Approaches to curriculum and learning design across UK higher education

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Executive summary
This report provides an overview of a landscape review into approaches to curriculum and learning design in UK higher education (HE). The context is the experience and impact on practice of the move to online learning and teaching during the COVID-19 pandemic and national lockdowns. The review was undertaken between May and August 2022.

The review consisted of:

- A review and synthesis of current literature and research into blended learning and models of practice and what we have learnt from the pandemic, including review and synthesis of curriculum and learning design methodologies and how they are being used and adapted within a range of university contexts.

- A survey of the UK HE sector on current practice/challenges around developing curriculum and learning design approaches and practice.

- A series of interviews with a range of practitioners and Jisc staff to complement the survey data and gain further insights into current and developing practice across a range of UK HE organisations.

This report provides an overview of the findings from the survey and interviews. Appendix 2 contains a summary of the models currently in use in UK HE, drawn from the literature review.

For the purposes of this review we used the following definitions.

By **curriculum design** we mean all the processes of reviewing, planning and developing a course of study. This might include formal processes in departments, and mapping content to graduate outcomes or to professional bodies and standards.

By **learning design** we mean defining how learning will be supported within each module or unit: the activities, tools and technologies, core content, class sessions and group types, mode(s) of participation, assignments and assessments, and opportunities for interaction and feedback.

Curriculum design and learning design often overlap, and the term ‘learning design’ is still not widely used. This is why we often use the two terms together in this report – **curriculum and learning design** – to mean all the processes of planning and designing a course of study and how students will learn within it.
Key findings

Strategy and implementation

• Curriculum frameworks/models, design principles and learning and teaching values are recognised as key mechanisms to drive changes in, and support for, curriculum and learning design processes

• Learning and teaching strategies are the primary organisational drivers for the curriculum design process. Curriculum change is implemented in practice through support from a range of centrally located and disciplinary learning/educational development support professionals. Support is typically framed in terms of a locally contextualised model and/or set of design principles which may or may not be well articulated within the learning and teaching strategy

• Curriculum review was also a common driver that emerged from interviews. It provides the occasion and rationale for implementing strategic changes to learning and teaching practice, and gives agency to programme teams. Since the pandemic there is evidence of curriculum review, including new interest in modes of delivery, alongside routine and ongoing curriculum review and refreshes

Moving beyond the pandemic

• Consistency in curriculum design and support calls for a strategic approach. Since the pandemic there appears to be more of an emphasis on curriculum change at the programme level. This can allow for a more coherent use of programme-level resources and information. However, flexibility is still needed in defining component modules, materials and sessions

• Staff workload allocation, staff reward structures and investment in academic staff development were key concerns. If these are not addressed, they represent significant challenges to progress in curriculum and learning design over the next three years

• The role of students as co-creators extends in principle to an active engagement with curriculum and learning design. However, based on the survey responses, this seems to be more of an aspiration than a realisation for many organisations, or is still in the early stages of development. There is a clear desire to work with students beyond the established methods of student representation on review panels etc, and many organisations are actively working with student representatives to increase their involvement in curriculum and learning design activities

Learning design

• Learning design resources may be a route to encouraging open educational practice, given that 64% of responses in the survey indicated that learning design resources are available as open educational resources

• The links between quality assurance, quality enhancement and staff engagement with learning design are increasingly explicit. Engagement with institutional design process/models is actively encouraged in many institutions as part of formal curriculum review processes

• A number of the design models and approaches developed through Jisc’s curriculum design programme (2008-2012) are now firmly embedded into practice and continue to be adapted and contextualised to suit a variety of contexts
Challenges moving forward

In terms of changes to curriculum and learning design over the next three years, the key concerns were issues around staff workload allocation and reward structures and investment in academic staff development.

If universities are to meet the challenges of flexibility around space, place and modes of delivery, then strategic consideration needs to be given to providing updated workload models that recognise (and reward) the changing needs for staff to engage with design activities, evaluate their practice and provide support for innovation and changes of practice that will engage learners.

It appears that there is a need for a shared vocabulary and understanding around modes of participation. Evidence of different student experiences and outcomes could be shared across the sector, along with examples of different ways of organising time, space, independent and collaborative working, synchronous and asynchronous interactions.
Survey overview

The survey was designed to look beyond the emergency responses of the pandemic to see how and if the online pivot is having an impact: what are the current and planned future approaches to curriculum and learning design, and how are staff being supported to design and deliver learning in flexible and accessible ways?

The survey was aimed at senior managers, professionals and teaching staff actively involved in curriculum and learning design in HE. It ran between 26 May and 17 June 2022. It was promoted via Jiscmail lists, relevant professional bodies, including the Association for Learning Technology (ALT) and Staff and the Educational Development Association (SEDA), and social media. Twenty-four in-depth interviews were also conducted with key UK HE staff involved leading and supporting curriculum and learning design, relevant Jisc staff and the Quality Assurance Agency (QAA).

The survey consisted of 26 mixed-response questions. There were 155 individual responses from 75 unique HE providers across the UK. The survey results are summarised in Appendix 1.

Staff roles and institution affiliations
A total of 155 responses were received. They came from a self-selecting group and so largely represent a personal rather than organisational perspective. Respondents were asked to share their institutional affiliation, job role and discipline area. Some respondents were in senior management and so provided a more strategic perspective.

In terms of UK coverage, the individual responses have been aggregated into UK nation universities/HE providers. There was a particularly large response rate (36) from the University of the Highlands and Islands\(^1\) (UHI). In the list below, UHI is included only once.

\(^1\) UHI is a federated university consisting of 12 academic partners and a Central Executive Office. Each partner is responsible for curriculum design within their own context.
Roles and disciplines
Forty-nine (32%) of the individual respondents self-identified as academic practitioners with 47 (30%) identifying as academic/educational developers. Twenty-five (16%) of respondents self-identified as senior management, 25 (12%) of respondents as learning technologists and nine (6%) as learning designers. There was some evidence of evolving role descriptions for staff involved in supporting learning design during the interviews. For example, the University of Liverpool now has a team of educational developers who are specialists in either curriculum development or digital enhancement and the University of Durham has created a new role of learning designer. There is still no single consistently used role description for those involved in supporting learning design.

Forty-eight (32%) of respondents identified as having no specific discipline. This is not surprising given the high level of support roles of respondents. Thirty-seven respondents (24%) identified with education and teaching, again not surprising given the context of the survey. Other respondents identified with 14 different subject areas.

Organisational context for staff support
Responses indicate that staff support for curriculum/learning design is primarily found in central academic development units (117 responses, 75%) and central digital or e-learning units (101 responses, 65%). Significant support is also provided through departments/schools/faculty support (103 responses, 66%). As these figures suggest, the majority of respondents located design support in more than one unit.

In terms of support for online or blended learning, there was a small but perceptible change between central digital or learning units (118 responses, 76%) and central academic development units (94 responses, 61%).

This perhaps indicates a perceived difference between support for the “why” (curriculum/learning design) and the “how” (support/training to use systems). Again, department/school/faculty support also scored highly (90 responses, 58%). This also suggests that most respondents located support for online or blended learning in more than one unit.

A range of formal and informal peer networks (from colleagues to subject networks) were also identified in the free text comments as providing support. However, the role of institutional support for curriculum and learning design is significant.

The survey consisted of:

- 26 Mixed-response questions
- 155 Individual responses received
- 75 Unique HE providers across the UK
Key findings

• Learning and teaching strategies and frameworks are the primary organisational drivers for curriculum design. Organisational-specific learning design support through contextualised use of various models provides the mechanism for implementing curriculum change.

• From the interviews, curriculum frameworks/models, design principles and learning and teaching values were identified as being key mechanisms to drive and support curriculum and learning design processes.

Central academic development units appear to be leading strategy and implementation of strategies relating to learning and teaching, and in turn curriculum and learning design (69.3%). The role of support from within departments, schools or faculty also scored highly, with 51% indicating the importance of this contextual support. Central digital/e-learning units still provided significant support (40.5%). In this more strategic context, central IT departments (5.9%) and the library (3.9%) also featured in responses.

The role and importance of formal organisational/academic committees, and quality procedures, sponsorship by/support from pro vice-chancellors (PVCs)/vice-principals (VPs) of education were highlighted within the open text comments.

Examples of practice

• The University of Hertfordshire has developed a new set of design principles which were released in summer 2021. This involved consulting widely with students and staff.

• The University of the Highlands and Islands has also undertaken a consultation with students and staff to update its values-based learning and teaching enhancement strategy, which was approved in late spring 2022. The 10 values in the strategy must be evidenced across all curricula.

• The University of Liverpool has a curriculum framework model, in place pre-pandemic, that combines pedagogical approaches with institutional graduate attributes.

• The University of Hull launched a new competency-based curriculum framework just before lockdown. In a radical change, learning outcomes have been replaced by programme-level, discipline-specific competencies and relevant skills development. Currently, approximately 75% of undergraduate programmes are using the framework.

• As part of the implementation of its new Strategy for Learning 2030, Glasgow Caledonian University (GCU) has developed a set of eight design principles and an implementation framework to guide academic teams as they develop their curricula. The framework integrates the university’s pedagogical approach, values and graduate attributes.
Curriculum review was also a common theme to emerge from interviews as a locus for strategic change in learning and teaching practice. Institution-wide reviews provide a way for teams to support any practice changes demanded by changes to learning and teaching strategies. Sixty-four free text responses outlined current and ongoing review processes.

“Yes but not necessarily as a result of the pandemic – however, the pandemic has affected student numbers which in turn forces us to review how we work.”

“Yes, there is a university-wide curriculum review in early stages at the moment. We are refining our curricula review, approval and re-approval processes, partly to support the implementation of the new learning and teaching enhancement strategy and partly to support the current curriculum review.”

“We have included a new element to our review of portfolio which includes specific question around ability to offer a blended online component to any new programmes/courses.”

Learning and teaching strategies and frameworks are the primary organisational drivers for curriculum change, while organisational-specific learning design support, through contextualised use of various models, provides the mechanisms for implementing curriculum change.
Learning design

Key findings

• A number of the design models and approaches developed through Jisc’s curriculum design programme (2008-2012) are now firmly embedded into practice and continue to be adapted and contextualised to suit a variety of contexts

• 64% of responses indicated that learning design resources are available as open educational resources (OERs), suggesting that learning design resources may be a route to encouraging open educational practice

There was significant evidence (121 responses) that support for learning design takes place through a project, team or initiative, though 21 responses indicated individuals were not sure if such support was available in their institution.

The details provided in the free text responses indicated that centrally supported team-based approaches are typical. A range of support is offered, with workshops and on-demand services (based on specific requests from course/project teams) being the most common.

The importance and influence of constructive alignment and Bloom’s taxonomy as part of supported learning design processes was apparent through the interviews and survey responses.

A range of models and processes were highlighted in the free text responses. These included the ABC model (developed by UCL and informed by Viewpoints, a past Jisc-funded curriculum design project at Ulster University);

Carpe Diem, developed by Gilly Salmon and developed further at the University of Northampton; Laurillard's conversational framework; the Open University models (again with links to past Jisc-funded work); constructive alignment; the ICEBERG model (also from the Open University), and various bespoke models. The ABC model featured in 32 of 79 responses (40% of the open text comments mentioned using ABC or an adaptation of it).

The flexibility of identified models was highlighted through the interviews. Nearly all interviewees shared that support for learning design relied on a mix of models and they were adapted for the institutional context. Most no longer run the two-day intensive workshops common in earlier iterations of eg Carpe Diem, but instead a series of shorter sessions (ranging from one to two hours). During the pandemic, learning design workshops had to be adapted for online delivery. Currently, in common with other learning and teaching/CPD activities, a mix of online and face-to-face workshops are being offered across organisations.

Staff supporting learning design are highly skilled educators and facilitators, with a range of academic, digital and design skills. They are also generally situated in teams responsible for implementing institutional changes relating to curriculum design. Many now have considerable experience in supporting programme teams through various contextual areas of curriculum change at programme, module and activity level. These staff are often perceived as critical friends/consultants, bringing specialist skills and an objective stance to support colleagues through changes in practice.

2 It was also highlighted during one interview that perhaps there needs to be more critical reflection of their use. They tend to focus on the cognitive rather than affective domains of learning. Different modes and types of participation (for example, more vocationally focused micro-credentials) perhaps require an expanded discussion and reflection on their use.
Examples of practice

- As part of its digital transformation strategy, Teesside University has been rolling out a series of design bootcamps. The bootcamps use the learning design framework and toolkit to produce an action plan for teams to implement. An online version of its design framework and toolkit has been developed in partnership with Jisc and Educause.

- The University of Northampton has evolved its original CALeRO learning design process to reflect organisational changes such as the move to semesterisation. The team now runs two-hour online workshops that cover support for programme, module and session-level design.

- During lockdown, the University of Falmouth developed its Hitchhiker’s guide to curriculum design. This resource provides a self-accessed guide to the fundamentals of curriculum and learning design.

- Over the past academic year, the University of Brighton has been piloting its Co:Lab Curriculum Design approach. A series of three two-hour workshops has been to create a “collaborative curriculum enhancement process for courses, teams and students to work in partnership.”

- The University of Portsmouth has developed its enABLE team-based workshop approach to support the design of active blended learning across the university.

- During lockdown UCEM adapted its two-day Learning design jam process into a series of shorter online sessions.
Curriculum review/design
Curriculum review was also a common theme emerging from interviews around implementation of strategic change to learning and teaching practice. It provides an “in” for support staff. The links between quality assurance, quality enhancement and staff engagement with learning design is increasingly explicit. Interviewees highlighted the value of having staff with learning design support remits as part of formal course review panels in Northampton and Durham. Engagement with an institutional design process as part of formal review processes appears to be gaining traction.

Examples of practice

- The University of Hertfordshire has developed a learning principles toolkit for course teams to work through during periodic reviews.

- UCL requires evidence that teams seeking programme approval have engaged with the design process.

- At the University of Northampton, a learning designer is on review panels, and the university has incorporated quality standards into its workshops/support.

- At UHI, a representative from its Learning and Teaching Academy or learning design team is part of approval panels.

- At the University of Portsmouth, a core deliverable of its current Digital Success Plan is to put every programme through its enABLE (re)design process as part of the strategic drive to embed a “blended and connected” approach, based on the principles of Active Blended Learning, across all programmes.
Reward and recognition
Recognition for staff participation in learning design activities was low, with 110 responses indicating that no recognition was provided to staff and 20 responses indicating that recognition was given. Twenty-three responses indicated they were unsure if any recognition was given. Where credit was given, it took the form of digital badges or credits towards PGCerts in learning and teaching programmes/professional recognition pathways. These may have more relevance to early career teaching staff than long-established academics. The University of Central Lancashire (UCLan) has an internal staff development programme known as 'DigiLearn', and also hosts an external community of practice – the ‘DigiLearn Sector’. Both initiatives support and provide recognition for various aspects of digital learning practice. This includes awarding digital and physical badges, as well as providing regular opportunities for individuals to share their practice through presentations, podcasts, blogs and case studies.

The majority of support for learning design is still provided internally, with only 11% of respondents indicating that external support was used.

In the responses detailing the type of external support, only one named external partnership was identified. The other responses identified Jisc, Advance HE and guest speakers. One respondent mentioned using contractors for “quick turn-around projects” during the pandemic, but they were hoping to move to more in-house provision.
During lockdown, support was developed in-house for **online teaching skills** (88%), **online learning skills** (74%) and **learning/curriculum design** (67%).

The responses indicate that relatively little external material or support was bought in by organisations. A small number of responses (nine) indicated that no support was developed during the pandemic.
Experiences of staff and students during the pandemic

From coding of the free text responses to Q12 “What were/are the main concerns of students about online learning?), 277 separate codes were recorded from 139 unique responses. Some responses yielded more than one code as several issues were mentioned.

Six issues appeared regularly, that is in around one in ten responses (25-34 times). In descending order they were:

• The loss of social interaction and community
• Issues of access and inclusion (especially the digital divide)
• Technical issues (also associated with the digital divide)
• Student mental health and wellbeing
• Difficulties with motivation and engagement
• Issues in adapting to the online mode of learning

While they were coded separately, these issues relate to one another very closely, and they align with issues identified in the desk review. These issues also align with findings from the recent Jisc digital experiences insights HE student survey.

From coding of the free text responses to Q13 (what were/are the main concerns of teaching staff about online teaching?), 293 separate codes were recorded. Of these, 198 codes were defined as ‘teacher’ issues – that is, issues directly affecting teaching staff (including staff-student interactions, seen from the teacher perspective);

67 as ‘student’ issues, that is issues affecting students but of concern to teaching staff; and
28 as ‘transition issues’, that is issues relating to the overall context of rapid shift to online. In descending order, these issues were:

• Teacher confidence/skills
• Teacher time/workload (teacher issue) and student disengagement (student issue) equally
• Staff-student interactions
• Online pivot (‘transition’ issue)
• Technical issues
• Student wellbeing (student issue)
• Teaching practical skills
• Assessment issues
• Use of digital media
• Lack of support (for teaching staff)
• Student access and inclusion (student issue) and hybrid/blended learning (transition issue) equally
Key findings

- From the interviews, strategic development appears to focus on consistency of approach towards curriculum design support within those organisations that allow for flexibility across disciplines and modes of delivery. There was also an emphasis on programme-level developments.

- The free text responses indicate that many universities are in the process of updating either their teaching and learning strategy or revising parts of it to prepare for different delivery modes. Several interviewees describe the coming academic year as being a period of transition and consolidation, reflecting on the experiences of moving in and out of lockdowns, the pivot to online and the transition back to a more campus-based approach.

- The links between quality assurance, quality enhancement and staff engagement with learning design is increasingly explicit. Engagement with institutional design process/models is actively encouraged in several institutions as part of the review process.

- Feedback data from students is a key starting point for all the design processes shared in the interviews. Nearly all the frameworks/values/principles shared via the interviews are explicitly student centric.

On-campus and on-campus/blended provision appear to be the dominant delivery modes for undergraduate/postgraduate courses. While there was awareness of the potential for shorter courses/micro-credentials eg lifelong learning, there was also some caution, as the details (particularly around the credit allowance for lifelong learning (LLL) courses) have still to be finalised. However, some institutions do have strategic drivers to develop courses in this area. For example, Teesside University has a strategy to support economic development within its community. It already provides a range of short CPD courses, so micro-credentials fit with that existing area of strategic development. The Open University (OU) is engaged in developing a range of shorter courses, and is actively exploring different forms of informal recognition. This links to ongoing research around learning pathways and developing more coherent links between modules to allow for a range of potential pathways for learners.

A number of interviewees felt that they see the coming academic year as a transition year, allowing for more considered reflection and planning based on the experiences from the pandemic. The past academic year was felt to have still been driven by reactive changes to pandemic regulations.

QAA is working with the Department for Education as well as HEIs around micro-credentials and how they fit within existing credit frameworks. It published a micro-credentials characteristics statement in May 2022. QAA has also worked extensively with the sector to learn and share practice from the pandemic experience. It is supporting a number of collaborative enhancement projects considering different aspects of post-pandemic pedagogy and flexible learning pathways, for example a project exploring assessment workload in micro-credentials led by the University of Huddersfield and another on modular learning by design, now led by Bath Spa University.
There was a consensus in the interviews that government intervention in England was having an impact on delivery for the coming academic year. So while there continues to be innovation around more flexible, asynchronous approaches – as developed during lockdown – the main focus and language being used has a strong narrative of returning to on-campus delivery. The desire for on-campus delivery is apparent in other parts of the UK. Glasgow Caledonian University’s (GCU) design implementation framework is based on how to “optimise” the curriculum for the most appropriate blend of in-person and online activities, with on-campus/in-person activities being the norm.

There was a degree of caution about developing new fully online provision, primarily due to resource and cost implications. Hybrid/hyflex delivery also has some practical challenges – for example, the change in teaching methods (more team teaching approaches are needed for hybrid delivery), staff development for design and teaching in mixed delivery modes, as well as technology investment.

Despite some hesitancy around the efficacy of hybrid/hyflex approaches expressed in the interviews, there is a recognition that there needs to be more experimentation and evaluation of how, where and when they can be effective. For example, GCU is starting to explore approaches to enhance student engagement and community building through simultaneous delivery between its London and main Glasgow campus.

It was also noted in the interviews that there can be a potential for drop off in applications from international students if there is a mixed mode of delivery as students may not meet visa requirements around in-person attendance. These challenges were echoed in the free text comments in the survey.

“Restrictions in crossing borders into the country affecting international student numbers, as well as restricting the nature and number of courses available under these tighter conditions. Ramifications stem from this in many respects.”

“Many of our students are mature, in employment and have non-traditional qualifications and/or are a widening access cohort, our main challenge is students’ expectations of the time commitment and independent learning required of degree level study.”

“The biggest challenge we face is our geographic distribution, which makes running equitable workshop experiences difficult. However, we have ways round that which we have used for a few years now. Our other big challenge is that we are undergoing a period of significant change – new people, new curriculum, new strategies, new branding, etc. Probably rather too much change all at once (in my opinion).”

“OfS push to go back to pre-pandemic levels of F2F teaching rather than learning from the worldwide experience we have had to bring the best possible learning experience.”

Many of the developments in online assessment brought about by the pandemic are continuing and are seen as key areas for evolving practice. UCL has a particularly strong focus on assessment and feedback, for example, and has a new team in place to work specifically on supporting pedagogic and technological practice change.

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3 In the survey we used Beckingham’s (2021) of modes of learning model to define hybrid and hyflex learning.
Examples of practice

- The implementation of the University of Hertfordshire’s new curriculum design principles is actively encouraging and supporting the further development of alternative approaches to assessment brought in during lockdown, such as open book exams, problem-based learning approaches, the use of online presentations, and online collaborative spaces for group work. In-person exams are now the exception.

- Based on the pandemic experience, UCL is keeping assessments online. A new team of digital assessment advisors has been appointed to work within faculties to support academics with assessment design and develop use of a new online assessment system. A new institutional-wide assessment load tariff has been developed and is being implemented. Work is ongoing around redeveloping the use of assessment visualisation tools originally developed in the Jisc curriculum design and delivery programme, including the ESCAPE project at the University of Hertfordshire.

- Following its pandemic experience, Teesside University is in the process of updating its assessment and feedback policy to embed digital literacy in assessments. For example, the need to allow students to undertake professional practice-related assessments in online environments that match the new realities of online professional practice.

- The advanced nursing practice team at GCU had to rapidly redesign in-person practice assessments and negotiate approval from relevant professional bodies to continue their use.

- The Open University now has a dedicated pan-university project exploring students’ experience of online exams during the pandemic and views about how they could be incorporated into its assessment practices.

The survey response provided strong indicators that many organisations are also reviewing their overall curriculum portfolio (124 responses indicated yes to Q17: Is your institution undertaking a review of the curriculum portfolio (over and above the usual cycles of review)?

Curriculum review was also a common theme emerging from interviews. As a formal process it provides an opportunity for teaching and support staff to engage with change to learning and teaching practice. There was also a common theme around the importance of programme-level change, to ensure greater consistency of the student experience across modules. Student feedback at University of Hertfordshire highlighted that consistency, or lack of consistency, in teaching and assessment approaches were much more noticeable to students during online delivery.

The University of Hull’s focus on programme-level competencies also requires staff to engage with the whole programme approach, and not just the modules they teach on.

In the interviews there was a feeling of reluctance to make engagement with the design process mandatory. Most would prefer to work with colleagues on a “want to” not “need to” basis. There was also a desire not to reduce learning design to a series of checklists but to make it a reflective and evidence-based process.
Sixty-eight of the 131 free text survey responses to Q18 (Has your institution introduced any new roles and units, or any new processes relating to curriculum and learning design? Please share brief details) described how new staff roles have been created (mainly learning technologist and learning developer/designers), rather than new departments/units. This was echoed in the interview responses, which brought up examples of teams being extended and job titles changed. For example, the University of Liverpool now calls its team ‘educational developers’ rather than ‘learning technologists’ and each has a specialist focus on aspects of either digital pedagogy or digital technology. Over the past two years, Durham University has also created specific learning designer and senior learning designer roles.

There are indicators that the role of learning designer is more commonplace now, and that experience in learning design is starting to be more widely recognised and differentiated from general learning technology support. Some support previously based within IT, library or digital technology departments have been moved into academic development departments as part of restructuring support services.

The role of students as co-creators is extending to more active engagement with approaches to curriculum and learning design.

However, this seems to be more of an aspiration than a realisation for many, or is still in the early stages of development. There is a clear desire to work with students beyond the established formal methods of student representation on review panels etc. This resonates with the “with not for: co-creating future student success” theme of the recent UPP A Student Futures Manifesto, and its call for universities to create even more student co-creation opportunities.

“Recommended as good practice, but not yet embedded in core practices.”

“This happens wherever possible. Finding it difficult to recruit students these days.”

“Yes, there is a curriculum design student panel who provide feedback on learning design across all faculties. There are student representatives who provide feedback and consultation on all sorts of initiatives, eg the inclusive curriculum tool that staff use to prompt them to make more inclusive choices. Some students attend learning design workshops – although this is not the norm the hope would be that it becomes the norm in the future.”

Feedback data from students is a key starting point for all the design processes shared in the interviews. Nearly all the frameworks/values/principles shared via the interviews are explicitly student centric. Discussions around student involvement in the design process during the interviews varied quite widely. For example, the students’ union at UCL produce an annual Student Priorities for Education Report (2022) which forms the basis for the university’s learning and teaching priorities each year. Teesside University is still in the early stages of rolling out its learning design support so has taken a conscious decision to focus on developing staff digital skills and capabilities before extending support and engagement with students in its design processes.
Challenges moving forward

Key findings

• In terms of changes to curriculum and learning design over the next three years, the key concerns were issues around staff workload allocation and reward structures (112 responses, 74%) and investment in academic staff development (93 responses, 62%)

• If universities are to meet the challenges of flexibility around space, place and modes of delivery then strategic consideration needs to be given to providing updated workload models that recognise (and reward) the changing needs for staff to engage with design activities, evaluate their practice and provide support for innovation and changes of practice that will engage learners.

• It appears that there is a real need for a shared vocabulary and understanding around modes of participation. This could build on QAA’s Building a taxonomy for digital learning report (2020).

There are significant and interlinked challenges around changes to curriculum and learning design over the next three years. Providing appropriate staff workload allocation and recognition (112 responses) and investment in academic staff development (93 responses) are clearly areas of concern moving forward.

Sixty-two responses indicated the need for vision and strategy, with models and processes receiving 50 responses. A smaller number of responses (19) indicated the challenges of government policy.

In response to Q21a, which asked respondents to share in free text any other important changes to curriculum and learning design over the next three years, the following topics were identified as being the most influential: student, staff, learning, design and experience.

In terms of changes to curriculum and learning design over the next three years, the key concerns were issues around staff workload allocation and reward structures (112 responses, 26.9%) and investment in academic staff development. This correlates to the responses in Q10 around reward and recognition for participation in learning design activities where 70.9% of responses indicated that there were no rewards/recognition for engagement with learning design.

Staff wellbeing and burnout were highlighted in the free text responses. Workload allocation issues were also highlighted throughout the interviews as being a perennial challenge. Different modes of delivery require a change in standard workload allocation for preparation and delivery.

If universities are to meet the challenges of flexibility around space, place and modes of delivery then strategic consideration needs to be given to providing updated workload models that recognise (and reward) the changing needs for staff to engage with design activities, evaluate their practice and provide support for innovation and changes of practice that will engage learners.

During the interviews, challenges around developing more consistently used and understood equivalences across different teaching and learning modes, for example study load in online/hybrid situations, were highlighted. It was also anticipated that it would be challenging to explain different teaching models/modes within the current teaching excellence framework (TEF) framework.
The challenges of providing flexible, engaging and consistent teaching and learning opportunities were highlighted throughout the interviews, as was the potential for strategically supported approaches to learning design to begin to address these challenges.

From the free text responses, it is clear that staff are cognisant of the many challenges to providing good learning experiences over the next three years. Again, from the multiple choice and free text responses there are several significant, interlinking issues in creating a positive student experience.

The multiple-choice options identified that the areas of most concern are: being able to provide flexible, accessible and equitable learning opportunities (89 responses) and student wellbeing (75 responses). Supporting different modes of participation (67 responses) and effective use of digital technologies (64 responses) also scored highly. This indicates that staff are concerned about how to ensure they can support a positive learning experience for students over the next three years in a range of different places, spaces and modes of participation.

"Managing any support initiatives will be tough. With limited resources, ‘teaching to the middle’ is common. The gap between eager/advanced online tutors, those in the middle and those who are lagging behind has grown and that will have to be addressed."

"I would say that staff burnout is a major challenge for all staff whatever their role. This means staff are less likely to feel able to review and make changes as they don’t have the headspace."

"Inclusive online assessment is a challenge. Choice is important but difficult to implement. I think one of the biggest challenges is that students have A LOT more choice now in terms of where they might attend, what courses they will do, how they will attend/what modes they will engage with and as a result their expectations are wildly different to what they might have been say three or four years ago. Designing experiences to match those expectations is a challenge."
“Staff wellbeing isn’t up there (why not??), without us there is no teaching!! The workload implications of constant change in uncertain times, alongside student numbers increasing exponentially is leading to burnout (in our school we’ve had a huge number of staff signed off sick – any many, many more working beyond what would be considered healthy limits with little consideration – we also went through the pandemic (and still are) but the focus is always on student wellbeing with no recognition that if that staff are happy and healthy then they will be able to provide more engaging/interesting courses and be able to look after our students more effectively. Focusing just on student wellbeing is like putting a plaster on something without considering how the injury was caused!!”

Although it was not directly addressed by many interviewees, it does appear that there is a real need for a shared vocabulary and understanding around modes of participation. What combinations of time, place, online space, resources and activities, and participants in different roles and relationships, create effective learning opportunities for different types of students? This question cuts across other key issues – the use of estates (on-site and virtual), investment in technology, technology-related teaching and learning skills, new modes of assessment, new workload models for teaching staff and, above all, the student experience.

There is also a need for evidence-based guidance around learning space and place design, which again connects with issues such as flexible and accessible provision as well as the use of digital technologies, both those in student hands and in their private study spaces, and those provided in institutional spaces.

It was highlighted in the interviews that, moving forward, there could be a danger of conflating accessibility (designing systems to optimise access) and inclusion (giving equal access and opportunities to everyone wherever possible). More work is needed to unpack the various elements of creating an inclusive and accessible curriculum, building on the understanding gained during the pandemic of how different modes support different students, as part of the overall curriculum and learning design processes.

Assessment is also a concern, though in this survey assessment design (59 responses) was identified as more of a challenge than tackling plagiarism and academic integrity (13 responses). This suggests there is a greater appetite for guidance on alternative modes of assessment than for moving existing modes of assessment (especially closed book exams) online and dealing with the problems this generates. This aligns with the findings of Jisc’s assessment and feedback higher education landscape review.

Using learner data effectively had a relatively low response rate (16 responses), perhaps reflecting the views expressed during the interviews, which indicated that the main use of learning data is centred on student support and identifying students ‘at risk’, and in need of more extra-curricular support. A number of institutions have quite sophisticated systems in place that trigger a series of support interventions for such students. There was some recognition of the potential for learning analytics to provide information relevant to learning design, but a feeling that this is still at the early stages of development and integration for most organisations. The exceptions are UCEM and The Open University. As the provision at both organisations is either fully online or at a distance, they use data and the insights gained from it far more heavily than more traditional HE providers to evaluate the effectiveness of their module designs as they are being presented, review the curriculum pathways students choose, and inform quality enhancement.
Examples of practice

• The University of Portsmouth is developing its in-house analytics capabilities and looking towards predictive analytics. At the same time, it recognises the need to provide data to staff in easily accessible and meaningful ways.

• UCL has a focus on visualising assessment data and is looking to map assessment patterns at programme level.

• UHI has a number of learning analytics pilots to explore how to build capacity around the “good use of analytics”. This includes looking at VLE engagement and assessment loading. They are cognisant of the limitations of using VLE data — and other data from institutional systems — as proxies for student engagement and learning.

• At UCEM, data is used as part of its new module review processes. It has two types of review: deep dive — a workshop that looks in-depth at how a module has performed and the student experience to identify enhancements — and “in delivery” to examine the student experience during module delivery. The team has various “at risk” points to try to understand student behaviour, engagement, what is going well/not so well.

• The OU uses a range of data and analytics to help support students during course presentations. This data is also used as part of evaluation and design of modules. It is now exploring ways to use more qualitative data representing the student voice, alongside the quantitative data.
The challenges of providing flexible, engaging and consistent teaching and learning opportunities were highlighted throughout the interviews, as was the potential for strategically supported approaches to learning design to begin to address these challenges.
Acknowledgements

Thank you to everyone who took the time to complete the survey and all those who shared additional insights through individual interviews.

A special thanks to Sarah Knight, Jisc project manager, for all her support, ideas and expertise.

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Dr Mark Childs, senior learning designer, University of Durham.

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Dr Simon Cross, associate director, Institute of Educational Technology, the Open University UK.

Dr Ailsa Crum, QAA.

Dr Helen Fenwick, associate dean arts, cultures and education, University of Hull.

Sarah Flynn, associate professor/associate director of learning and teaching (workplace learning and degree apprenticeships), Learning and Teaching Innovation Centre, University of Hertfordshire.

Jim Harris and Nicola Denning, learning designers, University of Northampton.

Kate Lindsay, head of digital education, University College of Estate Management (UCEM).

Dr Evelyn McElhinney, senior lecturer, advanced practice (nursing), Glasgow Caledonian University.

Chris Melia, educational developer, Centre for Collaborative Learning, University of Central Lancashire.

Professor Alistair Robertson, pro-vice chancellor, learning and teaching, Glasgow Caledonian University.

Dr Rebecca Rochon, associate professor education, Buckinghamshire New University.

Professor Keith Smyth, dean, teaching and learning, University of the Highlands and Islands (UHI).

Dr Elaine Swift, head of digital learning and teaching, University of Worcester.

Dr Ann Thanaraj, assistant academic registrar/ Paul Durston, digital learning manager, Teesside University.

Professor Simon Thomson, director, Centre for Innovation in Education, University of Liverpool.

Dr David Walker, associate PVC education and students, University of Brighton.

Professor Simon Walker, director of programme development, Arena Centre for Research-based Education, UCL Education and Student Experience.

Jisc colleagues for their support and sharing their insights to this area.

Dr Esther Barrett
Paul Bailey
Scott Hibberson
Professor Lawrie Phipps
Chris Thomson
Karla Youngs
Marianne Sheppard
Appendix 1.
Overview of the survey

Context
Over the past two years there has been a focus on moving learning online due to lockdowns and restricted access to campus spaces.

We wanted to look beyond the emergency responses to see if and how this experience is impacting current and future approaches to supporting staff to design and deliver learning in flexible and accessible ways.
The survey
The survey ran between 26 May and 17 June 2022. It was promoted via Jiscmail lists, relevant professional bodies (ALT, SEDA) and social media. It consisted of 26 questions. Twenty-four in-depth interviews with staff were also conducted.
## Institutions by country

- **England, 77.5%**
- **Scotland, 14.1%**
- **Wales, 4.2%**
- **N Ireland, 4.2%**

## Roles and disciplines identified by respondents

- **Academic practitioner, 31.6%**
- **Academic/educational developer, 30.3%**
- **Senior manager, 16.1%**
- **Learning technologist, 12.3%**
- **Instructional designer, 5.8%**
- **Other, 3.9%**

### Sixteen discipline areas

<table>
<thead>
<tr>
<th>Discipline Area</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education and teaching</td>
<td>37</td>
</tr>
<tr>
<td>Business and management</td>
<td>37</td>
</tr>
<tr>
<td>Subjects allied to medicine</td>
<td>37</td>
</tr>
<tr>
<td>Creative arts and design</td>
<td>6</td>
</tr>
<tr>
<td>Social sciences</td>
<td>6</td>
</tr>
<tr>
<td>Historical, philosophical and religious studies</td>
<td>4</td>
</tr>
<tr>
<td>Psychology</td>
<td>4</td>
</tr>
<tr>
<td>Biological and sports sciences</td>
<td>4</td>
</tr>
<tr>
<td>Computing</td>
<td>4</td>
</tr>
<tr>
<td>Agriculture, food and related studies</td>
<td>3</td>
</tr>
<tr>
<td>Engineering and technology</td>
<td>3</td>
</tr>
<tr>
<td>Humanities and liberal arts (non-specific)</td>
<td>3</td>
</tr>
<tr>
<td>Mathematical sciences</td>
<td>2</td>
</tr>
<tr>
<td>General and others in sciences</td>
<td>2</td>
</tr>
<tr>
<td>Law</td>
<td>1</td>
</tr>
<tr>
<td>Language and area studies</td>
<td>1</td>
</tr>
<tr>
<td>No specific discipline</td>
<td>48</td>
</tr>
</tbody>
</table>
Support for learning design

Support for curriculum/learning design is mainly provided by:

- Central academic development unit, 30.0%
- Department, school, or faculty support, 26.4%
- Central digital or e-learning unit, 25.9%
- Library, 7.4%
- Central IT department, 5.1%
- Other, 3.6%

Support for online or blended learning is also mainly provided by:

- Central academic development unit, 25.1%
- Department, school, or faculty support, 24.0%
- Central digital or e-learning unit, 31.5%
- Library, 7.2%
- Central IT department, 7.5%
- Other, 4.0%

53% of responses indicated use of an institutionally supported model, approach or structured methodology to support learning design.

78% of responses indicated an organisational project team or initiative that supports learning design activities.

71% of responses indicated their organisation does not provide recognition for participation in learning design activities.
Models, frameworks and approaches for supporting learning design
A range of models and processes were highlighted in the free text responses, including the ABC model, Carpe Diem, Laurillard's conversational framework, the Open University models, constructive alignment, the ICEBERG model, and various bespoke models.

40% of free text comments mentioned use/adaptation of the ABC methodology.
An emerging common model for learning design workshops

Workshop process or design sprint (90 mins-half day)
Involving curriculum team and other professionals

Relevant information
eg student outcomes, feedback, reflections, professional body requirements, data, student consultations

Aspects to be determined
eg aims, outcomes, sessions, activities and assessments, media and materials

Principles to be applied

Prompts (decision support)
eg typologies, checklists, algorithms, heuristics, learner personas, design rubrics

Prototype, design, outline plan etc showing decisions made

Course handbook
with learning outcomes, skills required and developed etc

Timetable or session plan, workload/assignment map, learner journey

Spaces and places, learning environments, real world locations, rules and roles

Materials
eg readings, notes, recordings, interactive content

Appendix 1. Overview of the survey | 33
Challenges going forward

Key areas for change to support curriculum and learning design in the next three years

<table>
<thead>
<tr>
<th>Area</th>
<th>Percentage</th>
<th>Survey Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff workload allocation and reward structures</td>
<td>74.7%</td>
<td>112</td>
</tr>
<tr>
<td>Vision and strategy</td>
<td>41.3%</td>
<td>62</td>
</tr>
<tr>
<td>Models and processes</td>
<td>33.3%</td>
<td>50</td>
</tr>
<tr>
<td>Investment in academic staff development</td>
<td>62.0%</td>
<td>93</td>
</tr>
<tr>
<td>Investment in specialist professional staff</td>
<td>30.0%</td>
<td>45</td>
</tr>
<tr>
<td>Investment in data and infrastructure</td>
<td>23.3%</td>
<td>35</td>
</tr>
<tr>
<td>Government policy</td>
<td>12.7%</td>
<td>19</td>
</tr>
</tbody>
</table>

Main challenges to providing a good learning experience in the next three years

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Percentage</th>
<th>Survey Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective use of space (digital and physical)</td>
<td>44.8%</td>
<td>69</td>
</tr>
<tr>
<td>Effective use of digital technologies</td>
<td>41.6%</td>
<td>64</td>
</tr>
<tr>
<td>Supporting different modes of participation</td>
<td>43.5%</td>
<td>67</td>
</tr>
<tr>
<td>Student wellbeing</td>
<td>48.7%</td>
<td>75</td>
</tr>
<tr>
<td>Flexible, accessible and equitable learning opportunities</td>
<td>57.8%</td>
<td>89</td>
</tr>
<tr>
<td>Assessment design</td>
<td>38.3%</td>
<td>59</td>
</tr>
<tr>
<td>Tackling plagiarism and academic integrity issues</td>
<td>8.4%</td>
<td>13</td>
</tr>
<tr>
<td>Using learner data effectively</td>
<td>10.4%</td>
<td>16</td>
</tr>
</tbody>
</table>
Appendix 2. Instructional models in current use in UK HE

Curriculum design and development is an important aspect of organisational identity in UK HE. Institutions have often developed their own principles and guides, with their own local stakeholder engagement and ownership. Some of these models relate to an underlying learning design framework or approach, but many do not.

These models illustrate some of the differences in practice between curriculum design – the planning of a whole course of study – and learning design, its focus on smaller elements such as activities and materials and how they are aligned.

1. **Curriculum design** can involve a wide range of stakeholders, not all of whom are specialists. For example, some could be students, employers, community beneficiaries. It can be an inclusive and conversational process. Learning designers may realise some of the decisions taken by this wider group of stakeholders.

2. **Curriculum design** takes a more open ended and reflective approach to the analysis and planning of the course: a wide range of qualitative considerations may be included such as student experience, teaching reflections, changes in subject matter and cohort, horizon scanning. Learning design takes a more instrumental approach with a focus on data inputs (grades, scores, feedback, metrics) and formal outcomes (designs, prototypes etc).

3. ‘**Constructive alignment**’ of activities with outcomes at a course/curriculum level allows for modules, sessions and assignments to be open ended. Some work can be done by students that does not directly contribute to the stated outcomes so they can explore interests and strengths.

4. **Tightness of fit** or degree of specification may differ, so curriculum development may allow teaching staff considerable freedom in delivery of sessions, activities and assignments within a broadly defined curriculum, while learning design closely specifies materials, online course structures, activities and workflows.

5. **Ownership** of different plans and representations can vary, so course teams may prefer a loosely structured plan with room for contingencies, while learning professionals may prefer a tightly structured plan so they can design and deliver course elements in a timely way and have them signed off.
<table>
<thead>
<tr>
<th>Model</th>
<th>Practice supported</th>
<th>Process or principles?</th>
<th>Key features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carpe Diem</td>
<td>Curriculum design</td>
<td>Process</td>
<td>The original ‘course design intensive’: Blueprint – Storyboard – Prototype – Reality Check – Review</td>
</tr>
<tr>
<td>Viewpoints</td>
<td>Curriculum design</td>
<td>Process + principles</td>
<td>As for ABC, the workshop process can in principle be differentiated from the content of the workshop artefacts, allowing different versions (several have been developed)</td>
</tr>
<tr>
<td>ABC (minus specific cards)</td>
<td>Curriculum design</td>
<td>Process</td>
<td>Workshop process involving a course/module timeline plus cards showing learning activities or principles to organise in sequence</td>
</tr>
<tr>
<td>Teesside Learning design toolkit</td>
<td>Curriculum design</td>
<td>Process</td>
<td>Plan your module – Prepare your students – Structure your module – Design collaboration and construction - Put learning into practice – Assess – Conclude your module</td>
</tr>
<tr>
<td>Keele Flexible Digital Learning</td>
<td>Curriculum design</td>
<td>Principles</td>
<td>Learning resources – Creating a digital community – Collaborative research and analysis – Presentation and response – Interaction and co-production – Academic guidance and support – Formative assignments and feedback – Peer-to-Peer guidance – Summative assessments – Module evaluation and review</td>
</tr>
<tr>
<td>Enable</td>
<td>Curriculum design</td>
<td>Principles</td>
<td>Principles for curriculum design for blended learning: active learning – context over content – scaffolding – asynchronous and synchronous – teaching before technology</td>
</tr>
<tr>
<td>University of Brighton Co-Lab Approach</td>
<td>Curriculum design</td>
<td>Process</td>
<td>Aims and outcomes – balance learning types and modes of delivery – storyboard learning types, activities, modes and tools – timeline including assessment and feedback – reflect and strategic alignment</td>
</tr>
<tr>
<td>University of Liverpool Curriculum Framework</td>
<td>Curriculum design</td>
<td>Principles</td>
<td>Curriculum will be: Inclusive – Research-connected Will involve: Active learning – Authentic assessment Will promote: Confidence – Global citizenship – Digital fluency</td>
</tr>
</tbody>
</table>

This is not an exhaustive list of models and frameworks in current use. The key features column highlights the key features of each model as identified by the authors for the purposes of this study. They do not explain any of the models in full, or offer any evaluation of them. Readers are encouraged to visit the links provided and explore the features and benefits of each model for themselves.
<table>
<thead>
<tr>
<th>Model</th>
<th>Practice supported</th>
<th>Process or principles?</th>
<th>Key features</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Hertfordshire Reflective Toolkit</td>
<td>Curriculum design</td>
<td>Principles</td>
<td>Prioritises student learning – coherent design – opportunities for personalisation – harnesses technology – builds community</td>
</tr>
<tr>
<td>ADDIE</td>
<td>Curriculum design</td>
<td>Process</td>
<td>Stages of (any) design: Analysis, Design, Development, Implementation, Evaluation</td>
</tr>
<tr>
<td>Learning designer</td>
<td>Curriculum design</td>
<td>Process (+ principles)</td>
<td>Complex series of models, including:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Activity types: Acquisition, Collaboration, Discussion, Inquiry, Practice – Production</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Course cost modelling</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Assessment/time on task modelling</td>
</tr>
<tr>
<td>Activity design model (Jisc)</td>
<td>Curriculum design</td>
<td>Principles</td>
<td>Define: Outcomes (what will be produced) – Activities (eg Laurillard types) – Roles and relationships – Tools and resources – Learner characteristics and modes of participating</td>
</tr>
<tr>
<td>OU LDI activity types</td>
<td>Curriculum design</td>
<td>Principles</td>
<td>Activity types: Assimilative – Communicative – Finding and handling info – Productive – Experiential – Interactive Also includes a design template</td>
</tr>
<tr>
<td>Seven Cs of LD</td>
<td>Curriculum design</td>
<td>Process + principles?</td>
<td>Conceptualise – [Capture – Communicate –Collaborate – Consider] – Combine – Consolidate (The four in brackets are activities designed into the course and the rest are curriculum design activities)</td>
</tr>
<tr>
<td>Learning design construct</td>
<td>Curriculum design</td>
<td>Principles</td>
<td>Ron Oliver’s 1999 version. Define: Outcomes and assessments – Tasks – Supports - Resources</td>
</tr>
<tr>
<td>UCEM Framework and resources</td>
<td>Curriculum design</td>
<td>Process</td>
<td>Student outcome-led design -&gt; active, authentic learning Designing for online engagement: teaching presence, social presence and cognitive presence</td>
</tr>
</tbody>
</table>

This is not an exhaustive list of models and frameworks in current use. The key features column highlights the key features of each model as identified by the authors for the purposes of this study. They do not explain any of the models in full, or offer any evaluation of them. Readers are encouraged to visit the links provided and explore the features and benefits of each model for themselves.
<table>
<thead>
<tr>
<th>Model</th>
<th>Practice supported</th>
<th>Process or principles?</th>
<th>Key features</th>
</tr>
</thead>
</table>
| Activity design (Beetham/Jisc 2007)       | Learning design                     | Principles             | Design activities to mediate between: Learners and their differences to Intended learning outcomes  
Design activities around: Types of interaction (roles, rules) – Tools in use – Representational media  
Activity types: Discover – Develop ideas – Develop techniques – Solve problems – Collaborate – (Re)present |
| Rapanta et al 2020                        | Learning design                     | Process                | Design for: Learner goals – Tools and resources – Concrete tasks/activities and relations among these  
Teach for: cognitive presence, social presence, facilitatory presence |
| Merrill’s five events of instruction      | Learning design                     | Process                | Principles of instruction: Task statement, Activation, Demonstration, Application, Integration |
| TREC                                      | Learning design                     | Process                | Trigger, Review, Expectation/evidence, Consolidation |
| SPAM                                      | Learning design                     | Principles             | Subject (content) – pedagogy (learning activities) – modality (mode of participation) |
| Laurillard’s model (ABC version)          | Learning design + Learning          | Process                | Six learning events (also types of learning) as part of a conversational process: Acquisition – Inquiry – Collaboration – Discussion - Practice - Production |
| Bloom’s taxonomy (revised)                | Learning design + Learning          | Principles             | Cognitive domain |
| Kolb’s learning cycle                     | Learning design + Learning          | Process                | Stages/styles of learning (therefore of instruction): Concrete experience – Reflective observation – Abstract conceptualisation - Active experimentation |
| TESTA principles of assessment            | Learning design + learning          | Principles             | Time on task (quantity, distribution, orientation) – Activity type – Standards (high, clear) – Feedback (regular, timely, sufficient, detailed, performance focused, actionable, clearly expressed |

This is not an exhaustive list of models and frameworks in current use. The key features column highlights the key features of each model as identified by the authors for the purposes of this study. They do not explain any of the models in full, or offer any evaluation of them. Readers are encouraged to visit the links provided and explore the features and benefits of each model for themselves.