to new regulations coming into force⁶.

Inclusivity also encompasses learners from historically marginalised backgrounds.

Accessibility needs to be viewed in the very broadest sense and designed into assessment practice from the outset. In practice, many institutions are still at the stage of 'retrofitting' accessibility by taking a non-accessible assessment and providing adaptations to meet the needs of students with specific disabilities.

However, any student with a sports injury or a short-term illness affecting their vision or hearing may have exactly the same needs as a learner with a longer-term disability. A well-designed assessment benefits all students by allowing them to produce their best work while minimising costly and inefficient workarounds and adaptations for particular needs. The accessibility features built into many standard programs and applications can make it much easier to support individual needs using digital technologies rather than paper-based assessment.

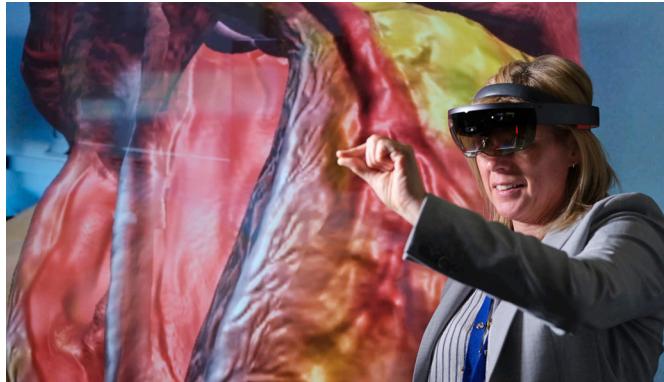
"We have a guiding principle that if assessment isn't inclusive it's not good assessment. That's one of our ground rules. We didn't want to go down the road of having an assessment for 90% of students and then having a row of assessments on offer for those students who couldn't do the main one. Instead we wanted to flip it round and, as far as is possible – and it's not always going to be the case – try to make the assessment inclusive for everybody."

James Trueman, academic lead: assessment, Anglia Ruskin University

How is technology being used?

The ability to change font size, colour etc to support learners with visual impairment or dyslexia has been one of the best-known and most used features of digital technologies for a number of years. However, while technologies supporting voice-to-text and text-to-voice are well established and reliable, they tend to be little employed in assessment, aside from the use of screen readers to help the visually impaired.

⁶ jisc.ac.uk/accessibility



Deborah Millar is group executive director of digital learning technology at Grimsby Institute, where 18% of learners have a declared disability. By promoting the use of accessible technology, and taking staff through online learning modules about accessibility, she is seeing benefits across the college.

"I drive everything including assessment through accessibility... So not every member of staff is good at writing feedback. They're really good at one to one feedback so why not use audio feedback?"

Technology can also make assessment more inclusive of those with mental health issues, such as anxiety. Under authentic assessment, students may well be asked to do more team work and deliver more presentations but these activities can be highly stressful for some students. Anglia Ruskin University is experimenting with video to support these students:

"Technology is a huge boon to what we can offer students. Some students find presentations terribly daunting and so one of the things that we are trying to do is develop an iterative workload. Students can video record themselves doing the presentation and they can do it as many times as they like until they get it right, until they are happy with it. They then submit their video. It iteratively grows from there, until eventually they have built the skills and confidence to deliver a face to face presentation."

James Trueman, academic lead: assessment, Anglia Ruskin University

Case study: accessibility by default in Norway

National guidance issued to all Norwegian universities recommends that solutions should be universally designed in order to be usable by everyone to the greatest possible extent, regardless of the user's age or ability. In relation to digital assessment, it recommends accommodating assistive technologies including:

- screen readers/magnifiers
- refreshable braille displays and eye control
- an option for voice control of software and functionality
- support for reading and writing (including speech synthesis)
- an audio-out option eg with headphones
- language support for all of the official languages used in each country, including keyboard support for all the necessary characters, as a minimum

Conclusion

Accessible assessment is currently a high priority for UK universities and colleges. When approached as a matter of good learning and assessment design, it benefits all learners and results in organisational efficiencies. However, there may also be concerns around ensuring that assessments meet the needs of the programme, and tensions between designing for accessibility and introducing innovation.



Principle three: Appropriately automated assessment

“Assessment is a massive driver of everybody’s workload. It’s almost the beast everyone has to serve.”

Sarah Davies, director of education innovation, University of Bristol

Designing, marking and feeding back all take up a large amount of time for teachers and can mean that they are not able to deliver results quickly or provide the detailed feedback that students want. The human element of feedback is valued by teachers and students alike but rising student numbers are adding to marking workloads, and students express **more dissatisfaction with assessment and feedback** (ucl.ac.uk/teaching-learning/case-studies/2018/apr/how-we-raised-our-nss-feedback-and-assessment-scores-26-three-years) than with any other aspect of their learning experience, according to the National Student Survey.

The problem is high on the agenda of the government’s **Edtech Strategy** (gov.uk/government/news/edtech-strategy-marks-new-era-for-schools), with “reducing teachers’ marking workload” identified as one of the ten key educational challenges. The majority of the edtech organisations that are granted funding from the Department of Education and **Nesta’s EdTech Innovation Fund** (nesta.org.uk/project/edtech-innovation-fund/meet-the-grantees) are providers of online tools designed to automate marking and assessment, such as **No More Marking** (nomoremarking.com) and **Educake** (educake.co.uk).

Technology can certainly help by automating some aspects of assessment such as marking and feedback. And it can do this in a way that improves the student experience and frees teacher time and expertise for the most valuable human activities, ensuring assessment is for learning and not simply of learning.

"We're looking at AI, we're looking at automated marking, we're looking at those types of things to free up staff to work with students in a different way to support them to better succeed, to support them through assessment rather than just measuring the assessment."

Luke Millard, director of educational development, Birmingham City University

Case study: exploring natural language processing at Bolton College



Bolton College wants to move beyond closed questions to explore whether students can provide answers and receive automated feedback based on model answers provided by teaching staff. Staff have been exploring the potential that natural language processing and natural language classifications platforms have to offer from the leading vendors in the field such as IBM, Amazon, Google and Microsoft. Initial results are promising, with positive feedback received from students and teachers. Students liked receiving real-time feedback as they responded to open-ended questions, and teachers stated that these services could lead to a reduction in marking workloads.

How is technology being used?

Instant marking and feedback

Giving students feedback on their progress and guiding their learning via automated marking of multiple-choice questions is now fairly common. Extending it to natural language processing and classification, as Bolton College is trying to do, is more ambitious.

"Our initial trials have demonstrated that the quality of student work improves when their work is mediated by a computer. We recognise that larger trials need to be undertaken to ascertain if real-time feedback informs and improves the quality of student responses to open-ended formative assessment activities.

"The emergence of this new assessment tool enables teachers to make use of a richer medium for assessing their students. Traditionally, online formative assessment activities are undertaken using closed questioning techniques such as yes/no questions, multiple-choice questions or drag-and-drop activities. While valuable, this is a rather narrow way to do formative assessment. Our solution enables teachers to pose open-ended questions which can be automatically analysed and assessed by a computer. The ability to offer real-time feedback means that students can qualify and clarify their responses.

"It is important to note that teachers play an important role. They train the classification models that underpin the open-ended questions that they want to present to their students. Teachers may also welcome the fact that the accuracy of the classification models improves as more students engage with each open-ended question and as the volume of training data rises,"

Aftab Hussain, ILT manager at the college.

A clear concern is the extent to which technology might reduce student/academic staff interaction, and to what extent human judgement could or should be replaced entirely – hence the need for ‘appropriately’ automated assessment. Students at Bolton College expressed a preference for tutor feedback alongside the automated feedback: “Students said they like it, but they said that they wanted the teachers still to moderate it” (Aftab Hussain).

For essay-writing students who want instant feedback on style, if not content, écree (ecree.com) describes itself as “your personal AI writing tutor” and provides real-time writing feedback, spelling and grammar support, including whether work is well structured as an academic essay with developed points and a strong conclusion. The aim is to help students improve their essays before their tutor sees them, thereby saving time marking up basic errors and allowing more time to focus on feeding back on the content and learning points.

However, students need to be aware that when such platforms originate from the US they may operate on American English linguistic rules. In addition, students writing in their own voices, or using an expanded range of media, can expect to evolve new styles which may be very apt vehicles for academic ideas but will be unrecognised by this normative approach to marking, especially given knowledge of how algorithms favour dominant cultures.

Adaptive comparative judgment

Comparative judgement works on the principle that the human brain finds it easier to compare two items and decide one is better or worse than the other than to make an objective assessment about the quality of either against a given rubric. Repeated comparison of pairs (usually nine to 12 rounds) ultimately allows the items to be rank ordered.

Adaptive comparative judgment (ACJ) uses technology to automate the comparison process. While scripts are initially compared randomly, the adaptive element comes in as the computer algorithm starts to select the pairs that will most improve the reliability of the ranking. Comparison between very good and very bad scripts is obvious and more effort goes into assessing those that are more closely matched.

While ACJ does not constitute fully automated marking, it speeds up the marking process and the ranking can be used to grade papers and determine grade boundaries. ACJ shows much greater reliability than other methods in high volume assessment using a distributed team of markers. It also enables students to receive feedback from multiple different markers whether staff or peers. ACJ is being used at the universities of Edinburgh, Glasgow and Manchester and those who have used it appear very positive about the advantages while sounding a note of caution that judging criteria need to be very clearly formulated

Conclusion

Automated marking is becoming a crowded market for online solutions. A challenge is developing a good evidence base to understand what works and what doesn’t and to tackle any misguided perceptions that it could supplant rather than augment a vital, human part of the feedback process that both teacher and students value.



Principle four: Continuous assessment

Education is about teaching people to learn. Students today do not absorb a body of subject knowledge that serves them for life: they need to be capable of lifelong learning as they adapt to the changes brought by the transformational technologies underpinning Industry 4.0⁷, with its effects on the world of work and across their lives.

Our approach to, and expectations of, education will change as future workplace requirements change, so students need to develop skills of independent, self-directed learning.

Too much emphasis on a limited number of high-stakes assessment points places stress on individuals and institutional processes, and reduces the time and effort that can be put into formative opportunities. Assessment scheduling can be a difficult balancing act. Over-assessment can have a detrimental effect on student attainment as, with too many different assignments to complete, students cannot concentrate sufficient effort on each one. This is a particular problem if combined with 'assessment bunching', where submission deadlines fall closely together⁸.

"My university has recently changed the way some units are run in relation to observing students' progress without all the pressure of one final piece of work contributing to our grade. Some units have now been structured so that, while the points still count to the degree, instead of the A,B,C grade format, a pass or fail has been put in place. This takes the students' focus off the anxiety of grades. With the pass and fail we are still given feedback despite not having a lettered result."

Brad Miller, undergraduate student at Ravensbourne,
University of London

⁷ jisc.ac.uk/rd/future-trends

⁸ jisc.ac.uk/guides/transforming-assessment-and-feedback/pattern-and-scheduling

How is technology being used?

The use of digital technology offers a host of opportunities for students to capture and reflect on evidence of their learning, to use and share formative feedback and to record progress. Looking forward, there are many possibilities for more transformative uses. Effective use of learning analytics might make some 'stop and test' assessment points redundant, while artificial intelligence might be used to deliver students a personal learning assistant to help formative development. Annual assessment cycles might be replaced by assessment on demand, whereby students can evidence their learning when they feel ready.

Case study: ongoing personalised assessment at Birmingham City University

Birmingham City University (BCU) is developing what it calls a 3D model of student support: Discovery, Development and Destinations. BCU recognises that a cohort of students can have very different experiences and skill sets on arriving at university so it is looking at personalising learning, beginning with discovery/diagnostics on entry. The diagnostics will be based around four pillars of academic skills, numeracy, well-being and competencies. The students will have access to ongoing personalised development through its new assessment centre. The final D is destinations, ie jobs – students will use the assessment centre to practice psychometric assessment and online interviews.

Learning analytics

The '**Quantified Student**' (<https://quantifiedstudent.nl/>) project in the Netherlands is using learning analytics to make students more aware of their study behaviours. The community is producing a range of apps that allow students to measure study-related behaviours and compare them to those of their peers in order to help manage the learning process. Similarly, Jisc's **Study Goal** (jisc.ac.uk/learning-analytics) is an app for students that enables them to view their data and to access other features that support their study.

Dutch universities, notably Amsterdam and Maastricht, have also been researching what data can best help predict a student's final grade. They concluded that the 'undoubted winner' for predictive ability seemed to be performance in formative tests in a digital environment – the act of doing the formative tests seemed to have more effect than different learning approaches and strategies in the run-up to the tests.

Digital qualifications

The **MySkills** (<https://myskills.org.uk/>) project led by City of Glasgow College and involving the Scottish Qualifications Authority is investigating the use of blockchain to support micro-credentialling and allow employers to verify qualifications. The project began in October 2018 and has produced a model for how the transition to using digital certificates in education, using blockchain, might be achieved. Work is now underway on a live trial of issuing digital certificates at the college.

Artificial intelligence

Some researchers are optimistic about the possibilities offered by a combination of artificial intelligence (AI) and the large amount of learning analytics data now available to transform how we assess learning. Rose Luckin, professor of learner centred design at the UCL Knowledge Lab in London, has suggested that, in the near future, AI will be able not only to adaptively guide students through learning content but to comprehend their current state of understanding and motivation, to ensure that the learning

experience is tailored to their capabilities and needs. AI could help us see and understand the micro-steps that learners go through in learning a subject and the common misconceptions that arise.

Conclusion

There is a risk that the differences between automated assessment and formative assessment can become blurred. The distinction is important. For example, some universities, such as Bristol, are placing a renewed focus on genuinely formative assessment: a process in which students are encouraged to take risks, make mistakes, fail and learn from those experiences. This approach is arguably at odds with low-level continual monitoring.

It may be more effective to assess learners continually throughout their course instead of through a final exam. However, while engagement may increase, there is also a danger that continual, low-level assessment may prove to be more stressful for students. And while it may, possibly, reduce staff workload, teachers may also be prepared to experience a small increase in workload in order to transition to a better continual assessment-focused approach that can provide a more authentic assessment experience and put less stress on students.

There are logistical challenges: the use, or not, of continuous assessment is dictated by the procedural systems that institutions are working within, and in some cases can be influenced by the technical solutions in use, such as student information systems. More universities and colleges need to collect the data about their assessment and assessment design in order to make analytics more useful.



Principle five: Secure assessment

"Cheating has become an arms race in recent years. It's a race that you don't want it to be in, but some students will do anything to get a degree, including paying other people to help them out."
Richard Goodman, learning technology team manager, Loughborough University

Universities and colleges need to ensure that the right student is taking the right assessment and that the work they are submitting is their own and abides by the rules of the assessment. Technology can help to ensure exams are secure.

However, there is also a growing need to monitor how new technology is being used to break assessment rules. Cheating has never been easier or more prevalent. A **recent study by Swansea University** (swansea.ac.uk/press-office/latest-research/) analysed surveys dating back to 1978 in which students were asked if they had ever paid for someone else to complete their work. The findings – covering 54,514 participants – showed a 15.7% rise between 2014 and 2018 in the number of students who admitted cheating. Essay mills – online companies that offer essay writing services – are seen to be at the heart of the problem. Illegal in some countries, a ban on their operation in the UK **has been called for** (<https://ji.sc/the-guardian-ban-essay-mills>) by more than 40 vice-chancellors.

Academic integrity is at the heart of this issue. Better assessment design, resulting in fresh, situated, personalised assessment tasks which effectively design out reasons and opportunities to buy in essays, has a role to play in reducing the likelihood of cheating. Technology can play a part.

How is technology being used?

"My entire degree is a distance learning degree so I learn all of it online and all of the exams are online. I currently take them in a meeting room which means that I am in a comfortable environment. I don't have the same stress as when taking exams previously - I remember when I was taking my A-levels there were just tables laid out and it was quite uncomfortable and scary. My online exams are more secure because when my manager invigilates they are given a password on the day of the exam and the exam itself is locked until the time that the exam is sat."

Nicole Stewart, cyber security degree apprentice

Use of biometric data such as face recognition or fingerprints can make it virtually impossible for one student to impersonate another.

Educational data forensics

Educational data forensics involves looking at unusual response patterns, in students taking online tests, as indicators of potential cheating. It assumes that viewing exam activity as an overall timeseries will show most students thinking and responding in rather short bursts whereas a cheat might show a different pattern eg a period of inactivity followed by a large chunk of data entry. Large-scale analysis (using techniques such as process mining) can show deviations that appear to be statistically significant although it can only ever highlight potential cheating.

Taking this even further, the writing style in candidates' answers can be compared to their previous work. Online tools that claim to help detect authorship include **écree** (ecree.com/) and **Elute Intelligence** (cflsoftware.com/). Researchers go so far as to suggest that keystroke dynamics represent a highly individual 'fingerprint' that could be compared against a previous sample. Such uses may raise concerns about privacy and consent.

Case study: digital exams for millions in India

Digital exams are taking place at scale in India through the Indian National Testing Agency (NTA), one of the world's largest exam bodies. Between December 2018 and August 2019, NTA assessed almost 5.5 million candidates for entrance to leading education establishments in India. Students use an e-card with their thumbprint and photo to access the examination room and a photo and thumbprint taken on the day is attached to the attendance sheet which must be signed by the student. The exam is LAN based so it is conducted on a computer but not online. The question paper is delivered in an encrypted format to every

exam centre and is only decrypted when the candidate clicks on the question paper. The order of multiple choice questions and answers will be randomised so that adjacent students are not presented with the same options. Real-time analytics are used to identify potential cheating. A core of around 20 cheating patterns, such as students working too quickly or too slowly, or two students exhibiting very similar patterns, is constantly being updated. Each time a potential cheating pattern is observed, an alert is sent to the invigilators, who are in the room and also watching via a live CCTV feed in NTA HQ.

Essay mills and contract cheating

For essay mills, technology is part of the problem and can be part of the solution. Tools such as the widely used plagiarism detection platform **Turnitin** (turnitin.com/) can help solve this problem, but it must be used alongside work with students to help them understand academic integrity and the issues involved.

"It's always been a case of trying to work with the students to help them understand the principles behind citing and referencing and attributing ideas...this is all about developing students' judgement about these things and their knowledge of their subject area. I think University of York's always done that really well with Turnitin because they would induct every single student to how to use Turnitin... they were one of the earlier institutions to give Turnitin back to students. I think that's definitely the way to go."

A senior teaching fellow in a UK university

Contract cheating is a growing and concerning issue. From a technological perspective, plagiarism tools are of little use. However, Turnitin's **Authorship** (turnitin.com/products/authorship) tool and Unicheck's **Emma** (<https://unicheck.com/blog/contract-cheating-prevention/>) tool show promise as emerging linguistic analysis technologies that, with more development, could offer useful and robust contributions to the assessment field.

Online invigilation

Online invigilation is being increasingly used for remote learners. The European higher education sector seems to be ahead of the UK in this, with such work as the **Online Proctoring for Remote Examination** (OP4RE) (onlineproctoring.eu/en/home/) project.

There are also a number of commercial online proctoring tools on the market, including **Examity** (<https://examity.com>), **Proctor Exam** (<https://proctorexam.com>) and **Proctoru** (proctoru.com).

Case study: online invigilation in a mobile era

Online invigilation is also used in the world of professional qualifications. The Awarding Body at the Association of Corporate Treasurers uses secure online invigilation (the Surpass system) for its global on-screen tests. The invigilator has a monitoring view of the student and a screen recording. The student is also required to use their mobile phone to show that there is nothing hidden in the room (which involves looking under the desk, up their sleeves, ensuring their water bottle does not have a label and that there is nothing attached to their spectacles or behind the ears). They then place the phone in a docking station behind themselves to give an additional view of the room.

Conclusion

Developing academic integrity, good assessment design and an understanding of the pressures that students are under – pressures that may lead them to consider cheating – are the keys to more secure assessment. However, there are also individually promising technologies and tools that can support universities and colleges in identifying plagiarism and contract cheating. These need to be implemented in an integrated, robust, seamless and learner-focused ecosystem. Many tools do not sit within, and will not talk to, existing platforms (such as the institution's LMS) and therefore managing them – setting up assessment tasks, enrolling students, extracting results etc – is a manual task requiring unscalable numbers of hours and people. It also requires multiple login credentials and can lead to lost usernames and passwords, as well as stressed students or failed assessments. There is a significant risk for many institutions in not having the underlying infrastructure to support technological innovation.

Targets and recommendations

Five targets for the next five years

“Digital assessment offers immense opportunities to improve student experience and develop modes of assessment which are more relevant and aligned to today’s needs. However, it also carries risk and it will be important that change is iterative and paced to ensure quality and maintain public confidence in qualification standards.”

Chris Cobb, pro vice-chancellor and deputy chief executive, University of London

If we want to transform assessment to make it genuinely relevant in a timely manner to the needs of students and employers – to make it smarter, faster, fairer and more effective – we will need to increase the current pace of innovation in the sector.

We believe that setting the following targets for 2025 could help to achieve this transformation.



Authentic

There will have been a shift in focus from acquiring knowledge rooted in a particular curriculum or occupational area to acquiring transferable skills, and these will be assessed in a more realistic way.



Accessible

The design of assessments will have moved to an accessibility-first principle that allows the same assessment to be delivered in multiple ways depending on the needs of the learner.



Appropriately automated

A balance will have been established between automated and human marking and feedback that delivers the maximum learning benefit to students.



Continuous

Data and analytics will be in widespread use to assess the effectiveness and impact of continuous assessment and to plan strategies across the whole organisation.



Secure

There will have been a general adoption of authoring detection and biometric authentication for identity and remote proctoring.

Underpinning all the targets is the need for a priority focus on staff digital skills development, allowing teachers more time to experiment and enabling more confidence to implement innovative new approaches to assessment.

How could we meet the targets?

"Put ourselves in the position of young people who are having to take the assessments that we're offering at the moment and to really be honest about whether those assessments are serving those young people well. If they aren't then what are we going to do about it? Do we still think it's going to be ok in ten years' time? What are we doing about that?"

Martyn Ware, head of assessment futures, Scottish Qualifications Authority

The experts consulted for this report suggest a number of actions that can be taken as next steps to progress assessment towards being more authentic, accessible, appropriately automated, continuous and secure, both now and further into the future.

Assessment needs to be treated as a large-scale transformation programme requiring consistent high-level management and organisational support alongside the freedom to innovate and permission to fail. Students must be part of the journey.



Authentic

Understand assessment from the student perspective and build assessment that supports learning and works for today's digital society. There is a need for honest evaluation and to determine whether assessment is fit for purpose in the world that students inhabit now and in the future – this may require going back to first principles and asking what assessment is for.

Work with employers and professional bodies and seek to understand what they need from assessment and what learning and assessment look like in the workplace. If assessment is to be truly authentic, universities and colleges need to understand how assessment can work to prepare students effectively.



Accessible

Establish a universal design approach to assessment, ensuring that all assessments are as widely usable as possible. Use this approach to inform all decisions about assessment strategy, design and technology.



Automated

Communicate, network and collaborate to identify technical solutions and to influence platform providers to better meet the needs of the sector. In a crowded marketplace, universities and colleges can struggle to identify the right technology, so there is a need to share information and work together to articulate how organisations want to assess students and develop requirements. Universities and colleges also need to dedicate effort to identifying which elements of assessment can be automated and which parts are so valuable that, even if they are time consuming, automation should be avoided.



Continuous

Take a structured, organisation-wide approach to learning and assessment design that aligns organisational values, learning and teaching principles and the desired learning outcomes for any programme of study. Universities and colleges need to take a strategic approach to collecting and analysing data about assessments (who, what, when etc), as well as the assessment data itself, to help long-term planning, generate new insights and permit the use of tools such as AI and analytics. Use curriculum analytics to understand better how the curriculum is structured and to identify and correct any issues such as assessment bunching. Once a foundation of data about assessment has been established, use this to explore opportunities where continuous assessment could improve the learning experience.



Secure

Develop a two-pronged strategy for dealing with the critical issue of assessment security by promoting a culture of academic integrity among students and also making better use of technological tools. There are many technologies that are worth experimenting with now, from security applications to online proctoring to digital fingerprinting.

Conclusion

This report reveals a fundamental and growing disconnect between the way we assess education, the value that assessment currently provides to students and the value they need and expect from it.

As UK learning and teaching move toward 'Education 4.0' to prepare students for a world shaped by the transformational technologies of Industry 4.0, the assessment of learning is still rooted in the practices of the 20th century and earlier. Students learn, communicate and collaborate in a digital environment; go on to work in a digital environment and yet online assessment is some way behind the curve. We believe in learning throughout life; where embracing and using knowledge, whether in work or education, is continuous. Assessing that journey should be as flexible as possible, rather than involving an approach that evaluates and tests knowledge through a limited number of high-stake, high-stress assessment points.

UK assessment is ripe for change: and it needs to change to unleash the full potential of both students and the technologies available to educators. There are pockets of good practice and innovation within institutions across the UK (such as Newcastle University's move to digital exams and the project to explore automated marking using natural language processing and classification at Bolton College mentioned in this report). There are many individuals within universities and colleges who recognise the issues and are experimenting with innovative tools and apps to effect change from the bottom up.

However, the overall pace of change is too slow to best serve our learners or match practices in other countries: in parts of Europe, for example, assessment is close to 100% digital and in India digital exams are taking place at scale, assessing 5.5 million candidates in one year using biometric data, digital security and real-time analytics to detect fraud. The UK is, currently, far from doing the same.

This report sets out five, broad, five-year targets that align to the five principles we have set out for assessment: authentic, accessible, appropriately automated, continuous and secure. The targets are essential and realistic: meeting them will confront many of the concerns in this report. But we will not meet them unless we speed up.

And that, in turn, relies on an unglamorous but essential starting point: our institutions need to improve the data and systems infrastructure that can make transformational change possible and enhance staff skills to ensure that technology can be used effectively and appropriately. Both of these are difficult undertakings requiring a long-term commitment and institutions will need to show focused leadership and genuine strategic investment if assessment is to catch up with the rest of Education 4.0 within five years.

Not to do so carries the great risks outlined above. But doing so with success will provide great rewards: an assessment system that is properly reflective of the UK's foremost education, serving learners' evolving needs and getting the best out of them, reducing teacher workload, giving meaningful credentials to employers and keeping our sector globally competitive and relevant.

We will be working with Jisc members to support the sector in meeting the five targets and we urge any university or college that would like to work together on the challenge of the future of assessment to get in touch at innovation@jisc.ac.uk.

The future of assessment over a longer timeframe – up to 2030 – will be explored further in a report from a group convened by Emerge Education, and Chris Cobb pro vice-chancellor (operations) and deputy chief executive, University of London, and supported by Janison. If you are interested in contributing to that report please get in touch with the Emerge research team research@emerge.education

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