AdvanceHE

MEMBER BENEFIT

Flexible learning: a literature review 2016 - 2021

Professor Mark Loon

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Contents

Foreword 4

1 Executive summary 6

1.1 Introduction and background 6

1.2 Method 6

1.3 Overview of literature reviewed 7

1.4 Findings 8

1.4.1 Using the CIMO framework as a lens 8

1.4.2 Using Advance HE's Flexible Learning Framework 9

1.5 Implications and recommendations 11

1.5.1 Policy for the sector 11

1.5.2 Policy in institutions 11

1.5.3 Practice of flexible learning 12

1.5.4 Flexible learning research 12

2 Introduction 13

2.1 Aim and objectives of the review 13

2.2 Background to flexible learning 13

3 Methodology 16

3.1 Methodological approach 16

3.1.1 Method of selection for inclusion 19

3.1.2 Excluded literature 19

3.1.3 Overview of included literature 19

3.1.4 Method of analysis 21

3.2 Reflections on the methodology 21

4 Findings 22

4.1 CIMO results 22

4.1.1 Contexts 22

4.1.1.1 Micro drivers. Exploring field-based pedagogies 22

4.1.1.2 Micro drivers. Development of the HE teaching profession 25

4.1.1.3 Macro drivers. Covid-19 26

4.1.1.4 Macro drivers. Professional and vocational development 26

4.1.1.5 Context: macro drivers. Affordance of technologies 27
4.1.1.6 Macro drivers. Socially based drivers 28
4.1.2 Interventions 28
4.1.2.1 Technological configurations. Digitalising the classroom 28
4.1.2.2 Technological configurations. Gamification and interactivity 29
4.1.2.3 Technological configurations. Learning analytics 30
4.1.2.4 Technological configurations. Personal learning environments 31
4.1.2.5 Technological configurations. Selective deployment of technologies 31
4.1.2.6 Technological configurations. Intuitive technologies for educators 32
4.1.2.7 Explorative approach to pedagogies. Various examples 32
4.1.3 Mechanisms 37
4.1.3.1 Systems approach. Various examples 37
4.1.3.2 Role of educators. Various general examples 41
4.1.3.3 Role of educators. Reflexivity and communication 42
4.1.3.4 Inclusivity. Various examples 43
4.1.4 Outcomes 44
4.1.4.1 Student impact. Student learning 44
4.1.4.2 Student impact. Student behaviours in learning 46
4.1.4.3 Organisational learning. Learning from trial-and-error 47
4.1.4.4 Organisational learning. Advancing social-orientated aims 47
4.1.5 Summary of CIMO findings 48
4.2 Advance HE Flexible Learning Framework 49
4.2.1 Technology-enhanced learning 50
4.2.1.1 Adaptive technologies 50
4.2.1.2 Artificial intelligence 51
4.2.1.3 Learning analytics 51
4.2.1.4 Specialist/discrete technologies 52
4.2.1.5 Ubiquitous technologies 53
4.2.1.6 Adapting existing TEL technologies 54
4.2.2 Pedagogical approaches 54

4.2.2.1 Integration of approaches 54
4.2.2.2 Balancing priorities 56
4.2.2.3 Entanglement with local context 57
4.2.2.4 Adopting multiple perspectives 58
4.2.2.5 Cognition-based theories 59
4.2.2.6 Teaching languages 59
4.2.2.7 Technology-based pedagogies 60
4.2.3 Employment 61
4.2.3.1 Work-based learning and learner engagement 61
4.2.3.2 E-learning and interactivity 62
4.2.4 Institutional systems and structures 63
4.2.4.1 Strategic approach 63
4.2.4.2 National policies 65
4.2.4.3 Bottom-up approach 65
4.2.4.4 Academic workforce development 66
4.2.5 Key findings from the analysis using Advance HE's Framework 67
4.3 Case studies 68
4.3.1 Case study: flexible learning in the Middle East 68
4.3.2 Case study: critique of flexible learning 69
5 Conclusions, limitations, implications and recommendations 72
5.1 Concluding statement 72
5.2 Limitations 72
5.3 Implications and recommendations for policy, practice and research 74
5.3.1 Policy for the sector 74
5.3.2 Policy in institutions 75
5.3.3 Practice of flexible learning 77
5.3.4 Flexible learning research 79
6 Glossary 80
7 References 82

Foreword

The affordances provided by flexible learning were recognised as far back as 1858 when the University of London offered degree programmes by correspondence allowing students to combine study and work without relocating. Spooling forward over one hundred years and the higher education sector recognised that there needed to be wider access to higher education to meet the growing needs of governments, employers as well as the aspirations of individuals. Pioneering institutions, such as the Open University in the UK, used the available analogue technologies to enhance learning experiences and manage programmes. This instrumental role of technology in enhancing learning, teaching and assessment activities, as well as in developing learning management systems and providing opportunities for social interaction, means that flexible learning is often used synonymously with online learning. But flexible learning is much more than online learning, it is about providing learners with choice in terms of what, where, how and when they learn.

Prior to the pandemic many higher education providers had developed strategies and practice to provide more flexibility in how and when students could access their programmes. They reflected on the pedagogic approaches required to support flexible learners and invested in the technology needed to provide engaging learning environments. The Covid-19 pandemic forced all institutions to rapidly adopt new ways of teaching and assessment to facilitate students to continue or complete their studies. Whilst the pandemic forced the sector to rethink 'the art of the possible', it also highlighted the need for it to enhance its capacity to deliver by means of flexible and resilient education systems.

This integrative literature review therefore provides a timely update on the Advance HE flexible learning framework. It includes an in-depth analysis of 105 research articles published between 2016 and 2021. The papers considered in this review detailed research undertaken across the world, using quantitative, qualitative and mixed methods and include a few conceptual articles. The research studies showed that technology or technology-dependent initiatives remain one of the most prominent enablers of flexible learning. Given the rapidity of advancements in the flexible learning field this publication provides a critical evidence-based review of the impact of emergent technologies, the importance of adapting and evaluating innovative teaching and assessment practices, the need for workforce development and policy review, and the intersections with employment and employability.

The review uses a Context- Mechanism-Intervention-Output (CMIO) lens to classify the studies. The CMIO approach provides the reader with a clear insight into the specific context(s) of the study and what interventions and mechanisms were put in place to achieve the stated outcome.

Post-pandemic, what constitutes a high quality learning experience remains a topical debate. The affordances of online learning realised during the pandemic benefitted many, often marginalised student groups, including students with disabilities, commuter students and students with caring responsibilities or work.

This review will provide a valuable resource to all those reflecting on how to build on what has been learnt about online teaching and assessment practices during the pandemic to develop and deliver an institutional vision for flexible learning, exploring cross-cutting themes of access and retention, employability, inclusivity and sustainability.

To conclude, I wish to thank Professor Mark Loon for his thoughtful analysis of studies in this complex area. This timely review provides an important addition to the ongoing interrelated work being undertaken by Advance HE through the review and update of the Essential Frameworks for Enhancing Student Success, providing our members with insights into the current, relevant, and research informed best practice.

Dr Kay Hack

Principal Adviser (learning and teaching)
Advance HE

1 Executive summary

1.1 Introduction and background

This review aims to identify and summarise flexible learning trends, issues and impact from 2016 to the end of 2021. In particular, the review will focus on identifying what 'works' in the design, development and implementation of flexible learning. The specific areas the review will pay close attention to are the contextual frame of flexible learning, such as situational factors from an institution or national perspective, technological developments and/or their application, and pedagogical developments.

The notion of flexible learning in higher education (HE) has been around for many years. Perhaps the merits of flexible learning were formally recognised by the establishment of the Open University in 1969. The Open University was created to allow prospective students with 'non-traditional' qualifications to earn a degree through distance learning. The advantages of flexible learning have been amplified by the internet, with online learning now considered a mainstream mode of learning (Loon, 2017). Flexible learning has continued to grow from technological, pedagogical and institutional perspectives. With most universities, the question about flexible learning is not 'if' but about 'how'. If flexible learning was previously not a given, it probably is today, given the realities that universities have to live with since the impact of Covid-19 in early 2020.

In today's world, the notion of flexible learning is pervasively associated with online learning and its associated technologies. Such perceptions are unavoidable as technology plays such an integral role in enabling flexible learning. This area of technology-enhanced learning is not just about technologies created for the primary purpose of supporting learning (for example, learning management systems), but it is also about technologies developed for other purposes (for example, entertainment, socialising) adapted for learning purposes. Pedagogical approaches involve the content and delivery of teaching how students can or should learn in a flexible learning mode. A typical example is how pedagogies can be designed and delivered using synchronous and asynchronous learning modes individually and how they complement one another. Because higher education is increasingly expected to demonstrate value to its students, the discussion about employment is integral. Indeed, the notion of flexible working parallels flexible learning as students and graduates are now expected to manage their own work and learning. Finally, institutional systems and structure are crucial in enabling flexible learning to be developed and implemented with adequate quality. Elements such as a curriculum associated with flexible learning need to be embedded within the overall programme. In addition, HEIs must also have in place systems and structures that enable the administration and delivery of flexible learning. Administrative procedures and credit systems need to be adapted, and educators must be trained to teach in flexible learning modes (eg online) effectively.

1.2 Method

This study adopts an integrated systematic review draws on the work of Littell, Corcoran, and Pillai (2008), Loon et al (2019, 2020, 2021), and Torraco (2016) that encourages discipline, provides transparency and enables reproducibility. Consistent with the aim of this proposed literature review,

Torraco (2016) suggests that a key aim of literature reviews is to analyse and synthesise current work to gain a sense of direction of the development of a field. There were three main stages. In stage one, the details of the review methods were finalised with Advance HE and a peer reviewer selected by the researcher. In stage two, the review was undertaken, selecting the research studies as the 'data' for analysis and synthesis. In stage three, the findings are reported. As part of the search criteria in the first step of stage two, a Boolean search was undertaken using confirmed keywords (with wildcards), 'flexib*', 'adaptab*', 'versatil*' conjoined with 'learning'. In the second step (of stage two), Advance HE's database and two academic databases (Web of Science and Scopus) (Loon et al, 2019; Loon et al, 2020) were used. These databases are recognised as the most comprehensive. Filters within the databases (eg publication dates) were applied. On identifying the articles from step two, further refinement was undertaken to ensure relevance and fit with the purpose of this literature review.
In step three, the inclusion and exclusion criteria were applied. The inclusion criteria broadly involved literature that focuses on flexible learning, specifically; what, how, when and who is engaged in flexible learning (Section 3.1.1 provides more details). In step four, the articles from Scopus and Web of Science were merged, and overlaps were removed. The articles were then merged again from the groups using the three search terms – flexible, adaptive and versatile learning – resulting in 105 articles. The literature was then analysed and synthesised using the CIMO framework (Denyer, Tranfield, & Ernst Van Aken, 2008). The CIMO framework is based on the logic of design science (Bunge, 1967, 1997; Pawson & Tilley, 1997), which states that outcomes (O) can be traced back to their context (C) through a unique intervention (I). Denyer et al (2008) refined the notion of mechanisms (M) as thematic underlying 'explanations' that link interventions to outcomes. As part of the analysis, Advance HE's Framework was also used as a lens to identify evidence that aligns with the Framework and evidence that may help shape, inform and update the Framework. Stage three is the reporting of the research and its findings. This review did not evaluate the quality of the methods, analysis or arguments found in the studies, given the papers are deemed to be peer-reviewed.

1.3 Overview of literature reviewed

Eighty-four papers were included in the final review (please see spreadsheet). The geographic spread and the type of research methods adopted by the papers reviewed are presented before the findings. In terms of the geographic spread of the studies, participants in the studies reviewed came from 28 countries. Some studies (three papers) were global in nature (eg using data from MOOCs and international literature, such as this study). In contrast, some papers, eg especially conceptual papers, were agnostic of the country of origin (10 papers). Most of the articles reviewed were from the UK (13); however, these included five Advance HE reports. The next most significant contributor was the US with 11, followed by the Philippines with six. Australia contributed five papers. There were three research papers undertaken in the context of Canada, New Zealand, Saudi Arabia and Spain each. Finland, Hong Kong, Mexico and South Africa had two papers written in each national context.
The following countries had one article, each, undertaken in its context: Azerbaijan, Brazil, China, Costa Rica, Ghana, India, Iraq, Israel, Japan, Norway, Oman, Pakistan and Turkey. There was one paper written in the context of Poland and South Korea.

Finally, one study did not specify the country but located its reflection in the African region of sub-Sahara. In terms of the type of methods used (excluding the five Advance HE reports that included two case studies and a survey, conceptual paper and qualitative scenario-modelling paper each), a majority of the research papers were quantitative (involving hypothesis testing) followed by 14 conceptual papers. Next, mixed methods (which combine qualitative and quantitative methods) was popular with 13 studies, followed by 10 case studies. There were six surveys, which usually adopted more straightforward methods of analysis. There were five reviews and qualitative papers (eg interviews and focus groups). Several articles adopted an action research approach (four), followed by three quasi-experiment papers (eg computer simulations). Finally, one paper each adopted archival data, experimental and a 'mixed-methods, quasi-experiment' approach.

1.4 Findings

1.4.1 Using the CIMO framework as a lens

The 'context' element includes micro drivers (with sub-themes of exploring field-based pedagogies and development of the HE teaching profession) and macro drivers (with sub-themes of Covid-19, professional and vocational development, the affordance of technologies and socially based drivers). There were two central 'interventions': technological configurations (with sub-themes of digitalising the classroom, gamification and interactivity, learning analytics, personal learning environments, selective deployment of technologies and intuitive technologies for educators) and explorative approach to pedagogies (with various examples). There were three themes in 'mechanism': systems approach, the role of educators (both with various examples), including highlighting the importance of reflexivity and communication). Finally, the 'outcomes' elements had two main themes: student impact (with sub-themes of student learning and student behaviours in learning) and organisational learning (with sub-themes of learning from trial-and-error and advancing socially orientated aims). The results of the analysis using the CIMO have revealed myriad reasons why flexible learning is adopted, the different forms it takes, and how it is implemented.

The most prominent was micro drivers, which essentially involve HEIs and educators instigating flexible learning to assess its feasibility in the context of an array of fields. A different but corollary micro driver is educators' capabilities in designing, developing and implementing flexible learning. Papers published latterly highlighted Covid-19 as one of the leading contextual drivers in their studies. Another theme that emerged from the analysis was professional development, where speed is essential but may also face constraints in terms of pace, place and costs. Flexible learning is a useful concept for developing capabilities at speed. The papers reviewed also show that the adoption and advancement of flexible learning practices can be driven by desires to maximise technologies' utility. The review also highlighted socially based drivers. For example, social mobility and participation in HE is also one of the key reasons behind HEIs' adoption of flexible learning.

There are two primary themes in the intervention category; technological configurations and explorative approach to pedagogies. Within the theme of 'technological configurations', the examples identified include digitalising the classroom, gamification and interactivity, learning analytics, personal

learning environments, selective deployment of technologies and intuitive technologies for educators. In the theme of 'explorative approach to pedagogies', the research papers discussed the various designs, fine-tunes and combinations of existing pedagogies to develop a flexible learning curriculum.

Mechanisms are underlying thematic 'explanations' that link interventions to outcomes. The three themes that emerged are the systems approach, educators' role, and inclusivity. A systems approach compels educators to think more broadly and consider more nuanced factors that may enhance or impede the effectiveness of flexible learning initiatives. The educators themselves play a crucial role. While the importance of the educators' role in flexible learning is considered implicit, their agency is too vital to remain tacit and needs to be explicitly highlighted. A distinct aspect of the 'educators' role' theme involves educators' reflexivity in reflecting and taking swift action when required and continuously fine-tuning flexible learning pedagogies to enable student impact. Although a limited number of articles highlighted inclusivity, this notion is considered a mechanism because it compels HEIs and educators to think about the design and implementation of flexible learning critically.

Outcomes result from the implementations of the myriad forms of flexible learning. Two primary themes emerged from the review: student impact and organisational learning. In terms of student learning, many of the studies reviewed that captured empirical data involving student learning reported positive results in terms of student impact. The review showed that some of the pedagogical approaches adopted by educators are not formulaic. Given its variants, it is not easy to conclusively determine which pedagogical design for flexible is the best (even defining what is considered 'best' is context dependent). However, by having students at the heart of the design and development of flexible learning, it is envisaged that students are not just able to have a better learning experience and achieve more in their learning, but may be more self-directed. Although the pandemic has had a negative effect on many and was challenging to both students and educators alike, it has nonetheless accelerated HEIs' development of its capability to deliver learning via flexible and distance learning. Finally, a key learning for HEIs in taking advantage of technologies is to have policies and have capabilities that enable them to do so. These actions allow HEIs to meet its socially orientated goals in broadening access to HE.

1.4.2 Using Advance HE's Flexible Learning Framework

The second part of the findings involves assessing the literature against Advance HE's Flexible Learning Framework. Specifically, the findings highlight significant trends that may inform and update the Framework in terms of its four dimensions: 1) technology-enhanced learning (with sub-themes of adaptive technologies, artificial intelligence, learning analytics, specialist/discrete technologies, ubiquitous technologies and adapting existing TEL technologies); 2) pedagogic approach (with sub-themes of integration of approaches, balancing priorities, entanglement with local contexts, adopting multiple perspectives, cognition-based theories, teaching languages and technology-based pedagogies); 3) employment (with sub-themes of work-based learning and learner engagement, and e-learning and interactivity); and 4) institutional systems and structure (with sub-themes of strategic approach, national policies, bottom-up approach and academic workforce development).

From the technology-enhanced learning aspect of the Framework, the review revealed that three distinct but inter-related technologies were the most frequently studied: adaptive technologies, artificial intelligence and learning analytics. Both adaptive learning and artificial intelligence technologies are complemented by learning analytics. This provides the data mining capability required to enable the functionalities in these technologies. There were also technologies discussed that had specific uses. In one such case, the ability to apply flexible learning in fields with significant in-class practical components increases. In addition, using the elementary utility of mobile phones (ie ubiquitous technologies) is becoming more popular, especially in countries where internet infrastructure is still in development. Finally, while many technologies for learning such as Moodle, MOOCs (and variants) and open education resources (OER) have been around for some time, their use in other countries may spur further innovations.

From a pedagogical perspective, the theme of 'integration of approaches' highlights how educators combine different, but usually well-established, pedagogic approaches to find the most effective way to implement flexible learning that is appropriate for their context. Although there are similarities between integrating approaches and the next sub-theme, balancing priorities addresses potential tensions that are likely to occur when different pedagogical approaches (with different aims) are combined. The pedagogical approaches that emerged from the review also highlighted the need to be 'practical'. Specifically, this meant ensuring the realities that educators and students face are reflected in the design of the flexible learning initiative, which was evident in the articles from the Philippines and Ghana in the context of Covid-19. In addition, while balanced pragmatism is crucial in developing flexible learning, the literature review suggests that adopting multiple perspectives is equally important as this enables HEIs to develop suitable and relevant curricula for students. The review also highlighted three studies that adopted cognition-based theories, ie cognitive flexible theory, into the design of flexible learning initiatives. The researchers found this useful in enhancing students' learning achievements. Authors also highlight that it is crucial to adapt pedagogical approaches for teaching languages, given their uniqueness. Finally, there is no doubt that novel technologies, such as those central to adaptive learning, are vital. However, implementing such technologies should be measured in developing bespoke pedagogies to support student achievement while optimising the technologies for learning. In the 'employment' aspect, the literature reviewed also showed the duality of how flexible learning plays a role in the workplace and how work-based learning is a fundamental form of flexible learning.

In the 'institutional systems and structures' aspect, a strong sub-theme that emerged was the strategic approach adopted by some HEIs. While there are many strategic drivers of flexible learning within the universities featured in this review, there are instances whereby national policies play a role in impeding and amplifying university policies. In contrast to the top-down strategic approach, literature also highlighted the bottom-up 'organic' approach that has emerged in some cases. The final sub-theme parallels the bottom-up approach as the literature suggests focusing on the development of the academic workforce as an institutional imperative in developing flexible learning.

1.5 Implications and recommendations

1.5.1 Policy for the sector

The popularity of microcredentials has instigated a shift in the thinking of HEIs in prioritising the development of a curriculum that serves increasingly diverse learners. While there is still a lot of work needed to understand how microcredentials may work in institutions, country-specific higher education sectors may provide leadership in this area to instigate and guide work coordinating microcredential development among HEIs as well as employers in industry. Another area with significant potential for exploitation for the benefit of students is open educational resources (OER), in particular the governance of OER for the sector. OER are a promising aspect of technology-enhanced learning from a flexible learning perspective. From the viewpoint of institutions, the HEI sector as a whole and governments, OER enable the costs of education, both public and private, to be contained. Indeed, institutions can play a more prominent role in promoting OER. Institutions can encourage, incentivise and even mandate the production of OER. HEIs may not just include the innovative (re)production of OER as part of the career development pathway of teaching and scholarship staff but also embed the (re)use of OER in its training and development initiatives. Similarly, governments can revise their funding to HEIs to incentivise that they accelerate and amplify the development and diffusion of OER. Both HEIs and governments could create central repositories (such as an app store) to enhance the discoverability of OER.

1.5.2 Policy in institutions

The adoption of flexible learning varies in HEIs. At one end, some take a strategic top-down approach; at the other is a bottom-up approach driven by educators and lecturers. There is no right or wrong as institutions must do what is appropriate for their circumstances and contexts. Nonetheless, the key recommendation here is that HEIs should take a proactive stance irrespective of whichever approach is adopted. If an HEI takes a strategic perspective, this is usually in itself being proactive. Such an approach will involve a clear plan of the type and degree of flexible learning the HEI will design and develop, with a clear view of the audience and beneficiary of flexible learning. The strategic approach will also usually entail a clear programme of work in rolling out flexible learning, prioritising programmes, schools and faculties across the university. Nonetheless, HEIs can also be proactive in the bottom-up approach. At the centre of this approach is organisational learning. Organisational learning is not about the ‘doing’ but emphasises learning and capturing the learning. Organisational learning necessitates HEIs to be proactive. Being proactive in this sense involves encouraging programmes and schools to experiment with flexible learning. The design, development and implementation of flexible learning can be undertaken by reconfiguring existing budgets and resources. Universities can create a safe organisational climate at the institutional level that encourages calculated risk-taking. Institutions can embed organisational learning processes for educators and lecturers within faculty and institute-level committees, supported by the appropriate policies.

1.5.3 Practice of flexible learning

While flexible learning is not synonymous with technology, it is difficult to ignore the central role it plays. Therefore, it is vital that the understanding of present and emergent technologies is central to developing practice related to flexible learning, particularly AI and learning analytics. HEIs will have to establish a 'data strategy' to drive innovations from data. Such a strategy will enable educational practitioners to interpret data, adopt evidence-based actions and, ultimately, cultivate data-informed practices. However, as part of the development of a governance structure and systems, the issue of ethics will play a central role, with similar concerns arising in the use of AI found here as well. Another implication is the growth of blended and hybrid course models. The key challenge for educators is to develop a hybrid model that provides 1) the right balance that meets the needs of students and demands of public health; 2) flexibility in reacting to changes to the environment; 3) opportunities to leverage their capabilities to design and implement blended learning to attract other cohorts of students.

1.5.4 Flexible learning research

First, while studies looked at student impact of flexible learning, more robust evidence is needed, especially longitudinally. Such a research design will require researchers to implement flexible learning pedagogies over a more extended period. Another area that deserves further investigation is in the area of microcredentials. Grey literature (eg industry-based reports, white papers) has highlighted developments in the design, implementation and coordination of microcredentials, which academic research can further examine. Finally, further research is required to explore the impact of equality, diversity and inclusivity on flexible learning. The literature reviewed in this report has provided conceptual arguments and what is needed now is empirical evidence.

2 Introduction

2.1 Aim and objectives of the review

This review aims to identify and summarise flexible learning trends, issues and impact from 2016 to the end of 2021. In particular, the review will focus on identifying what 'works' in the design, development and implementation of flexible learning. The specific areas that the review will pay close attention to are the contextual frame of flexible learning, such as situational factors from an institution or national perspective, technological developments and/or their application, and pedagogical developments.

The review's objectives are to provide recommendations to inform future policy and practice based on evidence. As part of meeting this objective, the report will highlight research that shows the demonstrable impact of flexible learning activities and practices, along with its contingencies and limitations. These demonstrable impacts in student outcomes include, but are not limited to, student performance, progression, engagement, satisfaction, skill acquisition and/or self-efficacy. Another objective is to identify and highlight trends related to Advance HE's Flexible Learning Framework. Flexible learning is relative and context-specific, and the study will help inform and update the Framework where relevant.

The literature review will focus on recent articles published between 2016 and the present day (end of 2021) to meet these objectives. In addition, to identify themes relevant to the aim of the study, this review will also provide additional emphasis on cases of particular interest. These cases showcase areas of interest, developments and/or concerns within the flexible learning ecology. The recommendations from this report will draw out implications of the findings relevant to the sector as a whole, HEIs, educators and professional services staff (eg providing support to teaching staff in the use of technology-enhanced learning tools).

2.2 Background to flexible learning

The notion of flexible learning in higher education has been around for many years. The merits of flexible learning were, perhaps, formally recognised by the establishment of the Open University in 1969. The Open University was created to allow prospective students from 'non-traditional' qualifications to earn a degree through distance learning. The advantages of flexible learning have been amplified by the internet, with online learning now considered a mainstream mode of learning (Loon, 2017). The growth of flexible learning stems from the evolving sophistication of pedagogical approaches, technologies and even from institutions who see flexible learning as a strategic driver. With most universities, the question about flexible learning is not 'if' but about 'how'. If flexible learning was not already a 'fact of life', it probably is today, given the realities that universities have to live with since the impact of Covid-19 in early 2020.

Nonetheless, as practitioners and researchers have looked into flexible learning, they have discovered it to be a rich and complex concept. An area that contributes to its complexity is that it is relative. A seminal report by Barnett (2014) for Advance HE (then known as the Higher Education Academy) offered a comprehensive and helpful way to think about flexible learning. He highlights 15 conditions for flexibility in higher education and a general yardstick used to evaluate flexible learning.

The first is framed within higher education and advocates that flexible learning must lead to a qualification. The corollary message is that flexible learning should serve a 'higher-order purpose' rather than just because it is convenient. The second suggests that flexible learning is contingent on some degree of self-directedness by the student to learn using their agency. Therefore, HEIs should offer all students access to suitable materials to enhance their learning experiences and outcomes. Third, flexible learning should allow students to interact with other students, especially with the affordance of today's technologies. This form of social learning is the fourth principle of synchronous interaction with their tutors. Nonetheless, the fifth principle is that autonomous learning from the students still requires educators to provide prompt and informative feedback on students' formative work and summative assessments.

Sixth, Barnett (2014) argues that students be provided with access to other academic services such as counselling academic and careers advice. This proposal suggests that students learning flexibly in part or as a whole be afforded equal treatment to other students attending in more traditional modes. This assertion is consistent with the seventh principle that flexible learning offers students financial benefits. The eighth is to be receptive to student feedback in reflecting. Like other learning modes, continuous improvement is necessary and expected. Ninth, the content and mode of delivery of flexible learning should be open and inclusive of all persons and respect diversity and equality. Tenth, the structure of flexible learning should be academically and educationally sound. As an integrated part of any curriculum, flexible learning must offer a ladder of progression to students (eleventh principle), with robust and reliable (twelfth principle) as well as cost-effective (thirteenth) that leads to students being able to successfully complete their programme (fourteenth).
Finally, flexible learning is not a path of least resistance or an easy way out. Like other study modes, flexible learning must be sufficiently challenging, reflecting the level and field of study. Barnett's (2014) work has subsequently been used and cited by many, each focused on a narrow set of principles and building on the work.

Indeed, flexible learning is rich. By building on evidence, practitioners and scholars have contributed an array of essential topics important to the development of flexible learning as a practice for educators and a strategic direction for HEIs centred on students of today and tomorrow. Drawing on the evidence and seminal work, Advance HE defines flexible learning in terms of pace, place and mode of delivery, often emphasising these, allowing students choices and a degree of control over when, where, how and sometimes what they learn. Advance HE has synthesised the various perspectives into an aptly named Flexible Learning Model[1]. The model highlights four distinct but interrelated areas of flexible learning: technology-enhanced learning, pedagogic approaches, employment and institutional systems and structure.

1 www.advance-he.ac.uk/guidance/teaching-and-learning/flexible-learning

In today's world, the notion of flexible learning is pervasively associated with online learning and its associated technologies. Such perceptions are unavoidable as technology plays such an integral role in enabling flexible learning. This area of technology-enhanced learning is not just about technologies created for the primary purpose of supporting learning (eg learning management systems), but it is also about technologies developed for other purposes (eg entertainment, socialising) adapted for learning purposes. Pedagogical approaches involve the content and delivery of teaching how students can or should learn in a flexible learning mode. A typical example is how pedagogies can be designed and delivered using synchronous and asynchronous learning modes individually and how they complement one another. Because higher education is increasingly expected to demonstrate value to its students, the discussion about employment is integral. Indeed, the notion of flexible working parallels flexible learning as students and graduates are now expected to manage their own work and learning. Finally, institutional systems and structure are crucial in enabling high quality flexible learning. Elements such as the curriculum associated with flexible learning need to be embedded within the overall programme. In addition, HEIs must also have in place systems and structures that enable the administration and delivery of flexible learning. Administrative procedures and credit systems need to be adapted, and educators must be trained to teach in flexible learning modes (eg online) effectively.

Given the background discussed, it is clear that this review builds on compelling practitioner evidence and robust scholarship and research in flexible learning. The following section discusses the methodology adopted to undertake the literature review. The presentation of the findings follows this section. Next, recommendations are provided to support and inform future policy and practice in flexible learning.

3 Methodology

3.1 Methodological approach

This study's unique approach in adopting an integrated systematic review draws on the work of Littell et al (2008), Loon et al (2019; 2020; 2021), and Torraco (2016) that encourages discipline, provides transparency and enables reproducibility. Systematic reviews have a long history in the medical field and were used to review randomised clinical trials using a rigorous systematic approach (McGrath, 2012) for future replication (Doolen, 2017). Integrated reviews reflect the same rigours as systematic reviews, but the key difference is that integrated reviews may include a broader range of research studies (eg qualitative and quantitative) (Doolen, 2017; Littell et al, 2008; McGrath, 2012). Consistent with the aim of this proposed literature review, Torraco (2016) suggests that a key aim of literature reviews is to analyse and synthesise current work to gain a sense of a field's direction of development.

The method adopted is informed by Loon et al (2019; 2020; 2021), emphasising transparency and reproducibility, with our research progressing through three broad stages. In stage one, the details of the review methods were finalised with Advance HE and a peer reviewer selected by the researcher. In stage two, the review was undertaken, selecting the research studies as the 'data' for analyses and synthesis. In stage three, the findings are reported (presented in the next section). Table 1 provides a summary of the three stages and their constituent steps.

Table 1: Stages and steps in the literature review

Stages	Short description of steps
Stage one	Finalised the review plan. Agreement on the methodology details (eg inclusion and exclusion protocol) as a result of the initial advisory group meeting.
Stage two	Conduct the review. Applying the search criteria and selecting the studies as 'data' for analysis and synthesis. Step one: Boolean search using confirmed keywords Step two: selection of databases and use search filters. Step three: apply inclusion and exclusion criteria on literature resulting from the search to finalise the set of literature to be analysed. Step four: merge articles and remove overlaps. Analysis and synthesis by applying the Context-Intervention-Mechanism-Outcome (CIMO) analytical framework.
Stage three	Producing the outputs as agreed in stage one.

As part of the search criteria in the first step of stage two, a Boolean search was undertaken using confirmed keywords (with wildcards), 'flexib*', 'adaptab*', 'versatil*' conjoined with 'learning'. Advance HE's database, and two academic databases (Web of Science and Scopus) (Loon et al, 2019; Loon et al, 2020) were used in the second step. These databases are recognised as the most comprehensive. Filters within the databases (eg publication dates) were applied. Upon identifying the articles from step two, further refinement was undertaken to ensure relevance and fit with the purpose of this literature review. Step three was conducted in applying the inclusion and exclusion criteria. The inclusion criteria broadly involved literature that focuses on flexible learning, specifically, what, how, when and who is engaged in flexible learning (Section 3.1.1 provides more details). The exclusion criteria discounted literature that merely skims on the topic of flexible learning and literature that is not related to higher education (eg primary and secondary school) (Section 3.1.1 provides more details).

Regarding the scope of materials, the selection of articles from academic literature databases was based on peer-reviewed papers as indexed in Web of Science and Scopus. Web of Science contains more than two billion cited references resulting from the peer review process, while Scopus is the largest abstract and citation database of peer-reviewed literature. This step is in keeping with Podsakoff et al's (2005) notion of validated knowledge. In addition, while only papers published in English were selected, the review covered non-European settings. Although non-European literature was integrated into the overall findings, the report highlights these studies for special attention, especially in drawing out implications that challenge Eurocentric models (see Table 2 for details of the search results).

In step four, the articles from Scopus and Web of Science were merged, and overlaps removed. The papers were then merged again from the groups using the three search terms – flexible, adaptive and versatile learning – resulting in 105 articles. The literature was then analysed and synthesised using the CIMO framework (Denyer et al, 2008). The CIMO framework is based on the logic of design science (Bunge, 1967, 1997; Pawson and Tilley, 1997), which states that outcomes (O) can be traced back to their context (C) through a unique intervention (I). Denyer et al (2008) refined the notion of mechanisms as thematic underlying 'explanations' that link interventions to outcomes. As part of the analysis, Advance HE's Framework was also used as a lens to identify evidence that aligns with the Framework and evidence that may help shape, inform and update the Framework. Stage three is the reporting of the research and its findings. This review did not evaluate the quality of the methods, analysis or argumentation found in the research, given the papers are deemed to be peer-reviewed.

Table 2: Search Results (30 Nov 2021)

Search Round	Flexible Learning	Scopus	WoS*	Adapt* Learning	Scopus	WoS	Versatil* Learning	Scopus	WoS
1	Article Title: “flexib* learning” Filters: Article + Review; Journal**; English From 2016 (inclusive)	306 173 **52**	199 116 **49**	Article Titles: “adapt* learning” Filters: Article + Review; Journal; English From 2016	2,329 945 **429**	1,703 862 **384**	Article Titles: “versatil* learning” Filters: Article + Review; Journal; English From 2016	10 5 **2**	7 1 **0**
2	Article Title: “flexib*” + “learning” Filters: Article + Review; Journal; English From 2016	1,687 949 483	1,340 805 459	Article Title: “adapt*” + “learning” Filters: Article + Review; Journal; English From 2016	14,063 6,241 3,626	10,774 5,750 3,434	Article Title: “versatil*+ “learning” Filters: Article + Review; Journal; English From 2016	100 45 25	81 35 20
3	Article Title, Keyword & Abstract: “flexib* learning” Filters: Article + Review; Journal; English From 2016	1,454 808 300	839 528 268	Article Title, Keyword & Abstract: “adapt* learning” Filters: Article + Review; Journal; English From 2016	9,816 4,363 2,050	6,685 3,807 1,871	Article Title, Keyword & Abstract: “versatil* learning” Filters: Article + Review; Journal; English From 2016	52 25 10	31 13 5
4	Article Title, Keyword & Abstract: “flexib*” + “learning” Filters: Article + Review; Journal; English From 2016	47,613 26,015 13,829	34,630 23,507 13,829	Round 4 for ‘Adapt* Learning’ and ‘Versatil* Learning’ was not undertaken as the review of the articles’ abstracts in Round 3 revealed diminished returns of relevant papers.					

*WoS = World of Science

**Filter not available in WoS, But the ‘article’ filter is adequate

3.1.1 Method of selection for inclusion

In addition to the Boolean search term used, the inclusion criteria required the papers to be either research articles or review papers in English and be published between 2016 and the end of 2021. Review papers are included as, similar to other empirical-related research, they follow a rigorous methodology and are expected to generate knowledge (Post, Sarala, Gatrell, and Prescott, 2020). In reviewing the abstracts, only papers that appeared to substantially relate to flexible learning and the aims of this report were included. In addition, the papers also had to be in a higher education context. For example, papers in which the participants were not university students were excluded.

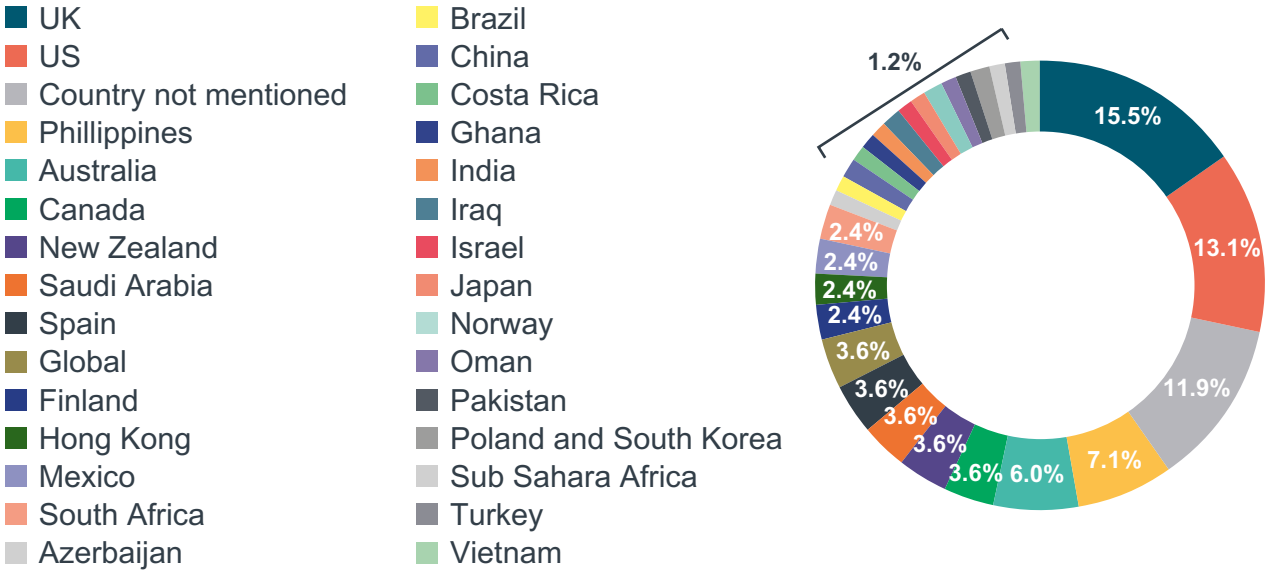
3.1.2 Excluded literature

On reading all the articles, of the 104 articles identified from the search results, 20 papers were excluded. These papers were excluded for several reasons in the context of the review's aims. The most common reason was the papers did not involve HEIs in terms of the research participants being from the university context and/or the implications of the research having a direct impact on higher education, including the employability of graduates. The second most common reason was associated with articles derived from 'adaptive learning' as a search term. Some of the studies from this search were exclusively focused on neuroscience, with the discussion involving flexibility mainly related to the cognitive process from a neurological perspective. As a result of the exclusion, 84 articles remained for the final review.

3.1.3 Overview of included literature

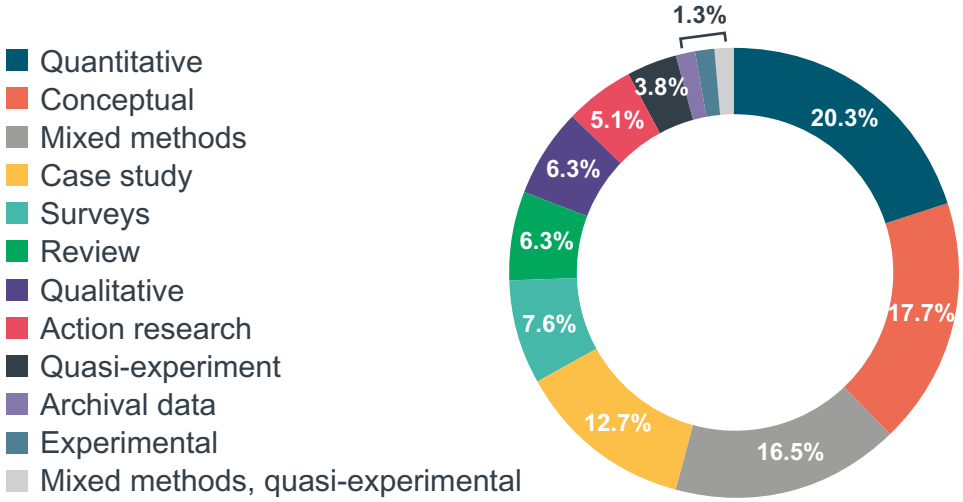
Eighty-four papers were included in the final review. In terms of the geographic spread of the studies, participants in the studies reviewed came from 28 countries. Some studies (three papers) were global in nature (eg using data from MOOCs and international literature, such as this study). In contrast, some papers, especially conceptual papers, were agnostic of the country of origin (10 papers). Most of the articles reviewed were from the UK (13). However, this included five that were Advance HE reports. The next most significant contributor was the US with 11, followed by the Philippines with 6. Australia contributed five papers. It should be noted that a study was conducted with all authors affiliated with Australian universities but, as the study was about flexible learning in Vietnam with Vietnamese participants, the study was classified under 'Vietnam'. There were three research papers undertaken in the context of Canada, New Zealand, Saudi Arabia and Spain each. Finland, Hong Kong, Mexico and South Africa had two papers written in each national context. The following countries had one article, each, undertaken in its context: Azerbaijan, Brazil, China, Costa Rica, Ghana, India, Iraq, Israel, Japan, Norway, Oman, Pakistan and Turkey. There was one paper written in the context of Poland and South Korea, which were the paper's authors' university countries of affiliation. Finally, one study did not specify the country but located its study in the African region of sub-Sahara. Figure 1 provides a snapshot of the country where most of the studies were situated.

Figure 1: Geographic spread of the participants in the research papers reviewed



In terms of the type of methods used (excluding the five Advance HE reports that included two case studies, and a survey, conceptual paper and qualitative scenario-modelling paper each), a majority of the research papers were quantitative (involving hypothesis testing) followed by 14 conceptual papers. Next, mixed methods (which combine qualitative and quantitative methods) was popular with 13 studies, followed by 10 case studies. There were six surveys, which usually adopted more straightforward methods of analysis. There were five reviews and qualitative papers (eg interviews and focus groups). Several articles adopted an action research approach (four), followed by three quasi-experiment papers (eg computer simulations). Finally, one paper each adopted archival data, experimental and a 'mixed-methods, quasi-experimental' approach. Figure 2 shows a breakdown of the types of research papers reviewed.

Figure 2: Types of research papers reviewed



3.1.4 Method of analysis

The CIMO framework was used as a lens in the analysis. 'Context' compels the evaluation of the drivers of flexible learning. 'Interventions' are the wide-ranging actions or activities related undertaken by HEI and/or educators (eg using new technologies, creating new pedagogies). 'Mechanisms' are the underpinnings of the interventions that enable the aggregation (ie common themes) in flexible learning in the studies reviewed. 'Mechanisms' are akin to the cogs-and-wheels of the concept. Finally, 'outcomes' relate to the 'results' derived from flexible learning (eg student achievement). In some studies, more than one of the elements, ie context, intervention, mechanism and outcome, may play equally important roles. In such situations, this review highlights the essential elements as noted by the respective authors in each study, guided by the aims of this study. An abductive process was used in the analysis method to identify the key focus of the study using the CIMO framework. The abductive process was also used to identify thematic insights into Advance HE's Flexible Learning Framework.

3.2 Reflections on the methodology

The CIMO framework provides not just a framework that guides the analysis, but also helps with the synthesis of the results into a pattern that highlights the drivers found in the context, the action taken (as interventions), the result (ie outcomes) and, equally important, the underlying mechanisms (ie underlying themes) that link the intervention to the outcomes akin to cogs-and-wheels in an engine. Nonetheless, as with any method, there are limitations. First, the methodology assumes that all articles will have content related to context, intervention, mechanism and outcomes. For example, research notes tend to be brief and may not contain all of the elements characterised in the CIMO framework. Second, some papers do not fit with the pattern of CIMO and are perhaps not intended to do so by their authors. As such, the analysis and synthesis of the research studies in this review has been undertaken sensibly.

4 Findings

4.1 CIMO results

The findings are presented thematically using the CIMO framework. There are two main themes in the 'context' dimension: micro (exploring field-based pedagogies and development of the HE teaching profession) and macro drivers (Covid-19, professional and vocational development, affordance of technologies and socially based drivers). Similarly, there were two primary themes in the 'intervention' element: technological configurations (digitalising the classroom, gamification and interactivity, learning analytics, personal learning environments, selective deployment of technologies, and intuitive technologies for educators) and explorative approaches to pedagogies (with various examples). The 'mechanisms' dimension has three themes: systems approach (with various examples), educators' role (with various examples and, in particular, reflexivity and communication) and inclusivity (various examples). Finally, two main themes emerged from the 'outcomes' dimension: student impact (student learning and student behaviours in learning) and organisational learning (learning from trial-and-error and advancing socially orientated aims). In some of the papers, each of the four elements in the CIMO was present. In such cases, the article's most evident or central theme that was most consistent with the report's aim was highlighted as part of the discussion.

4.1.1 Contexts

4.1.1.1 Micro drivers. Exploring field-based pedagogies

The most prominent was micro drivers, which primarily involved HEIs and educators instigating flexible learning to assess its feasibility. In the literature reviewed, it was clear that the design, development and implementation of any flexible learning initiative are informed by the subject/discipline. Although there are aspects of flexible learning that are common and can be applied across all subjects, eg asynchronous reading materials, there are aspects that are likely to be subject-centric. Such a view was explored by Acosta et al (2018) in the subject of optometry. As with some subjects, the teaching of optometry necessitates the application of practical, hands-on teaching elements. In their study of the use of e-learning interventions for the subject, they explored the suitability of static and interactive websites to teach ocular anatomy and physiology and the usefulness of blended online and in-lab environments to deliver teaching in optometry. Their study found that students accepted all intervention types, but this was contingent on the topic and purpose, eg learning information versus understanding and applying knowledge. Nonetheless, given the nature of optometry, it was of no surprise that the students preferred blended learning and viewed the educator as an essential part of their learning process. Acosta et al (2018) also noted that students' experience in using technology as part of flexible learning is dependent on their comfort levels in a technologically centric learning environment and their savviness in using technology tools.

Similarly, Lo, Han, Wong, and Tang (2020) explored how flexible learning could be used in a chemistry-based undergraduate class, 'Advances in Organic Synthesis', at a Hong Kong university. The course involves advanced information in organic chemistry such as reaction mechanisms, asymmetric catalysis, retrosynthesis and applications in the synthesis of natural products.

The blended learning curriculum combined face-to-face and e-learning components with interactive online components, including technical experimental videos. The course involved integrating different knowledge domains, which helped students better understand. In the flipped class, students participated in the case studies of organic synthesis and shared their findings with other classmates in oral presentations. This 'flexible learning with multicomponent blended learning mode', as termed by the authors, enhanced student engagement and self-motivation in their studies. The course evaluation score and students' academic performance in the blended learning mode increased significantly compared with traditional teaching methods used in previous years. The study found that students' engagement and self-motivation in learning were enhanced.

In another science-based example of flexible learning, Jeffery, Rogers, Jeffery and Hobson (2021) discussed how developing a virtual microscope enabled the field of geoscience (including petrology, mineralogy and geochemistry) to be taught flexibly and remotely. The main barrier in adopting pure online learning in similar fields is due to its requirements involving hands-on practical exercises. Such a situation presented opportunities to explore the potential value of, and provides a method for, building flexible, digital and asynchronous platforms to create student-centred materials for use in an online and/or blended learning environment. Still, within the science, technology, engineering and mathematics field, a couple of authors investigated the development of students' quantitative skills using flexible learning. In addressing the lack of quantitative methods provision within the UK HE sector, resulting in skills deficit in graduates and their preparedness for the workplace, Cook, Watson, and Vougas (2019) undertook research to explore if flexible learning could help address this issue. They developed a flipped approach that allowed students to engage online materials on a business and financial forecasting module outside of class time. By giving students a choice and allowing them to study at their pace with support, they found positive gains over four years.

Similarly, Delgado-Cepeda (2021) also explored how flexible learning could help enhance student outcomes in a 'numerical methods' class in Mexico. However, in this case, the author used a combination of technologies, especially mobile orientated platforms. These technologies included Zoom video class and tutoring channels, mobile instant messaging (called 'Remind'), formal evaluation tools ('Classmarker' and 'Socrative'), assessment (Google analytics), machine learning to support the development of blended learning (Mathematica), asynchronous videos (YouTube), e-books (Scribd) and electronic forms (Jotform). Delgado-Cepeda (2021) highlighted that students reported that the social learning dimension of the class was essential to them.

In an extensive study, Priestley, Dohaney, Atkins, Salmon and Robinson (2019) developed a MOOC course titled 'Antarctica: From Geology to Human History', which became quite successful. The Science in Society group developed and offered the MOOC at Victoria University of Wellington over three iterations. The MOOC was the primary intervention created from four main contextual perspectives; personal, institutional, political and educational contexts. The person context involved the three academics who aspired to innovate on flexible learning modes. In particular, they wanted to move away from classroom-style video lectures to filming lectures in field locations. From an institutional perspective, the Victoria University of Wellington supported the development of the

MOOC and even provided funding for its development as part of an overall institutional initiative to bring teaching and research together as complementary activities. From a political perspective, the development of the MOOC was also supported by the New Zealand government as it had an interest in Antarctica. Finally, from an educational context, the MOOC was developed to enable flexible learning and allow the course to be open to as many people as possible so that there is a better understanding of Antarctica and the need to protect the uniqueness of its environment. While learning about the 'science' of Antarctica was the main goal of the MOOC, the course also had secondary but important aims. The first is the use of the course as a public engagement platform about Antarctica and Antarctic science. The second was to maximise the use of new media for education and outreach about Antarctica. The third was to use the MOOCs as a way to record and maintain the legacy of the expedition. Overall, Priestley et al (2019) reported that learners across the three iterations reported positive learning experiences. The intended aims of the immersive video lectures were met as learners found them immersive and reported this approach to be overwhelmingly positive. Learners reported having a better appreciation of the fragility of Antarctica's environment, the need to protect it and how.

In other fields of artistic-visual education, González-Zamar, Abad-Segura, de la Rosa and López-Meneses (2020) explored how digitalisation promises new solutions to advance flexible learning in artistic-visual education. They argue that advancement on many fronts, such as digital media literacy, educational technology and haptics, allows educators to further incorporate elements of sensitivity, imagination and creativity into flexible learning environments to develop artistic thinking. A couple of papers explored how languages (Maori and English) could be taught using flexible learning. Howard and Scott (2017) found that a flexible learning approach effectively taught pre-service language teachers in New Zealand. While there are some similarities with other field-based subjects, the researchers argued that learning and teaching second languages are unique skills in their own right. Effectively learning a new language requires a natural process of acquisition. This process usually entails learning at one's own pace (more so than other 'subjects'), being placed in an immersive environment that allows one to practice, preferably while interacting with others (eg intercultural understanding and exchanges). The second paper involved teaching English as a second language in a Brazilian university's School of Business and Hospitality. A key aim of the programme was to enhance the university's students' prospects from an international perspective. The author, Vaz De Oliveira (2017), reports that flexible learning is adopted to deliver the programme, premised on blended learning (in-person and online) and tandem learning. Tandem learning is especially useful in learning languages, and it involves native speakers of two different languages (ideally, each learner is a native speaker in the language the other wants to learn) who work and learn from one another together to learn each other's language and develop the target culture and community knowledge. The gain that emerges from this process is learning a language and the (inter) cultural context. Learning a language's cultural context helps students to learn the languages. Flexible learning for languages can be equally as effective compared to other subjects. Its effectiveness is just contingent on the design.

In highlighting a relatively neglected discussion area in flexible learning, Nottingham (2016) argues that work-based learning is an important consideration in flexible learning. This consideration is important because it is fundamentally different from pre-experience undergraduate programmes, which tend to be the main focal point of mainstream flexible learning research. Still, work-based learning students are a sizeable and growing cohort of students important to HEIs. The author highlights that such an argument is further supported by the implications of policy changes in UK higher education (eg apprenticeships) that have now resulted in work-based and experience-based provision being standard offerings. Nonetheless, the author also highlights that, while policy changes have been a driver in enabling work-based and experience-based provision to be more prominent, the language used has marginalised this approach at the same time. The author notes that, in some instances, policy artefacts define work-based and placement learning merely as a 'mode', which does not do justice to the potential that this area of pedagogy offers. Nottingham (2016) argues that three main perspectives are crucial in enabling work-based and experience-based learning to be effectively integrated with flexible learning; the discipline-centred perspective, learner-centred perspective and employer-centred perspective. The discipline-centred perspective is subject-specific and is usually the primary perspective adopted by many HEIs and educators, and it remains a focus of the curriculum of work-based learning pedagogy. This perspective is grounded in professional areas of expertise that have played a significant part through professional body engagement. The learner-centred perspective highlights the appreciation of the uniqueness of work-based learning pedagogy, in particular concerning independent learning models, including the experiential learning models and outcomes. This perspective is focused on knowledge production that is interdisciplinary or transdisciplinary. Finally, in the employer-centred perspective, the employer is the focal point of the curriculum design targeted at a particular workforce. The design and delivery of the pedagogy can be undertaken as a corporate training style. The key aspect involves enabling the integration of flexible learning and work-based learning as hybrid pedagogies. Hybrid pedagogies help to address institutional drivers while balancing this with practical, flexible educational provision, eg involving content, method and pace of delivery. Like many other flexible learning models, there is no one best model. Educators and HEIs will need to develop bottom-up approaches reflecting the needs of the learners, the subject (or even workplace problems) and the employers. The primary outcome is that it provides the grounding for educators in developing hybrid pedagogies that integrate flexible learning and work-based learning. The characteristics of the three perspectives are crucial in the continuous development and prototyping of flexible work-based mainstream provision.

4.1.1.2 Micro drivers. Development of the HE teaching profession

A different but corollary micro driver is educators' capabilities in designing, developing and implementing flexible learning. This issue was highlighted in a study by Gachago, Jones, Esambe, Jongile and Ivala (2021) in South Africa. They argue that while the drivers for flexible learning in the country is similar to other nations, eg change in student demographics, the pace of change required within HEIs has not been maintained. In particular, they highlight the need for institutions to offer academic staff the opportunities and infrastructure to upskill in designing and delivering the relevant

curriculum to students. They undertook an action research project to help them gain insight into how teaching staff may enhance their capabilities to support institutional strategies for flexible learning. The study focused on two critical aspects of most learning and teaching: knowledge of the subject and pedagogy. They argued that these two sets of knowledge are intertwined in most curricula design. The participants in the research were teaching professionals. They were asked to reflect on being part of a process in transitioning from a face-to-face in-person learning environment to a blended learning mode that combined online and asynchronous learning with face-to-face synchronous learning. The involvement of teaching professionals in such a way allowed for a higher degree of authenticity of their experience that may enhance their empathy for their students' journey in flexible learning. The reflections undertaken by the participants also equipped them with the ability to adapt their curriculum for their students. Finding a 'fit' between the flexible learning approach and students' needs is imperative as it enhances students' experiences, learning and achievement. Ultimately, the researchers found that the action research helped build the participants' (and facilitators') positive individual dispositions towards flexible learning and enhanced their innovativeness and (measured) risk-taking.

4.1.1.3 Macro drivers. Covid-19

Eight studies highlighted Covid-19 as one of the leading contextual drivers in their studies, eg Alabdulkarim (2021); Anderton, Vitali, Blackmore and Bakeberg (2021); Dayagbil, Palompon, Garcia and Olvido (2021); Essel, Vlachopoulos, Adom and Tachie-Menson (2020); Joaquin, Biana and Dacela (2020); Lo et al. (2020), Tarrayo and Anudin (2021); and Whalley, France, Park, Mauchline and Welsh (2021). This research is presented throughout the Findings section. However, this report focuses on material aspects found in these papers other than Covid-19. While lockdowns imposed by governments in response to Covid-19 are material drivers, the discussion here will focus on other equally significant contextual drivers of flexible learning.

4.1.1.4 Macro drivers. Professional and vocational development

Another theme that emerged from the analysis was professional development, where speed is essential but may also face constraints in terms of pace, place and costs. Flexible learning is also a valuable concept for developing capabilities at speed. Lewis et al (2016) authored a paper describing their journey to create a distance learning programme to enhance nursing academics' competencies and nurture communities of practice. In 2002 the Vietnam Nurses Association developed a national action plan for strengthening the nursing and midwifery services within Vietnam. There was an urgent need for the professional development of nurse academics, which was also recognised as part of the country's national initiative to enhance its human capital. This plan essentially involved improving undergraduate and postgraduate nursing education. As a result, a collaborative partnership was established between the Vietnam Nurses Association and the Queensland University of Technology to develop an international distance education programme. The key factors that enabled the programme to be successful are: 1) opportunities for networking and collaboration; 2) acquiring new knowledge; 3) improving English, which is contingent on the programme's language; and 4) enhancing competencies of nursing academics and the development of communities of practice.

A relatively similar situation was highlighted in a study by Feldacker, Jacob, Chung, Nartker and Kim (2017), which focused on addressing the limitations in healthcare worker capacity in sub-Saharan Africa. These challenges were further compounded by the burden of tuberculosis and HIV epidemics in the region. Health care workers need to continuously update their knowledge given their dynamic environment. Flexible learning via online provisions provides effective continuing professional development to support practising health care to reach high standards of care. Nonetheless, these benefits are generally assumed, and it was the aim of Feldacker et al (2017) to gain the evidence. The researchers found that the region's healthcare workers accepted the need to take up the continuing professional development programmes and develop their self-directed learning. A study of similar contextual nature undertaken by Teymurova et al (2020) highlighted the role of national policy in encouraging and accelerating mobile learning in entrepreneurship education. Mobile technologies were deemed to be the most effective way to develop entrepreneurial skills in the country across geographies in a cost-efficient manner. The main component was the design of the courses by experienced educators using projects as a basis in teaching and learning. The involvement of national agencies created more urgency in the development and promoted more coherence in the approach across several HEIs in Azerbaijan.

4.1.1.5 Context: macro drivers. Affordance of technologies

The adoption and advancement of flexible learning practices is sometimes driven by desires to maximise technologies' utility. For example, the article by Hu and Spiro (2021) discusses the possibilities offered by the eXtended Massive Open Online Courses (xMOOC) and Connectivist MOOC (c-MOOC) platforms. xMOOCS are relatively prevalent and include platforms such as edX, Coursera and Udacity that provide xMOOCs. The term cMOOCS is used to differentiate platforms that are primarily used to bring people together for the purpose of learning. cMOOCS will often contain social media, blogs and other similar functions that enable learners to engage with one another. Unlike xMOOCS, which rely on an instructor to structure and facilitate the learning, cMOOCS consider all participants as teachers and learners.

In their article, Hu and Spiro (2021) used the cognitive flexibility theory as a lens to discuss how xMOOC and cMOOC could be used synergistically to enhance flexible learning. Cognitive flexibility theory suggests that, for learners to be effective in their learning, they must be prepared to select, adapt and integrate their existing knowledge and experience in a way that enables them to deal with novel situations and problems. Using this theory, Hu and Spiro (2021) argue that xMOOC and cMOOC support flexible learning and student learning achievements. They suggest that student learning is enhanced by enabling students to learn in ill-structured domains (as opposed to well-structured domains). Learning activities from these two domains can be presented to students through the two MOOC platforms. Ultimately Hu and Spiro (2021) argue that integrating technologies and platforms need to be undertaken with consideration of a pedagogic rationale (in addition to aims involving flexible learning). In doing so, they suggest that, by adopting the cognitive flexibility theory as a framework, instructional designers are likely to be more effective in developing courses that target specific skills they want to develop in students.

4.1.1.6 Macro drivers. Socially based drivers

Andrade and Alden-Rivers (2019) presented a compelling case study that highlighted the main driver for flexible learning in an institution in the US. The HEI, Utah Valley University, is an integrated university and community college with strong vocational roots. The university has a dual-mission model that combines academic and vocational programmes. Many of its students are from non-traditional backgrounds. One of its aims is to make education more affordable and accessible to students of all backgrounds, which improves social mobility. The university has about 40,000 students, with enrolments projected to reach 45,000 by 2025. Coupled with limited physical space and budget for expansion, enhancing and further embedding flexible learning is a key priority for the university, especially given the general profile of its students, with 78% of its students working from 21 to 31 hours per week, 30% over the age of 25, and nearly 40% being first-generation. The context that drives flexible learning in this university is not dissimilar to some other universities whose values and goals are to increase social mobility and participation in HE. Flexible learning in HE widens participation and enables a higher degree of access for prospective students from non-traditional backgrounds. This group of individuals includes those who may not have the cultural capital that other prospective students may have (through family and social circles) in terms of a tradition in accessing HE. There is more about this university in the section on institutional systems and structure.

4.1.2 Interventions

4.1.2.1 Technological configurations. Digitalising the classroom

While not usually highlighted as part of flexible learning, physical flexibility can play a role in the flexible learning ecosystem, as exemplified in the studies by Eickholt, Jogiparthi, Seeling, Hinton and Johnson (2019) and Ellern and Buchanan (2018) in the US, and Demir-Yildiz and Tatik (2019) in Turkey. In their study of flexible learning spaces in physical classrooms, Eickholt et al (2019) undertook a quasi-experiment. Their research aimed to examine if there are cost-efficient approaches in equipping and reconfiguring a physical classroom flexibly to encourage active learning. Using standard equipment, eg computers and monitors, coupled with students' own personal devices, the authors found that students' learning experiences were enhanced as they studied in the 'new' classrooms. The students found that the new space was conducive to their learning as they could interact and engage effectively with their peers to attain the objectives of the projects. In addition, Eickholt et al (2019) found that the physical spaces can be flexibly changed with efficiencies in costs, which were comparably lower than the benchmark used in their study of a 'typical' class. The article from Ellern and Buchanan (2018) shares similar intent and approach. The authors discuss how library professionals can help develop and enhance classroom flexibility. They focus on making full use of digital technologies to enable students to use the devices wire-free to maximise their ability to engage and collaborate. A study by Demir-Yildiz and Tatik (2019) referred to the flexible rearrangement of physical, non-technological assets in the classroom to enhance student learning.

All three studies were published before the pandemic, and an underlying trajectory of many HEIs was to enhance their students' classroom experience. However, the pandemic has shifted priorities. In particular, HEIs need to balance their staff and students' safety (and adherence to advice provided by their respective authorities) and students' preference to attend class in person. These studies are relevant to this pandemic era as they highlight how flexibility in the classroom can enable flexibility outside the classroom, especially as the pandemic continues. When it is safe to do so, the digitalisation of the classroom allows for faculty to teach in the classroom while providing a live feed of the class to students who prefer to attend remotely. Students can collaborate with one another on synchronous activities even if some are in the class and others are accessing the class remotely. This example gives students flexibility based on health and safety reasons. Although the pandemic compels this example, it is nonetheless at an additional capability that HEIs can build on. The current state of technologies in the education sector enables the creation of classrooms that connect students with one another, giving students the flexibility they need. In addition to electronic devices, HEIs may need to rethink how they manage their teaching facilities. The development of a 'dual mode' class that includes students who are in-situ and those who access the class online provides HEIs the opportunity to create a new approach in the flexible learning ecosystem. Such an approach may appeal to universities that prioritise campus-based teaching (when they can) and courses where a full online teaching mode is not feasible.

4.1.2.2 Technological configurations. Gamification and interactivity

Mayowski and Norman (2020) explored if educators can capitalise on the convenience and flexibility online training offers busy trainees without sacrificing interactivity and depth of learning. They undertook their research in the Institute for Clinical Research Education's (part of the University of Pittsburgh, USA) intensive biostatistics online course, which is the institute's primary means for flexible learning for professionals in the field. Mayowski and Norman (2020) developed and implemented 16 gamified, interactive online problem sets (called 'GIOPS') to supplement short lecture videos and other class materials. They found that gamification effectively engaged clinicians in clinical research training. In addition, they found that participants' problem-solving fluency was enhanced by incorporating more interactivity, practice and feedback. In particular, the researchers found that students who completed the GIOPS took less time to complete assignments and found them less effortful than students who did not complete GIOPS, suggesting that the GIOPS increased students' problem-solving fluency. The gamification element also allowed trainees at different levels to learn at their own pace. GIOPS significantly enhanced and personalised learning and permitted the flexibility that makes online education an attractive option for busy clinicians.

Similarly, Slade, Martin, and Watson (2019) reiterate that students are unique human beings, and while there are similarities, no two people nor learners will be the same. Therefore, teaching strategies need to be flexible and adapt to new cohorts of students. Nonetheless, what is likely to be similar is that students need to be attracted to learning (even when it is flexible and convenient) and excited in the learning process. According to the authors, the primary intervention to achieve this is game-centred learning. The notion of play is likely to trigger learners' affective senses such as enthusiasm,

anticipation and overall enjoyment. The intervention in the design in the gamification of learning initiatives is the cognitive flexibility theory that supports learners to assimilate, reconfigure and apply knowledge in new ways in addressing novel problems. The authors suggest that the application of game-centred learning makes learning more accessible to individuals who may be considered novices while still appealing to more experienced learners in the field.

Learning languages requires practice, with which technology can significantly help. However, to what degree technology provides better support than conventional methods is unknown. To address this issue, Vazquez-Cano, Mengual-Andres and Lopez-Meneses (2021) undertook research to gain insight into the use of a chatbot in improving the learning of Spanish by students at the National University of Distance Education in Spain. The chatbot was found to be helpful in correcting and enhancing students' use of Spanish. However, the intervention of students' interactivity with the chatbot is potentially the main driver in improving their learning. Students reported better support and companionship in the process due to the interactivity. The interactivity was quite natural in terms of it being conversational, and they found the learning process easy as they learned any time and anywhere.

4.1.2.3 Technological configurations. Learning analytics

The article by Liu et al (2017) took advantage of an opportunity to gain detailed insight into student performance using adaptive technologies. The adaptive technology enabled the researchers to examine the students' learning trajectories with the intent of personalising and adapting the curriculum as well as assessment to enhance the performance of the first-year students undertaking a pharmacy professional degree programme. They employed an adaptive system, called 'Leap', and used learning analytics systems, labelled as 'Activity Analytics' and 'Outcome Analytics'. The interventions of these learning analytics modules were essential to collect and manipulate the data of students' behaviour patterns (based on their needs and interests), which are used to inform the design of effective adaptive learning systems. Their research found that it was essential to consider affective factors such as motivation in adaptive learning, apart from learners' cognitive ability. In the application of adaptive systems, alignment among various components in an adaptive system can impact how learners access the system and, more importantly, their performance. The study's findings revealed that adaptive learning technologies were associated with attaining personalised learning for each student.

In addition, given the amount of data that learners are generating through their activities on online platforms, educators have the opportunity to use such data to support learners better. Such data is less subjective (compared to the self-reports usually collected and applied), and its validity can provide valuable insights. Given its prevalence, it is difficult to imagine a future that does not involve educators using this data. However, some stakeholders argue that such data may be unethical and perpetuate inequalities. Data still needs to be interpreted so its use is never a guarantee of objectivity. As a result, Siemens (2019) suggests that it is vital to have these balanced debates as transparently and rigorously as possible about the role of learning analytics and its role in flexible learning.
The central intervention is learning analytics, which, like many other technologies, has different degrees of functionality, algorithms and specialist application. Understanding the underlying technical mechanics and architecture of the technology is essential. The primary input in enabling educators

to apply learning analytics optimally involves strong comprehension of the learning experiences of individuals (eg while engaged in activities such as gamification). The central intervention in understanding the human experience while learning (including flexible learning) empowers educators to appropriately and effectively apply and position learning analytics. Ultimately, it is about appreciating the merits and issues concerning the use of learning analytics in flexible learning. Learning analytics was frequently highlighted in various literature reviewed and will be discussed in some of the following sections.

4.1.2.4 Technological configurations. Personal learning environments

While individual technologies are important considerations in creating flexible learning ecosystems, it is also important to consider them as a collective, especially given how dependent we (students and staff) all are on them. García-Martínez, Rosa-Napal, Romero-Tabeayo, López-Calvo and Fuentes-Abeledo (2020) highlight this important point in their research involving personal learning environments. According to them, there are two critical aspects of personal learning environments. First are the technological tools that enable them to take place. In their study of students in a Costa Rican university, García-Martínez et al (2020) found that the most commonly used tools were general and advanced search engines and video channels, while the least commonly used were MOOCs, information management applications and institutional archives. Their findings are consistent with previous studies. The second is cultivating the motivation in students to learn autonomously and be self-directed in developing themselves in general. The encouragement of students to use information and communication technology tools in their learning environments is crucial as the development of self-directed learning attitudes and behaviours are expected in the modern workplace. Overall, the authors found that students who used information and communication technology tools in their personal learning environments had higher mean grades, which is consistent with findings from other studies. They suggest that HEIs' flexible learning strategies should include the various technological resources available in the digital era to help ensure students maximise their development through their personal learning environments during their course of lifelong learning.

4.1.2.5 Technological configurations. Selective deployment of technologies

The review by Adams, Simpson, Davies, Campbell and Macdonald (2019) shows how HEIs and instructors cannot assume that what has worked well for students in general will work well for students who are neurodiverse. They explored how HEIs considered and reflected the needs of neurodiverse students in their design and implementation of flexible learning, particularly initiatives that are contingent on the use of technology. They found that there were nuances in the role of technology. Specifically, technology could be an advantage or a barrier. For example, online asynchronous learning may enable neurodiverse learners to learn independently and at their own pace, which is an advantage (Adams et al, 2019). However, the same programme may also be a barrier if it is not designed using appropriate media or display, eg colour scheme or text style. Therefore, while technology can support neurodiverse students, it must be carefully designed. Nonetheless, currently, there are a growing number of off-the-shelf software applications that HEIs can use for neurodiverse students.

4.1.2.6 Technological configurations. Intuitive technologies for educators

In addressing challenges related to student participation, engagement and achievement, the adoption of flexible learning modes (including flexible curriculum and flexible delivery), has been well received. However, different approaches to flexible learning have yet to be fully explored. Specifically, the research by Li, Yang, Chu, Zainuddin, and Zhang (2020) examined the effectiveness of a 'blended synchronous learning' design in a Hong Kong context. The blended synchronous teaching involved face-to-face and real-time online classes offered to distance learners to learn together with traditional learners present in the classroom. The streaming of live teaching from the classroom resulted in students indicating that the approach helped enable in-depth learning, convenience and effectiveness as students learning remotely could also participate in classroom activities. The most critical intervention in the deployment of blended synchronous teaching was the use of intuitive technologies that enabled the educators to swiftly grasp the control and application of the software. Intuitive technologies encourage 'buy-in' from educators, allowing the educators to focus on students and pedagogies rather than the technology. The other key factor is adequate technical support. Technologies with institutional expertise to support their employees are likely to stimulate its take-up from both educators and students.

4.1.2.7 Explorative approach to pedagogies. Various examples

In their evaluation of the effectiveness of blended learning against face-to-face in-person learning for undergraduate nursing students, Berga et al (2021) emphasised that the pedagogical model adopted is crucial. They hypothesised that both blended and face-to-face approaches resulted in similar results because a pedagogical model of progressive complexity underpinned both as interventions that enabled them to balance complexity with structure. So, while technologies and methods are essential, they are perhaps only as helpful in so far as they are designed to balance the ability to support and challenge the students.

The article by Abisado, Unico, Umoso, Manuel and Barroso (2020) regarding the developmental stage of the internet in the Philippines highlights the critical intervention that infrastructure and local authorities play. While these are almost taken for granted in many developed economies, these interventions are at the forefront of developing flexible learning initiatives in developing countries. In another study undertaken in the context of the Philippines, Gocotano, Jerodiaz, Banggay, Rey Nasibog and Go (2021) argued for a balanced approach when implementing flexible learning, particularly in the use of technologies. Echoing the work of Abisado et al (2020), they state that the communications and internet infrastructure in the Philippines is not conducive to intensive technologies that require high bandwidth. In addition, they also highlight that HEIs must consider students' affordability of technological devices (most can only afford their mobile phones, and most use this as their primary device for learning) and the high cost to access the internet. As such, HEIs must adopt a balanced and pragmatic approach. They suggest that these approaches include pedagogical designs that rely on programmes that do not require high bandwidth, preferably asynchronous, which can be easily operated using mobile phones and complemented by more basic

learning solutions such as podcasts. The use of low-technology solutions was also proposed by Essel et al (2020) (also mentioned in the section on Context). They advocated using audio-based tools for synchronous engagement between students and lecturers to reflect Ghana's infrastructure.

Keeping to examples from developing economies, the next involve Pakistan. Pakistan has a large population, and its internet infrastructure is still developing, especially in its reach in rural areas. A study by Shuja, Qureshi, Schaeffer and Zareen (2019) explores the role of mobile learning in Pakistan as it potentially offers an interim alternative to mainstream online learning. While content delivered over mobile learning may not be as comprehensive as mainstream online learning, it may be adequate in meeting minimum standards for learning to take place, especially for adult learners. In their review of literature, Shuja et al (2019) found that mobile learning holds significant promise in enhancing learners' performance. While the efficacy of mobile learning is contingent on other factors such as the topic/subject and pedagogic design, it presents an option for learners in Pakistan. The authors argue that the choice of mobile learning should be the result of discerning educators using media richness theory. The theory describes the reproduction of information transmitted by different media. This theory suggests that media that can transmit rich (eg text, visuals and audio) and even personal communication are preferred over less rich media. However, given constraints and limitations, educators are likely to make trade-offs with respect to the other advantages presented by different media, eg mobile phones that are highly flexible and accessible by users in a developing country such as Pakistan. Indeed, the outcome of their study revealed that the students were satisfied with mobile learning, which was adapted to the medium focusing on discussion-orientated means for≈learning.

The premise of an integrated pedagogical approach was also evident in a study by Ramírez-Montoya and Ramírez Hernández (2016). Similar to the other papers reviewed, their study echoed the need to focus on how pedagogy is designed coherently and purposefully to make full use of the selected technologies. Of course, an effective design of any curriculum depends on the necessary elements in the students' learning environment, eg the academic curriculum and content, and the equipment and devices. The authors emphasised that curriculum and technologies that enable student interaction and learning were important elements as well, especially in enhancing the student experience. Nonetheless, these elements are unlikely to be effective without a practical design. Their research applied such a design, which they termed 'inverted learning'. This design shifts the teacher's role away from being the 'sage-on-stage' who controls the content and flow of information to students towards focusing on students. The design focuses on the students' understanding and allows their progression in the class to inform how the course is delivered. However, an equally important aspect of inverted learning is active participation. To do so, students are tasked to prepare for class asynchronously 'outside' of class time. Similar to a flipped class, inverted learning focuses class time on practical activities and meaningful interactions between students and the lecturer. At the end of their research, Ramírez-Montoya and Ramírez Hernández (2016) reported that the students found the format attractive and even adapted their own learning expectations and styles to maximise their learning from this approach.

While the discussions of individual technologies help advance HEIs' flexible learning capabilities, an essential intervention related to technology-enhanced learning is adopting an integrated view. Indeed authors such as George and Vinay (2018) have argued that, given the advancement of mobile technologies and learning analytics, an integrated perspective is essential to ensure that HEIs can optimise their investment in these technologies and enable students to have effective learning experiences. Along similar lines, in their study of flexible learning with 511 students participants at a Norwegian University College, Bugge and Wikan (2016) suggest using lifelong learning as a philosophy in guiding the design and development of flexible learning interventions. They highlight the progressive work that has been undertaken by various institutions, including those allied with the European Union, that HEIs can leverage in developing flexible learning. They argue that lifelong learning presents a more holistic approach to flexible learning and may further future-proof institutional systems and structures. By aspiring to provide lifelong learning to student populations from diverse demographics, universities will anticipate and create programmes suited for these student populations that are likely to grow.

While flexible learning is about the pace, place and mode of delivery of learning, it can also be about balance in terms of enabling the lecturer to keep in control of the class across (virtual) spaces and, at the same time, providing students with a degree of flexibility to manage learning artefacts. A study by Muñoz-Cristóbal et al (2018) explored this as a conundrum by presenting two concepts: learning buckers and bucket-server. Using Web 2.0, lecturers can create learning activities using various tools such as apps embedded within virtual learning environments (such as Moodle). Each student is allocated a learning bucket which they are expected to use as guided by the lecturer. The second concept is the bucket-server, allowing lecturers to collate and integrate learning buckets. Bucket-servers will enable lecturers to manage (create, modify, remove, retrieve) learning buckets and learning artefacts (eg Google Docs, Picasa7 or Flickr) contained in the buckets using various software applications (eg virtual learning environment, mobile augmented reality clients). Muñoz-Cristóbal et al (2018) suggest that the learning buckets can ultimately enable students to participate in the technical implementation of the learning situations and can be an interesting instrument to support the evolution from teacher-centred approaches toward more student-centred ones in across-spaces learning. Learning buckets and bucket-server can help maintain the lecturers' control of students' actions while providing students with a relatively high degree of autonomy to undertake prescribed learning activities.

The article from McLean et al (2019) adopts a slightly different angle in implementing flexible learning. While they generally favour flexible learning due to its apparent advantages, the authors are also cautious, given there may be unintended consequences resulting from flexible learning (ie blended learning between face-to-face in-person teaching and online learning). Unintended consequences may occur due to an uncritical approach to flexible learning. First, they argue that, as part of flexible learning, HEIs are increasingly positioning students as customers rather than active participants in education processes. By treating students as customers, students are framed as recipients of a product rather than having transformative learning experiences in which they co-own the process and have responsibilities. Second, by contextualising their study in a programme aimed at decolonising

curriculum using critical theory. Decolonising curriculum emphasises the active role of students, which blended learning enables to an extent. However, the engagement between students and lecturers is limited as 'safe' environments are more effectively cultivated in an in-person setting. The authors put forward the notion of 'care-full' approaches in a blended learning environment. In this care-full approach, students are made aware of recognising the power dynamics surrounding the learning endeavour, taking care to want to make a positive difference to these relationships. The approach provides multi-directional support (lecturers and students, students with students) that enable critical thinking and the development of cognitive flexibility, reflection and empathy. McLean et al (2019) suggest that these 'care-full' learning experiences advocate shared responsibilities in creating a learning environment that nurtures and promotes diverse views, new insights and productive critique. Ultimately, the authors argue that blended learning must be applied clearly and with learning outcomes that fit the subject and topic. Lecturers must also identify a set of practices that, as a starting point, do not unconsciously reproduce uneven power relations, recolonise relations and expose vulnerabilities. While flexible learning is convenient for lecturers and students, its application must be scrutinised and critically assessed 'care-fully'.

In their two related articles on developing and implementing an integrated online, team-based learning model, Parrish et al (2021a, 2021b), there were two primary motivations for their studies: internal and external. The internal motivator for the initial model was based on their previous experience with asynchronous online programmes that had significant limitations that curtailed interactions due to muted design that was primarily text-based. It was no surprise that the feedback from students was largely negative. The external motivation was the need to develop communication and teamwork skills. The authors cited a report from the World Economic Forum that found that, while critical thinking and problem-solving skills were the most developed, effective social and interpersonal skills were lagging. This external factor informed the development of the model, specifically with the focus on team-based learning that engages students through collaborative, technology-enhanced and supported activities. In addition, the authors envisaged that the model would promote active learning and further develop the transferability of social skills. The primary intervention in the team-based learning aspect of the model was an instructional strategy aimed at engaging and motivating students through individual reflection, team interaction and team problem-solving. The intervention that enabled the integrated online team-based learning model to work combines the flexibility offered by the asynchronous mode of collaboration with the experience of 'connectedness' with other students and with the educator provided through synchronous opportunities. In proposing the initial conceptual model, the authors envisaged that the online team-based learning model would promote students' flexibility (for students and educators) and teamwork skills. In the evaluation focus groups, the authors found that students had learned more effectively (on the course content) through teamwork and synchronous meetings. These findings are consistent with previous studies that argued for synchronous technology tools fostering social presence and learning in online courses. Students had more positive experiences when they could significantly engage with their peers and the educators.

The notion of flexible learning can apply to learning activities as much as they relate to the place, pace and time of learning. This view is important given the complexity and multidimensionality of some

subjects. In the context of educating undergraduate students about biodiversity in an ecological class, students must be not just able to know the fundamentals of the fields (ie recognising, describing and interpreting biodiversity patterns from across spatial scales, and appreciating the relationship between human activity and its impact on ecological processes) but are also able to work with different technologies and approaches in relation to data science skills. In a study by Styers et al (2021), the authors found that an effective way to achieve these learning outcomes was to design and implement flexible learning activities that enabled a student to understand and apply macroscale biodiversity concepts by working with large datasets. However, the key intervention that helped the successful development of the flexible learning activities was the interdisciplinary team (including faculty from ecology and spatial sciences, scientists and grant personnel). The multidisciplinary team supported the development of content that fostered the adoption of multiple perspectives of the complex and rich subject matter, eg various analysis techniques and software programmes used to work with large spatio-ecological datasets. The new flexible learning activity provided students with strong foundations in macroscale ecology and developed their skills in working with big data (ie large datasets). In particular, the students demonstrated that they could perform basic quantitative analyses, which are skills that are essential for the next generation of ecologists.

Flexible learning is no longer a luxury or option for HEIs. Students are beginning to expect a degree of flexible learning as options as part of the programmes. Valtonen et al (2021) explored this notion and found that students expect some degree of online learning to be incorporated into their programmes to allow them some flexibility in studying. In addition, the authors found that students associated informal learning approaches and environments as flexible options as well. The intervention in optimising flexible learning uses both online learning and informal learning environments as appropriate. Such an integrated approach will enable HEIs to cater to the needs of their students, thereby increasing student satisfaction. Indeed, second-year radiography students on off-campus work placement required further training to ensure that they met the threshold safety standards. van der Merwe (2019) identified six important principles (ie flexible/blended learning, authentic assessments, reflection, social and situated learning, varied tasks and increased levels of complexity over time) that needed to be reflected in the design of curricula to meet the aims of the programme and the needs of the students. The main task is integrating the six principles into the curricula. The author envisages that the design-based principles in programme development for flexible learning will enable educators to balance various needs.

The final intervention is work-based learning. Work-based learning approaches can enhance the degree of flexibility in education provisions. Indeed, Talbot, Perrin and Meakin (2020) view work-based learning as a versatile concept as it can be an underpinning philosophy in itself, or it can be used to complement other programmes in different ways, including enhancing its flexibility. There are many forms of work-based learning interventions, eg using the workplace as a case study that, if appropriately designed, can increase the flexibility in the programmes as it allows students to use their workplace as the subject of their learning. However, the effective use of work-based learning and its integration with flexible learning philosophies required strategic leadership, the financial viability of any work-based learning interventions, quality assurance and a cohesive community of practice

among educators to ensure continuous improvement. Talbot et al (2020) highlight that, ultimately, the integration of work-based learning and flexible learning must be pragmatic to ensure success, which means that such approaches are contingent on the needs and aspirations of the institutions involved.

Ultimately, the increasing advancement of technology-enhanced learning and student needs (eg flexible learning) has meant that some HEIs have adopted a top-down approach in managing technology-enhanced learning. Indeed, the appropriate technology investment enables HEIs to maximise their utility while managing their costs. Nonetheless, Walker, Jenkins and Voce (2018) suggest that both a top-down and bottom-up approach is needed. Such a balanced approach allows educators to experiment with technology-enhanced learning to know how best to maximise and/or innovate from using the tools for the benefit of the students. To achieve this balance, more effort is required to bridge the gap between the institutional aspirations and policies with academic practice, especially in evolving into flexible learning modes.

4.1.3 Mechanisms

4.1.3.1 Systems approach. Various examples

The article by Orr, Weller and Farrow (2019) attempts to develop a model that enables HEIs to compare their development and the 'maturity' of their open, online, flexible and technology-enhanced modes of learning (termed OOFAT) initiatives. Their work highlights the interrelatedness of different elements in flexible learning that must be considered to work as a coherent system. They undertook the research because there is a lack of understanding of the strategic and systematic approaches HEIs adopt in designing, developing and using digital technology to build the OOFAT initiatives.
The Framework they propose provides a basis for comparing the models/approaches adopted by HEIs, allowing for comparison. As part of the discussion, Orr et al (2019) argue that three educational processes are crucial in applying digitalisation in enhancing the processes to be more flexible and open: content, delivery and recognition. 'Content' relates to the subject and discipline-specific curriculum and includes supporting processes vital to the student experience. 'Delivery' is the programme's place, pace and timing and includes synchronous and asynchronous modes. Finally, 'recognition' concerns the assessment and credentialisation of the programme, leading to recognition for the learner. These three processes are evaluated against the degree of flexibility (which then informs 'what' and 'how' in the selection and application of digital technologies) and the openness the programmes open to others (students, the HEI's wider community and even the public). Creating a survey instrument based on this criteria, Orr et al (2019) collected data from more than 150 responses in 47 cases (ie HEIs) from 36 countries. Combining the three educational processes with the two criteria of flexibility and openness, Orr et al (2019) identified six archetypes of OOFAT: 1) OOFAT at the centre; 2) OOFAT for organisational flexibility; 3) content-focused OOFAT model; 4) access-focused OOFAT model; 5) OOFAT for a specific purpose; and 6) OOFAT for multiple projects.
These six distinct archetypes of technology-enhanced learning vary according to the extent to which digitalisation is harnessed for content, delivery and recognition. The authors found that HEIs tended to favour one of the six archetypes to reflect the institution's strategy in the digitalisation of its educational provisions.

First, ‘OOFAT at the centre’ is a near-perfect flexible and open HEI archetype whereby OOFAT is an integral part of an HEI’s overall mission, found in 10 HEI respondents such as OERu. OREu is a network of institutions offering free online courses worldwide that enable learners to gain academic credits for qualification from recognised HEIs. Orr et al (2019) report that the OERu network has an ‘open’ practice in all activities, ie using open-source software. All OERu courses are available to anyone for free. Second, ‘OOFAT for organisational flexibility’ supports flexible and open provisions across all criteria. The authors identify six HEIs that reflected this archetype. College of the Canyons, in the US, for example, is shifting to OER content production and reuse. For some, their students have several options to choose from in terms of learning schedules and format (16, 12, 8 or 5-week terms, on-campus, online or hybrid), the time and place of their assessment. Third, the authors found three cases of ‘content-focused OOFAT model’, focusing primarily on flexible and open content. The authors cite as an example the National Open University of Nigeria, which, similar to other open universities, primarily offers distance learning provisions. The university encourages the use and reuse of OER, and learners are able to complete the courses at their own pace. Fourth is the ‘access-focused OOFAT model’, with seven HEIs reflecting this archetype. These HEIs employ digital technologies to increase students’ access to educational opportunities to a pre-defined set of learners. They highlight Odisha State Open University in India as an example. The use of OER is the standard policy in this HEI. Learners can engage and participate in any of its courses, but they charge a nominal fee for certification. As with the previous example, the institution’s educational offerings are flexible and open, with learners setting their own pace of learning. Fifth is ‘OOFAT for a specific purpose’, where it is clear that there is one clear criterion that the HEIs is focused on above all else. Orr et al (2019) cite the example of Universitas Terbuka (UT) in Indonesia, the country’s 45th state university focused on content delivery. The HEI’s programmes are open to all Indonesians, especially those living in remote access, and it provides free internet access via wifi to students. Finally, the ‘OOFAT for multiple projects’ is an archetype involving HEIs that focuses on a narrow set of criteria, which sometimes indicate that the relevant institution is preparing to develop flexible and open learning more strategically. They cite the example of Thompson Rivers University in Canada, who uses a wide range of technologies in a focused way, adopts available textbooks, and students are free to choose when to start on some of the university’s programmes, which require about 30 weeks to complete.
In highlighting the two key dimensions, (organisational) flexibility and openness, in underpinning content, delivery and recognition, the conceptual model provides a succinct way of assessing and comparing institutions’ degree of flexibility and openness in their educational provisions. The study has also highlighted that there is no single approach to flexible learning and that HEIs worldwide are experimenting with what ‘type’ of flexible learning works for them in their context and in striving for continuous improvement.

A study by Jacobson (2019) highlights how HEIs continuously aim to enhance modes for flexible learning and student learning. In general, research has not shown in any meaningful or consistent manner that the face-to-face in-person method of learning is better (or worse) than the blended/online learning method. Nonetheless, Jacobson (2019) argues that a win-win situation (being flexible and increasing student learning) can be gained by adopting a systems approach. One way of framing the

system approach is the open, flexible and distance learning systems. This system includes open educational resources, massive open online courses and microcredentialing systems. Jacobson (2019) argues that the diversity of platforms and systems provide learners with more choice and, therefore, flexibility. However, there is an optimum before the ecosystem of technologies related to flexible learning becomes somewhat messy. An open, flexible and distance learning systems approach provides a coherent way to 'organise' the different systems to support student learning. In particular, Jacobson (2019) suggests that the Framework offers HEIs a way to measure, collect, analyse and report learners and their achievement (within the different sub-systems). In an ideal world, learner analytics would be a standard technology to enable this process to be realised and enable instructors to interpret learner data intelligibly and consistently. Of course, for this to occur, sub-systems must be relatively standard in the way it organises learning activities (activities are broadly defined) and collects data. Such a system compels instructional designers to be more robust in planning and guiding prospective students in navigating and engaging with the system as a whole.

While personal learning environments are an intervention that an HEI can take, they are also a helpful example of the underlying systems approach that allows personal learning environments to be effective. In their conceptual paper, Peng, Ma and Spector (2019) discuss the potential of smart devices and intelligent technologies. These are helping to drive smart learning environments that, in turn, promote the development of personalised learning and adaptive learning. They observe a trend in the acceleration in the integration of personalised learning and adaptive learning. In discussing the potential future, the authors introduce a new concept, the smart learning environment. Peng et al (2019) suggest that smart devices with adaptive learning allow a new transformed generation of personal learning environments. These personal learning environments will adjust real-time teaching strategies based on the learners' factors, such as their dispositions and past performances on learning activities. A systems approach is crucial in integrating the various technologies in enabling greater understanding and personalisation of learning. The outcome of using personal learning environments is the development of 'learning portraits'. Learning portraits are learning sequences composed of learning cells that depict an individual's development processes in their learning. By exploring students' potential learning patterns using learning analytics and machine learning, further insight will be gained into students' personal learning paths. Such insight into a learner's learning portrait will enable educators to adjust teaching strategies based on 1) the students' individual differences, 2) the students' individual performance, and 3) the combination of the data from the student's personal learning environment coupled with their espoused aspirations.

The combination of flexible and adaptive learning necessitates a systems approach to enable a coherent and complementary application. A review by Martin, Chen, Moore and Westine (2020) also highlights the importance of adopting a systems approach when integrating adaptive technologies with learning analytics in maximising the utility of adaptiveness and the flexibility in HEIs and students to enhance student performance. Martin et al (2020) undertook their study to address the limitations of previous reviews that mainly focused on the learner model. In their review, the authors also emphasised the instructional model and the content model for adapting instructional content. The learner model refers to the learners' cognitive, affective and behavioural characteristics,

involving≈knowledge and skills, attributes, preferences, motivation, emotional and dispositional aspects. The content model is the domain-specific knowledge and covers the concepts and their interrelationship with one another. This model also maps how the learner's concepts and ideas are best delivered. The learner model is the adaptive source, 'to what will it be adapted'. The instructional model broadly refers to pedagogies, which are the algorithms that enable the adaptation based on the learner and content model. This model determines what is adapted, when, and how adaptation occurs, shaping the learning's format, pace and order. The content and instruction are adaptive targets that determine what will be adapted. These three models are fed into an adaptive engine, which is essentially an artificial intelligence sequence generator. The artificial intelligence engine incrementally introduces new content to the learner based on the level of difficulty premised on the learner characteristics (eg knowledge) and achievement in the learning activities. The adaptive engine creates different pathways based on the users' feedback (from completing activities). The review by Martin et al (2020) found that most studies were undertaken in the higher education sector in Taiwan and the US, and research on adaptive learning was framed in the computing science field. Adaptive learning research and practice need to consider the broader scope of the adaptive learning model to include both the source and target and its application in flexible learning environments.

Systems also involve the institutional dimension of flexible learning. Pillai, Upadhyaya, Balachandran and Nidadavolu (2019) argue that while HEIs can design and deliver their own flexible learning provision, other opportunities are present if HEIs work with one another. They suggest that HEIs should not reinvent the wheel but work to find complementarities and synergies. The suggestion offered by Pillai et al (2019) reflects some of the collaborative initiatives that some universities are part of, such as FutureLearn. However, the framework proposed by the authors may refer to a more local initiative. Of course, for such a collaboration to work, individual HEIs must have something to offer, particularly high-quality online learning provisions in terms of content and delivery. HEIs with such provisions can create a versatile learning framework that enables them to collaborate by complementing each other's provision for the benefit of the student body. This model would allow HEIs to be more student-centred and create communities of students with common interests. A similar view is shared by Dayagbil et al (2021). Dayagbil et al (2021) suggest that while top-down guidance was important to provide institutional direction and coherence, HEIs also had to listen to teaching staff as part of their response in using flexible learning to deliver educational provisions in the context of Covid-19. Such an approach was imperative given the staff's intimate knowledge of operational matters involving the relevant curriculum, delivery methods and assessment. Adopting a systems approach is crucial, especially in enabling feedback from various parts of the institution to be channelled to the appropriate organisational units. Such an approach provides a platform for a deliberate strategy in the future, specifically to recalibrate the curriculum, increase faculty capacity, upgrade the infrastructure, implement a strategic plan and assess all aspects of the plan. Indeed, flexible learning is also contingent on its macro environment as part of a broader system beyond the institution. Although the effects of Covid-19 meant that HEIs had to respond quickly, the lessons learned so far include the need for government involvement and support, especially in the context of the Philippines. Joaquin et al (2020) suggest that relevant government agencies such as the

Philippines' Commission on Higher Education, must not only be supportive in terms of policies but they also need to provide further guidance, eg specific regulations, to enable a more coherent response from the HEI sector to maximise the benefits of flexible learning for students.

4.1.3.2 Role of educators. Various general examples

While the importance of the educators' role in flexible learning is considered implicit, their agency is too crucial to remain tacit and needs to be explicitly highlighted. The following presents several examples of how educators play a central role in flexible learning. Muller and Mildenberger (2021) undertook a meta-analysis of extant research to examine if online learning, as part of flexible learning, compared to traditional classroom learning, fares better or worse in terms of learning. Such a question is essential and even more so in the context of the Covid-19 pandemic as many HEIs have adopted flexible learning, with some completely shifting to online teaching as instructed by their respective governments, especially at the height of the pandemic. As part of their study, the authors found that specific pedagogic design, the flipped classroom (or similar approaches but at times labelled with different names) was commonly used. They reflected the flipped classroom as a moderating variable to examine if this specific approach impacted the relationship between the learning outcomes and the two teaching approaches (ie traditional classroom learning and online learning). However, Muller and Mildenberger (2021) did not find any significant difference in the impact that traditional classroom learning and online learning, respectively, had on learning outcomes. They also found that the flipped classroom did not moderate the relationship between the learning outcomes and the two teaching approaches. A vital interpretation of the findings is that of the role of the educator. The quality of online learning technologies and bandwidth, especially in most western countries, allows students to enjoy good quality communications and even interactions with their lecturers and peers, which perhaps is comparable with traditional classroom learning (contingent on the nature of the subject, of course). In addition, the notion of the flipped classroom can be used in traditional classroom settings and online, which may explain the lack of difference in impact between the two approaches. Ultimately, it may not merely be the number of conventional classroom times that are shifted to online learning but also about the 'how'. In particular, lecturers design and implement bespoke, flexible learning initiatives that make a difference, ie quality over quantity.

In another article that explores how effective flexible learning can be designed in a flipped classroom (physical or virtual), Lawton (2019) argued that how content and the role of the educator entwine is crucial. In her evaluation of the role of the educator concerning the process of learning, she suggested that educators should play a role of a facilitator who set the scene of the programme and sessions (or artefacts if it is asynchronous learning). A comprehensive introduction is necessary for providing learners with a roadmap of what to expect. Some may be learning independently, and the facilitator is the only person they can depend on initially. When learning activities are undertaken, educators facilitate the activity by asking students questions to engage them and check their understanding. In facilitation, educators should also summarise and pull together the session in debriefing the key learning points to the students. In addition, Lawton (2019) also suggests that content is just as important. Of course, content is contingent on the subject, level and other aspects. However, the

author highlighted the vital role of the educators in making the content available to students and organised to allow them to learn asynchronously and, as a result, enable synchronous interactions to be maximised.

Naidu (2018) highlighted the vital role educators play in identifying and taking advantage of opportunities afforded by technologies – both emergent and maturing (eg given the potential cost efficiency and potentially more ubiquitous use that enhances interoperability). The author suggests that educators play a role in continuous innovation through experimentation in adopting technologies that support flexible learning. These new ideas can change how educators and HEIs think about and implement open and flexible learning. In another paper, Essel et al (2020) provide an example of how educators' 'make-do' abilities are essential in enabling flexible learning to materialise. While innovation can occur by adapting emerging technologies for novel uses, innovation can also occur in the use of 'old' technology as a workaround in the face of challenging circumstances. Such a situation was reported by Essel et al (2020) as they explored how flexible learning takes place in developing economies such as Ghana with limited communications and internet infrastructure in the context of Covid-19. The investigation revealed how an HEI in Ghana used audio teleconferencing (dial-in) with a cell phone and video conferencing to deliver teaching provisions. They reported no significant difference in the achievement test of students who opted for audio teleconferencing versus those who opted for video teleconferencing. The results also showed that the instructors and the students were satisfied with the audio teleconferencing.

4.1.3.3 Role of educators. Reflexivity and communication

A distinct aspect of the 'educators' role' theme involves educators' reflexivity in reflecting and taking swift action when required in continually fine-tuning flexible learning pedagogies to enable student impact. In their study to address paradoxical challenges in promoting flexible learning by retaining team teaching while maintaining student-to-student interactions, Kauppi, Muukkonen, Suorsa and Takala (2020) highlighted several effective practices. First, they suggest that teaching teams create shared knowledge objects, eg real-life cases that enable educators to contribute to and for students to analyse a 'common' case. Second, they highlight the advantage of establishing hybrid (virtual) spaces to allow students to engage and interact with one another synchronously and asynchronously. These spaces are not just for the students but also for lecturers to engage with the students. The consistency of engaging students in an 'established' virtual space enables educators and students to have some sense of continuity. Finally, if possible, they encourage educators to interact with students on the same central system used for other aspects of blended learning. The reason for doing so is beneficial as it allows learning analytics to be employed to capture all student-related engagement to support students' experience and achievement. However, Kauppi et al (2020) observed that educators' reflexivity is the primary mechanism in facilitating this. They argue that there is no formula to promote flexible learning, retain team teaching and maintain student-to-student interactions. In exploring and finding the right balance, educators must reflect on what they have learned from colleagues and students. Equally important is being reflexive and receptive to students' feedback to change course if that is the most appropriate action. Such an approach enhances the chances of gaining the right balance that suits the students and programme.

Another example of reflexivity in pedagogy design involved a research project undertaken by Jenkins and Crawford (2016). Conducting the research with secondary music teachers in an Australian university's faculty of education launching a tertiary pre-service music education programme, the authors explored how team teaching (which is a teaching strategy that has worked very well in the past and present and is to be retained) could be employed within a blended learning approach (which is considered given the many advantages it offers to students). Through action research led by the authors, the study found that team communication and the reflexiveness of the teaching team were the essential elements. In particular, this involved communication between lecturers after each session. The success in integrating team teaching with blended learning ultimately relied on meaningful communication between team members during the planning and debriefing processes and candidness about concerns that they may have had. Rather than any sophisticated technology, the critical mechanism in enabling traditional aspects of teaching that 'works' well (eg team teaching) to work with more contemporary approaches (eg blended learning) was the ability of the individuals to work together as a team and continuously communicate with one another in a candid but constructive manner. On completing the action research, the authors found that the participants had positive experiences of blended learning and team teaching (eg flexible learning) from a student perspective, which is an approach they may use in their own classrooms when they are teachers themselves.

A report published by Advance HE from O'Toole (2016) on the role of student champions is relevant in the discussion involving HEIs' journey in developing more flexible learning elements in their provisions through the reflexivity of educators in engaging with student champions. Student champions can help by providing students' perspectives on developing flexible learning-related projects and supporting HEIs' sensemaking on the conditions for flexibility on HEIs, its people, and their existing practices. Embedding the role of student champions in institutional structures and systems and the design process for flexible learning requires reflexivity on the part of HEIs and educators to consider and act on the feedback from student champions. Working with student champions and the respective HEIs' student body is an evolutionary approach to developing flexible learning with measured risks. Similarly, another Advance HE report by Peters et al (2016) argues that flexible learning is a crucial element in supporting students' 'whole person' development as not everything can be covered in the classroom. Flexible learning plays a role as it has the potential to engage students in a variety of ways, eg medium, asynchronously. However, only by working with students will an institution know what suits their students and what suits the HEI's strategic direction. As part of this, institutions and educators must also be reflexive. Reflexivity is vital because this promotes active listening and provides an HEI's propensity to act on students' feedback. Feedback without action is wasteful and may also discourage students from providing feedback in the future. Ultimately, taking action on their feedback empowers students to be active members of the institution's community.

4.1.3.4 Inclusivity. Various examples

Although a limited number of articles highlighted inclusivity, this notion is considered a mechanism because it compels HEIs and educators to think critically about the design and implementation of flexible learning. The article by Adams et al (2019) provides a powerful example of inclusivity as a

mechanism. While technological interventions are essential, mechanisms enable technology to be appropriate and 'fit'. The 'inclusivity' mechanism involves adapting existing technologies and revising curriculum and pedagogical approaches to ensure that they are suitable for neurodiverse students. In parallel, HEIs and educators need to introduce developmental programmes for their teaching staff. Although a cliché, supporting neurodiverse students is a journey. Research shows that there is a lot for HEIs to learn about different neurodiverse conditions, eg attention deficit hyperactivity disorder (ADHD), Asperger's, dyspraxia, dyscalculia, dysgraphia and Tourette's (this matter also increases in complexity when one also considers that some of these conditions intersect) and how these different conditions impact students' learning and wellbeing, how teaching professionals and the university as a whole can support them, and what flexible learning means for them. However, these challenges can be addressed if principles of inclusivity guide the design and implementation of flexible learning. In addition, staff and institutions need to maintain a developmental approach so that teaching approaches can be kept informed by discoveries made by research in equality, diversity and inclusivity in the context of flexible learning.

In another article, Veletsianos, Kimmons, Larsen and Rogers (2021) argue that there are many assumptions about flexible learning regarding its advantages concerning time, pace and place. However, these assumptions may not hold for everyone. They undertook a study to examine if the assumption about place-based advantages was valid for women. By using MOOCs as the primary intervention in their research (as reflects many advantages of flexible learning), the authors found that women did not completely realise the assumed place-based benefit that is long associated with flexible learning given their caregiving responsibilities. The authors argue that to address this issue, flexible learning initiatives should be informed by equality, diversity and inclusive principles to ensure the benefits of flexible learning are enjoyed by as many students from as many backgrounds as possible. HEIs may revisit the time-based advantages of flexible learning to narrow the gender disparity gap. Indeed, while the central role of technologies in flexible learning is essential, HEIs must also ensure principles concerning equitability and inclusivity is also prioritised in the planning and implementation of flexible learning. Veletsianos (2020) argue that by keeping to the principles of equitability and inclusivity, HEIs can ensure flexible learning becomes a sustainable strategy. The outcome is that HEIs are likely to make the appropriate strategic decisions about flexible learning.

4.1.4 Outcomes

4.1.4.1 Student impact. Student learning

The pedagogical approach that educators adopt in flexible learning is not standard. Given its variants, it is not easy to conclusively determine which pedagogical design for flexible is the best (even defining what is considered 'best' is context-dependent). Nonetheless, in an attempt to provide some insight into the effectiveness of online learning as part of flexible learning, Muller and Mildenberger (2021) undertook a meta-analysis of studies that compared the impact of replacing classroom time with an online learning environment facilitating flexible learning. Using traditional classroom learning as a benchmark, they found that, overall, there was little difference between the effects of blended learning

and traditional classroom learning. They observed these findings despite a reduction of classroom time, substituted with online learning between 30% and 79%, relative equivalent learning outcomes were found. These findings can be viewed as encouraging as blended learning starts with an almost equal footing with traditional classroom learning. Blended learning is likely to enhance learning outcomes as educators become more adept in designing and delivering appropriate pedagogies that fit the relevant programmes' context, academic content and learning outcomes.

It is recognised that technology can enhance student learning. Letchford, Corradi and Day (2017) found that this association is due to educators building the curriculum and technology around each other. In their effort to promote and encourage the critical reading of scientific papers for science undergraduates studying pharmacy, bioscience and chemistry, they implemented an online interactive resource called 'Evaluating Scientific Research literature'. They positioned the tool as an introductory session for new science undergraduates. They were provided with the right balance in terms of coverage of the general aspects of science literature with some specialist components involving pharmacy and pharmacology, biology and biochemistry, chemistry, and natural sciences.
Their evaluation study suggests that effective learning is likely to occur when the resource can be embedded in the curriculum. This approach enables students to appreciate the context of the resource's activities to see their relevance concerning assessed assignments, which encourages students to think deeply about the activities in conversation with one another and/or with their lecturers.

In another example, Shikino et al (2021) argued that the traditional face-to-face in-person mode of teaching physicians funduscopic examination is challenging for many medical students and interns, especially timing and access. However, although e-learning provisions for this training are available, the authors argue that there is a lack of evidence of whether the e-learning mode is at least as effective as the traditional face-to-face in-person mode. Although the literature suggests that e-learning is a practical education method, especially when learning and developing procedural skills, their research is timely. In completing their study, Shikino et al (2021) found that the flexible e-learning videos had improved the learners' diagnostic accuracy, confidence and motivation to perform funduscopic examinations. In particular, they found that this method enabled higher cognitive activity levels than the traditional, lecture-based classroom, as assessed using the revised Bloom's taxonomy.

In another study by Soffer, Kahan and Nachmias (2019), the authors argue that one of the main drivers of flexible learning is to provide flexibility to learners. Flexible learning allows learners to choose the practical aspects of their learning, eg when, where and even how. There is some evidence that flexibility does not degrade the quality of the students' learning experience and achievement but may enhance or at least be on par with traditional learning modes. However, the benefits of flexible learning are not very well known. In a study by Soffer et al (2019), they explored how increasing flexibility in online courses affords students more flexibility in their daily lives as they juggle these priorities with their learning. The authors' study provided some insight into students' patterns of use of flexibility in online academic courses and their relation to course achievement. Specifically, their findings show that individual students developed unique patterns and idiosyncrasies of learning regarding time, place and

access to content. As discussed by Soffer et al (2019), the results suggest that learners substantially used the flexibility afforded to them in addition to increasing their learning achievement. The insight into these diverse patterns concerning the flexibility offered may inform personalised learning design and enhance student collaboration, especially for those with similar characteristics.

4.1.4.2 Student impact. Student behaviours in learning

In a similar vein, Wanner, Palmer, and Palmer (2021) posit that students are intended to be at the centre of flexible learning. By having students at the heart of the design and development of flexible learning, it is envisaged that students are not just able to have a better learning experience and achieve in their learning, but that they may be more self-directed. Adopting this perspective, Wanner et al (2021) undertook research to explore if increased flexibility and personalisation of assignments will foster autonomous learner behaviours. Their study found that students felt empowered and their attitudes towards learning in general were enhanced. More specifically, the postgraduate group showed a significant improvement in their feelings towards higher education in general. The authors also suggested that experienced learners may be more adaptable to such an approach in flexible learning.

The sophistication of flexible online learning coupled with rich media elements can create excitement and enhance learners' learning experience. However, these trends can also have unintended consequences. Courses may over-use media and limit learners' actual learning, retention and understanding. In their study of MOOC users in China, Zhang, Lou, Zhang and Zhang (2019) found that students learn effectively using MOOCs and other educational technologies. They suggest using technology to track learning to gather more robust data on student learning while using MOOCs. Specifically, they suggest the use of learning analytics to collect clickstream data in MOOCs to monitor learners' behaviour and achievements. The key aim is to gain insight into learners' collective attention flow, which shows patterns of human attention, such as being short in time, selective, circulated and dissipated. Ultimately, these insights will enable designers of online courses and educators to be informed of the optimum level of content and use of media to maximise learning.

Juszczyk and Kim (2016) argue that there are clear opportunities to embed social learning in the design of flexible forms of learning. Social learning is valuable to learners, especially when a cohort is from different countries. Social learning enables cultural exchanges and appreciation. Indeed, since their paper was published, many flexible learning initiatives have some form of social learning opportunity embedded within them. Educators have started social learning using synchronous and asynchronous means, between student and educator, and between students. Their article also stresses that because social learning tends to be culturally bound, the technologies that support social learning need to be adapted to contexts (local or international, depending on the cohort). In some cases, the central flexible learning platform must accommodate cultural differences and indigenous local social media applications (for example, many East Asian countries use home-grown social learning platforms that differ from the west). The creative commons licenses and open education resources enable these tools/programmes to adapt quickly to local contexts. Nonetheless, Juszczyk and Kim (2016) make a secondary but important observation, specifically regarding outcomes from

social learning. They suggest that the coupling between social learning and open educational resources provides opportunities for co-creation. The co-creation process involving learning initiatives, tools and technologies can include any activities such as design, development, prototyping and evaluation. Such processes can be between educators and students and among students themselves and may generate a new perspective of social learning within the co-creation process.

4.1.4.3 Organisational learning. Learning from trial-and-error

Veletsianos and Houlden (2019) reported that flexible learning has gained interest in higher education and the workplace. This interest has made the subject not just richer but also more complex. While technology remains an important aspect of flexible learning, other factors have emerged. These include using flexibility as a pedagogy (rather than a mode of study), supporting activities that are needed to enable flexible learning to work, understanding the limitations of flexible learning (not just from an HEI perspective but also from an equality, diversity and inclusivity perspective), and the need to develop staff continuously. The key mechanism in meeting these challenges is for institutions to be both strategic and experimental in the way they approach flexible learning to ensure that initiatives are long-term orientated and well-resourced but, at the same, institutions must be willing to take measured risks. The primary outcome of such an approach is organisational learning within institutions, which inevitably reflects the ongoing evolution of flexible learning.

HEIs' learning regarding flexible learning has been accelerated and amplified by Covid-19. The pandemic has had a negative effect on many and was challenging to both students and educators alike. The pandemic accelerated HEIs' development to deliver education learning via flexible and distance learning. Tarrayo, Paz and Gepila (2021) suggest that a key to this relative success was the ability to work with and around the technologies available in the Philippines. The authors suggest that educators played a significant role in adapting their curriculum and delivery to mitigate impediments that they came across. A vital outcome of the recent past lies with HEIs learning from and building on the capabilities they have developed to further flexible learning.

4.1.4.4 Organisational learning. Advancing social-orientated aims

A study undertaken by Bugge and Wikan (2016) suggests the increasing need to explore and adopt different forms of flexible learning. They make this assertion based on their observation of the growing diversity in the student population across all ages, segments of society and individual needs. They observe that flexible learning has a moral dimension, given its development can enable the advancement of outcomes related to social justice and equity from an educational perspective. They cite the example of increasing social mobility for student cohorts who are not just at the start of their career but also those who may be well into their careers, with children and a background with no family members ever having attended university. Bugge and Wikan (2016) argue that there will be an increasing number of prospective students who have such backgrounds.

Indeed, Jeffery et al (2021) also observed flexible learning could incidentally support the socially orientated goals that most universities have as part of their strategies. They suggest that introducing the virtual microscope in geosciences classes provided further access to students. Therefore, the outcomes not only increased flexibility in the way students learned but also enhanced inclusivity in the field as it made the subject more accessible (and engaging) to students who may not have been able to attend the class nor have the inclination. Whalley et al (2021) posit that there are many merits to flexible learning for students and HEIs, which should not be overlooked. As the adoption of flexible learning increases, HEIs have learned that flexible learning requires significant investment, not just in terms of technology but also in developing staff adapting structures. Whalley et al (2021) cite how present-day technology enables HEIs to provide even more open, personalised and flexible provisions. Such a trend is likely only to grow. A key learning for HEIs if they are to take advantage of technologies is to have policies and capabilities that enable them to do so. These actions allow HEIs to meet socially orientated goals in broadening access to HE.

4.1.5 Summary of CIMO findings

Given that the research does not represent all phenomena in the field of flexible learning, no inference can be drawn from the frequency with which the drivers are reported. The results of the analysis using the CIMO framework have revealed myriad reasons why flexible learning is adopted, the different forms it takes and how it is implemented. What appears to be consistent is that it produces positive outcomes in terms of student impact, but this is not without caution and caveat, especially with regards to unintended consequences if adopted purely from an instrumental perspective. The findings from the Context dimension show flexible learning can be externally driven, with Covid-19 being the most cited reason, especially in more recent publications, but it can also be internally compelled. The reality is that the reasons that give rise to the adoption of flexible learning (in varying degrees) are a mix of internal and external reasons, which can change over time.

How HEIs address their external opportunities or challenges in their respective contexts is contingent on their resources. The affordance of resources is reflected in the papers' interventions, particularly technology and pedagogical approaches. From a technological perspective, the utility and functionality (and the cost) of technologies are both facilitators and limitations of flexible learning. From a pedagogical viewpoint, the study indicates that educators adopt (in part or in whole) approaches that have a degree of validation either from their own experience and/or the profession.

However, as highlighted in the Mechanism dimension, the educators' role is critical. Indeed, the educators' creativity, inventiveness and improvisation in combining and integrating technologies and pedagogies is the only limit. In addition, another underlying Mechanism is the systems approach. Successful flexible learning initiatives tend to be implemented as a whole, ie the 'elements' complement and/or reinforce one another. The systems approach gives students a sense of coherence in their curriculum. The 'inclusivity' mechanism enables HEIs to enhance the effectiveness of student impact and future-proof its flexible learning initiatives.

Finally, as highlighted, these Mechanisms enable a host of positive outcomes for both the students and HEIs. The review of the Outcomes dimension shows that flexible learning does contribute to student impact, not just in terms of their learning of the curriculum but also in shaping their attitudes towards learning and their sense of self-efficacy. However, it is not only the students that benefit as HEIs also gain from designing and implementing flexible learning through nurturing a sense of organisational learning but also enable the attainment of socially based aims that are usually part of most universities' strategic directions.

4.2 Advance HE Flexible Learning Framework

The second part of the findings involves assessing the literature against Advance HE's Flexible Learning Framework. While there is overlap with the studies reviewed in the CIMO framework, this section presents the review's findings from the lens of the Advance HE Flexible Learning Framework: technology-enhanced learning, pedagogical approaches, employment and institutional systems and structures. Specifically, the findings highlight important trends that may inform and update the Framework in terms of its four dimensions: 1) technology-enhanced learning (with sub-themes of adaptive technologies, artificial intelligence, learning analytics, specialist/discrete technologies, ubiquitous technologies and adapting existing technology-enhanced learning tools); 2) pedagogic approach (with sub-themes of integration of approaches, balancing priorities, entanglement with local contexts, adopting multiple perspectives, cognition-based theories, teaching languages and technology-based pedagogies); 3) employment (with sub-themes of work-based learning and learner engagement, and e-learning and interactivity); 4) institutional systems and structure (with sub-themes of strategic approach, national policies, bottom-up approach and academic workforce development).

A recent Advance HE report authored by Thibodeau and De Wilde (2021) explored the development of flexible learning in HEI members. The study focused on the four main areas using Advance HE's Flexible Learning Framework. In the first dimension of the 'technology-enhanced learning' perspective, the report touched on the growth of micro-credentials and digital badges, learning analytics and open educational resources. The 'pedagogic approach' dimension highlighted students' participation in co-creation processes as part of their learning. In the 'employment' perspective, discussions on microcredentials and digital badges were central in the report. While microcredentials and digital badges are part of the technology domain, the management of data and the recognition conferred is central to its success. These include both HE institutions and employers. Finally, in terms of the 'institutional systems and structure', the authors emphasised the shift from an intra-institutional focus to an inter-institutional ecosystem for interoperability. In addition, ideas about establishing an orchestrating body to support interoperability are discussed, including how institutions would address ethical concerns about collecting and using data for learner analytics. The report by Thibodeau and De Wilde (2021) shows well-rounded development of flexible learning in the topical area highlighted by Advance HE's Framework.

4.2.1 Technology-enhanced learning

4.2.1.1 Adaptive technologies

Among the technologies discussed in the literature reviewed, three distinct but inter-related technologies – adaptive learning, artificial intelligence and learning analytics – were the most examined. In their discussion about adaptive learning and its associated technologies[2], Cavanagh, Chen, Lahcen and Paradiso (2020) highlighted the link with flexible learning. In particular, they argue that adaptive learning compels institutions to help faculty develop flexible teaching approaches. Adaptive learning enables students to personalise their learning, to accelerate or even remedy their learning achievements. However, it is not all about technology. The faculty's role is vital as they need to be flexible and modify their teaching to take full advantage of the personalised learning that adaptive learning technologies offer. Cavanagh et al (2020) also stressed that, given adaptive learning is still relatively novel, its meaning, diverse technologies and positive impact on curriculum means that institutions need to take a strategic lead in its adoption. Such an approach provides clarity, consistency and coherence across the institution and ensures that students derive maximum benefit from the adaptive technologies adopted. The arguments by Cavanagh et al (2020) is echoed in a study by Peng et al (2019), who also highlight the advancement in adaptive technologies as one of the main drivers for flexible learning. They suggest that the application of smart devices and intelligent technologies promotes the development of personalised learning. They argue that technology-empowered pedagogy integrates adaptive learning with smart devices, which enables the real-time adaptation and adjustment of teaching approaches to suit learners' individual differences, eg personal learning characteristics, performance and personal development.

The article by Liu et al (2017) explored the use of adaptive technologies in learning. When learners interact with different systems monitored by learning analytics, a wealth of data can be captured about the learners' learning process. As more data is captured, patterns emerge that provide insights to better understand learners' behaviours. There were two main aspects of their study. The first is focused on the adaptive technologies called 'Leap'. Specifically, the study involved learning analytics to inform the design of adaptive systems using learning analytics, called 'Activity Analytics' and 'Outcome Analytics'. Activity Analytics is a module that shows the sections of a learning system that students have accessed in presenting a pattern of behaviour (termed as a learning path in the article). Outcome Analytics show the assessment scores from completed practice questions. The second involves a preceding step in using visualisation technologies to understand data (gained from 'Activity Analytics' and 'Outcome Analytics') about learner behaviour to inform the design of adaptive technologies for learning. The researchers used various visualisation techniques to gain insight into learner behaviours, including Radar Plots. The researchers found that visualisation techniques helped reveal diverse learning behaviours and nuanced patterns. Visualisation techniques are an emerging way to examine learner behaviour that can yield helpful information.

2 The term adaptive learning refers to technologies and/or processes that dynamically adjust to the level or type of course content accounting for individual differences eg an individual's abilities, skill attainment, and/or learning styles for the purposes of accelerating learners' performance.

4.2.1.2 Artificial intelligence

As mentioned, adaptive learning and artificial intelligence are inter-related technologies, and Martin et al (2020) explored this link. The authors describe the adaptive engine as an artificial intelligence sequence generator where a learning map with instructional content is created for the learner in the instructional model, increasing flexibility in technologies for enhancing student learning. In addition, they explored an adaptive strategy that involved three essential components; the 'Learner Model', the 'Content Model' and the 'Instructional Model'. The learner model is referred to as the adaptive source. The content model and the instructional model are together called the adaptive target. The adaptive source refers to the characteristics ("to what will it be adapted"), the adaptive target refers to the content and instruction that will be adapted ('what will be adapted'). In another study, the article by Vazquez-Cano et al (2021) explored the effectiveness of using a chatbot in learning Spanish. The use of chatbots is envisaged to improve the learning of punctuation in Spanish and enable opportunities to enhance open and flexible learning environments in the learning of languages.

Similarly, a study by Becerra-Alonso, Lopez-Cobo, Gomez-Rey, Fernandez-Navarro and Barbera (2020) highlighted the advancement in technology-enhanced learning in their evaluation of a learning tool, EduZinc. EduZinc is a software programme with two primary functions: to enable the creation of learning-related events, eg activities tests, undertake automatic grading and provide feedback to students. These two functions complement one another as the students' achievements in their tests are used to inform the next iteration of the development of learning products, which enables the personalisation of learning. The systems also alert students if they are falling behind and signal to students if they are doing well. The motivation for the development of EduZinc is to enhance the offer and opportunities for flexible learning to students in augmenting face-to-face in-person classes or distance learning programmes that have a strong element of independent learning. In evaluating the tool over six years, the authors found that, over time, students' performance with the use of EduZinc achieved a significantly better median mark than those evaluated using other systems. The authors reason that students enhance performance using EduZinc due to the daily evaluation and feedback they receive, which improves their engagement with the subject. As a result, students are motivated to better their results by reading more widely and leveraging other sources and opportunities suggested by the system.

4.2.1.3 Learning analytics

Both adaptive learning and artificial intelligence technologies are complemented by learning analytics that provide the data mining capability required to enable the functionalities in these technologies. The article by Siemens (2019) highlights the novelty and potential of learning analytics. Learning analytics is a novelty because of its advanced computing capability to access and analyse large datasets involving granular aspects of the learning process generated by students and their online activities. In addition to volume, the potential of learning analytics lies in its ability to analyse a vast array of data to understand how people learn using less subjective information than self-reports. Nonetheless, learning analytics uses data that can be considered personal data, which inevitably

will cause concerns around individuals' privacy and the ethical collection and use of such data. Another possible unintended consequence of learning analytics is the quantification of education. Education may become formulaic as a result of the algorithms used in learning analytics.

The discussion about open, flexible and distance learning systems by Jacobson (2019) argues that technology can be used to 'unify' and organise other technologies and maximise the utility of other technologies. Indeed, in his article Jacobson (2019) suggests that while learning technologies have advanced, there is still a lack of a coherent approach in interpreting and using the outputs generated by these technologies coherently and consistently. The ability to address this issue provides opportunities to enhance pedagogic designs in maximising the technologies. He highlights the use of learning analytics in the context of open, flexible and distance learning systems. Learning analytics enable HEIs and instructors to be better informed about learners' behaviours and design learning systems that allow learners to achieve. The key elements that instructional designers need to consider include students' varied pace of study (especially in asynchronous mode), which focuses on the human-machine interface within open, flexible and distance learning systems. Of course, other interactions, eg with an instructor and other learners (if there is one) are also key considerations. Learning analytics have to be robust, given the notion of flexible learning. The systems need to assume that educational sub-systems and artefacts (including embedded within the platforms such as multiple-choice questions, links to external videos and facilitated events) are accessible by anyone, at any time, anywhere with access to the internet.

4.2.1.4 Specialist/discrete technologies

There were also technologies discussed that had specific uses. In one such case, the ability to apply flexible learning in fields with significant in-class practical components increases. An article by Jeffery et al (2021) introduces a useful technology to enable students in the field of geoscience (including petrology, mineralogy and geochemistry) to participate in classes remotely. The technology is a virtual microscope, called Thinglink, that allows for remote learning and enables interactivity in learning activities, which helps to promote deep learning further. The authors describe the virtual microscope as both an educational and recreational technology. The primary function of the virtual microscope involves the augmentation of images and videos in creating interactive, visual learning experiences for the students. The technology enables students to control some parts of their learning as they can upload images. Students can also add a variety of hotspots. When clicked on, these hotspots provide users with additional images, text, audio files or links to other images that offer more insight to the learning 'object' from multiple perspectives engaging different senses. The technology is also compatible with virtual reality technologies. For example, students may upload 360 images or videos augmented in the same manner and viewed with Google goggles or virtual reality headsets.
The virtual microscope is a flexible and navigable resource that provides students with different ways of learning (through images and/or videos combined and integrated coherently).

Letchford et al (2017) focused on technologies that supported the development of a vital skill in undergraduate science students, developing their skills in reading and evaluating research papers.

Developing these skills enables students to know and understand the conventions of scientific reporting. Students also gain a sense of how scientific research is undertaken and to evaluate the validity and reliability of the findings and its limitations. This activity prepares them for their own research, ie collecting data, undertaking experiments, and recording and interpreting findings.
As a result, students develop their critical thinking skills. The advent of technologies has provided an opportunity to create tools that enable students to gain these more effectively and flexibly in their own time, pace (within the overall programme) and asynchronously. The authors, Letchford et al (2017), developed a flexible and online interactive resource entitled 'Evaluating Scientific Research Literature', and undertook research to examine its effectiveness and students' satisfaction with the tool.
The authors presented the tool through an introductory session at the start of the course.
The programme was written using Articulate e-learning software (www.articulate.com) and was hosted on the university's virtual learning platform Moodle 3.0.

Finally, concerning discussions in the CIMO section and taking the notion of digitalising the classroom further, Li et al (2020) explored the impact of live streaming of classroom teaching to students accessing the video content synchronously but remotely. This pedagogic approach involved integrating blended and synchronous learning, supported by asynchronous communication.
The researchers used existing technologies such as Panopto, which can be easily integrated with Moodle, the university's learning management system. A key reason behind the selection of Panopto is because the technology provides two screens, one for real-time class recordings and the other for MS PowerPoint presentations.

4.2.1.5 Ubiquitous technologies

Ubiquitous technologies come in different forms and functionality. A basic form uses the elementary utility of mobile phones. A study by Shuja et al (2019) explored mobile learning in Pakistan. Similar to previous studies on the use of mobile phones, eg Essel et al (2020), they found that mobile learning offers greater flexibility in terms of mobility to students in accessing learning almost at any time and place (contingent on the programme). While the design and quality of courses delivered over mobile learning are still developing, the 'on-demand' utility it provides to students makes it an ideal mode of delivery. On the other end of the spectrum of mobile learning technologies, Delgado-Cepeda (2021) investigated the role of mobile learning in enhancing 'numerical methods' classes in Mexico. In the context of the study, mobile learning included technologies such as Zoom, Remind, Classmarker, Socrative, Google analytics, Mathematica, YouTube, Scribd and Jotform. The research found that students predominantly found that the mobile learning aspect of the class to be broadly satisfactory. Of course, as the author observed, student outcomes are dependent not only on the mobile channel but also on the pedagogical design that coherently brings the technologies together.

Indeed, the advancement of technologies has enabled technology-enhanced learning to grow with sophistication. Muñoz-Cristóbal et al (2018) studied technologies that allow flexible learning by creating ubiquitous learning environments which seamlessly combine different physical and virtual learning spaces. Ubiquitous learning environments are a nomenclature to describe a group of

technologies, including virtual learning environments (eg Moodle) and augmented reality, enabling lecturers to develop learning environments across different spaces and situations. The authors developed a model using two further concepts to support ubiquitous learning environments: 'learning bucket' and 'bucket-server'. Learning buckets are virtual containers that comprise tools such as a Google Docs document or a Flickr picture. Each student has a learning bucket, and the lecturer prescribes its uses at the start of the learning programme. The bucket-server is the integration of learner-buckets across space. The bucket-server enables the integration of learning buckets into specified software applications created in specific learning spaces, including virtual learning environments in cyberspace and augmented reality apps in physical spaces.

4.2.1.6 Adapting existing TEL technologies

While many technologies for learning such as Moodle, MOOCs (and variants) and open education resources have been around for some time, Juszczyk and Kim (2016) posit that their use in other countries may spur further innovations. In adopting an international perspective, they highlight how these technologies have been adapted in other countries, such as Poland and South Korea. These adaptations were made to make them more useable within the context of the respective countries, eg including changes in terms of language to fit with other technologies that may be exclusive in a particular country. They suggest that innovations may also occur as part of the adaptation process. Such 'reverse' innovations are important as other countries may benefit from them. In their article, they identify social learning as an important example. Many learning technologies today can facilitate social learning. Nonetheless, social learning and communication across cultures can range from nuanced to contrastingly different. Therefore, the technologies and pedagogical approaches to social learning are likely dissimilar, contingent on the country and culture.

Similarly, while MOOCs have been part of the educational landscape for a while, incremental innovations emerge from their application in different contexts such as the field of study. A study by Priestley et al (2019) tracked the development of a MOOC on Antarctica over three iterations between 2015 and 2017. The authors are from the Victoria University of Wellington, which has launched a MOOC called 'Antarctica: From Geology to Human History' on the global edX platform. The content covered Antarctic science, history, geology, and culture and was mainly delivered via video lectures filmed in Antarctica. The study analysed feedback from learners among the 5,735 who engaged with the programme. A couple of unique aspects of the MOOC was its aim to immerse learners in the programme and explore the topic from a different disciplinary lens. The authors found that learners enjoyed the immersive Antarctic field lectures that challenged their preconceptions about Antarctica.

4.2.2 Pedagogical approaches

4.2.2.1 Integration of approaches

The theme of 'integration of approaches' highlights how educators have combined different, usually established, pedagogic approaches to explore the most effective way to implement flexible learning

appropriate in their context. A study by Kauppi et al (2020) highlights a situation that perhaps many lecturers and educators come across, specifically, how do they integrate the best of the old with the new? The authors referred to bringing together the practice of team teaching with blended learning. Team teaching has been an approach that has worked very well in a 'Collaboration and Professional Interaction Skills' programme in Finland. The teaching team's diversity enriched the programme's curriculum and provided students with different perspectives. However, the teaching team also felt it was beneficial to increase flexibility in the delivery of the programme by adopting a blended learning approach. Although they are not opposed to each another, team teaching and existing blended learning models do not easily fit with one another. Therefore, the team had to be creative in integrating these two elements. The first step was to clarify the key learning processes that students experienced in attaining the programme's learning outcomes. Understanding learning processes (ie interaction and engagement with other students) was vital in informing the design of bespoke programmes to suit the students' needs in meeting the programme's learning outcomes. They then tailored a pedagogical approach that enabled them to maximise the use of selected technologies (such as facilitating online interaction and promoting multidisciplinary collaboration skills). The versatility of flexible learning means that it is adaptable to suit the teaching of different subjects. Cook et al (2019) examined the utility of flexible learning in developing students' quantitative skills such as forecasting and scenario analysis. By adapting a flipped-classroom approach and enhancing the interactivity of the class, they reported the students made positive gains through flexible learning.

Similarly, a study by Lo et al. (2020) highlighted a pedagogical approach that combined blended learning and flipped classroom (which they termed a 'multicomponent blended learning mode') used in a chemistry-based undergraduate class 'Advances in Organic Synthesis'. The blended learning component combined the face-to-face in-person element with an online e-learning element that included web-based self-tests, online quizzes and multimedia, technical experimental videos. In the flipped classroom component, case studies were presented to students 'outside' of class, which they worked on asynchronously. The student then synthesised and shared findings with their classmates via oral presentations. This pedagogical approach was useful in the context of hands-on, laboratory-orientated classes such as chemistry. This approach was shown to be equally effective even when students had to undertake some chemistry experiments at home, without a laboratory's facilities. The authors argued that experiments such as making soap, shampoo and lotion were safe to create and involved the same principles and concepts required to be learned in the class. A similar approach to that of the flipped classroom was used by Ramírez-Montoya and Ramírez Hernández (2016). They undertook their research using the 'inverted learning' design. This design maximises social learning between students, which builds on the constructivist view that lecturers and fellow students are essential sources of knowledge. The approach also leverages present-day expectations of students in engaging with their peers as part of the learning process.

A study by van der Merwe (2019) emphasised integrating design principles in developing a blended, vocationally orientated pedagogy. Students undertaking the Bachelor of Radiography in South Africa must complete a programme on radiation safety. However, the completion and pass rate were issues, with the key challenge attributed to some of these students undertaking work experience internships

off-campus. van der Merwe (2019) undertook research to explore how this challenge could be addressed. In doing so, the author identified six principles that needed to be adopted in designing a flexible learning approach. The first, of course, was that the programme needed to be flexible and blended. The second, given that this topic is vocationally driven, is that it is desirable that assessments were authentic and reflect the realities of the workplace. The third involved incorporating reflection into the curricula to support 'buy-in' from students that safety is always a top priority. The fourth incorporates social and situated learning elements to encourage interaction with the supervisors and peers. As part of this, the fifth principle was to vary tasks as much as possible and increase levels of complexity over time as the sixth principle.

Finally, in their two related articles published in the same year, Parrish et al (2021a, 2021b) discussed their proposed integrated online team-based learning model. Their first article designed a conceptual model that combines the advantages of team-based learning with instructional technology that maximises social learning and the role of the facilitator in an online learning environment. They envisaged that the proposed model would promote flexibility for both students and educators, maximise the synchronous time in the course and enhance the student experience as they work in teams.

4.2.2.2 Balancing priorities

There are similarities between integrating approaches and balancing priorities. However, balancing priorities is about addressing potential tensions. For example, McLean et al (2019) highlighted that while flexible learning has many merits, its enthusiastic implementation may result in unintended consequences, especially in derailing efforts to decolonise pedagogies in settler societies such as Australia. Undertaking their research using a programme that has been redesigned into a blended learning 'format' at a university in Sydney, the researchers draw on the experiences of both lecturers and students to gain insight into the implications of flexible learning. More specifically, they argue that while blended learning can provide opportunities to improve learning experiences and support decolonising pedagogies, the reframing of students as clients and the prioritisation of money-saving approaches can limit these opportunities. While flexible learning has many merits, its often-touted advantages tend to be framed within the expediency it offers. In addition, decolonising education requires more than that which can be delivered by blended learning approaches in discrete forms. They argue that the integration of blended learning and decolonising pedagogies fundamentally requires a careful understanding and reconfiguration of responsibilities of all involved (eg to adopt a critical lens of existing pedagogies), an awareness and reflection of how blended learning enables/impede the advancement of the decolonisation of curriculum and reflexiveness in changing curriculum and modes of learning to allow effective learning to materialise.

From a technology perspective, Naidu (2018) suggests that as much as pedagogic philosophies and approaches shape the technologies selected, technologies should also shape pedagogies. The author suggests that educators use open education resources and other technologies that support flexible learning to rethink and recalibrate open and flexible learning approaches.

For example, the author argues that rather than focus on preferences for mode of learning, learning styles and approaches to learning of student cohorts, educators ought to create educational initiatives and nurture the development of more effective learning styles and approaches to learning that can yield more productive learning experiences for students. However, Valtonen et al (2021) adopted a different view that related to 'space'. Flexible learning is understandably primarily associated with online learning. Indeed the research by Valtonen et al (2021) in Finland found that to be the case. Nonetheless, they also found that students associated flexible learning with informal learning environments and approaches. This finding provides opportunities for HEIs and educators to broaden pedagogies to reflect informal learning spaces and events as part of the curricula.

4.2.2.3 Entanglement with local context

The pedagogical approaches that emerged from the review also highlighted the need to be 'practical'. Specifically, in ensuring that the realities that educators and students face are reflected in the design of the flexible learning initiative. These points were evident in the articles from the Philippines and Ghana in the context of Covid-19. For example, Dayagbil et al (2021) discussed how public universities in the Philippines accelerated their flexible learning capabilities due to the Covid-19 pandemic. They highlighted that the country's developing infrastructure meant that internet access and adequate bandwidth was not always available nor reliable. In their case study, they argued that many universities had to use myriad methods as part of their flexible learning approach. A significant reason for this stemmed from the unique needs of the subject and localities and other environmental constraints. Their study highlighted those pedagogical approaches are sometimes context-driven, not only in terms of institutional factors but also local ones as well. Specifically, they suggest that educators significantly contributed to the success of flexible learning. In doing so, flexible learning was developed bottom-up by using available technologies and the learners' environment to design the curriculum. However, they stress that a top-down approach is more appropriate in taking advantage of lessons learned in the future. The top-down approach may include reassessing and recalibrating the curriculum in a future iteration of the flexible learning, enhancing educators' capacity, upgrading the HEIs' infrastructure and implementing a continuous assessment of flexible learning initiatives from a strategic perspective.

Likewise, in their study of the development of pedagogic materials (eg toolkits, course sites, recorded lectures) for flexible learning in the context of the Covid-19 pandemic in the Philippines, Tarrayo and Anudin (2021) suggest that a systematic approach is required to ensure that the materials developed to meet students' needs but also reflect the limitations of the local infrastructure, eg internet connection. Therefore, they posit that the development of such materials needs to be guided centrally by the institution, informed by the students' needs. In addition, the study from Essel et al (2020) on flexible learning in Ghana has similarities in comparison with some of the research from the Philippines. Specifically, Ghana's internet infrastructure development is relatively nascent, with limitations. Working with their circumstances, educators in Ghana have used more 'basic' technologies such dial-in audio conferencing to support flexible learning in the context of Covid-19.

4.2.2.4 Adopting multiple perspectives

While balanced pragmatism is crucial in developing flexible learning, the literature review suggests that adopting multiple perspectives is equally important as this enables HEIs to develop suitable and relevant curricula for students. Lawton (2019) argues that while there are elements from traditional face-to-face in-person curriculum that can be ported to blended or online learning modes, it is potentially more efficient and even effective to start designing and developing curriculum for flexible learning afresh. The author even suggests that creating an online learning environment necessitates a different mindset. Using the FLIP framework (Flexible learning environment, a change in Learning cultures, Intentional content, and the Professional educator), the author advocates that, focusing on the content and educator, learning in flexible environments should include: 1) providing a clear explanation of expectations of learning and teaching hours in flipped/flexible learning approaches; 2) enabling students to interact with peers and tutors in the online and face-to-face activities; 3) making all intentional content available at the start of a course and additions are made where appropriate; 4) recognising the role of the professional educator when using flexible pedagogies.

In some fields of study, flexible learning does not only involve place, pace and time, but also includes flexibility in content that can leverage multiple perspectives to ensure that students learn effectively. Such a scenario was the driver of a study by Styers et al (2021) exploring ways to enhance ecology courses at the undergraduate level. A key challenge was developing students' capabilities in working with large ecological datasets, gaining insight from data science and understanding how ecological processes within broader spatial scales (macroscales) affect local ecosystems. The input by an interdisciplinary team underpinned the successful flexible learning activities developed by the authors. The team included scientists, faculty from ecology and spatial science, and grant personnel in designing-in flexibility in the teaching and learning macroscale biodiversity concepts using large datasets from the National Ecological Observatory Network.

Adopting multiple perspectives is crucial to understanding changing student behaviours and using this information to inform the development of pedagogies for flexible learning. This principle was highlighted in a study by Soffer et al (2019), which suggested that it is important to understand how pedagogies shape students' behaviours (in addition to understanding their experience and learning achievement. These behaviours, eg how students pace themselves in the use of asynchronous content, may provide insight to educators, which may inform the enhancement of current pedagogies. Indeed, their study from the viewpoint of flexible learning is crucial because, as the authors argue, it enables students to integrate learning into their busy lives through their agency. Indeed, Wanner et al (2021) focused on flexible and personalised assessments in which students are given a choice of assessment task, the weighting of the assessment and its submission date. They suggest that by providing flexibility in these areas, they empower students to take more responsibility for the learning. Focusing on empowerment fosters a new way of designing and developing flexible learning.

Finally, adopting multiple perspectives is also essential to ensure that the principles of equality, diversity and inclusivity are respected. In their study of the effects of flexible learning in light of gender, Veletsianos et al (2021) argue that conventional place-based (assumed) advantages in flexible

learning may disadvantage women given that women tend to have more caregiving responsibilities. The authors argue that the design of flexible learning should not entirely or in majority rely on time-based advantage as it may not materialise for half of the population of learners. Instead, other benefits of flexible learning programmes should be designed-in into the programme, eg time-based advantages.

4.2.2.5 Cognition-based theories

Three studies reviewed highlighted the central role in adopting cognition-based theories, ie cognitive flexible theory, into the design of flexible learning initiatives. In their article that highlights the need to understand learners' cognition in the context of flexible online learning, Zhang et al (2019) argue that online learning design needs to consider the inherent limitations on humans' cognitive load. Adopting an information-processing perspective, they suggest incorporating and using different media in courses, eg MOOCs, must be designed optimally to allow learners to focus and retain information adequately. As discussed in the Context section, the article by Hu and Spiro (2021) exemplifies the importance of identifying an appropriate pedagogic rationale to integrate technology-enhanced learning platforms synergistically. They argued that cognitive flexibility theory is a useful lens for HE lecturers, given that it focuses on learning within ill-structured domains. Their study was situated in MOOC platforms, particularly how xMOOCS and cMOOCS can best complement one another.
A study by Slade et al (2019) explored the development of a learning-centred flexible teaching model for transforming play through the development of a game. The authors argued that such pedagogic design must be enjoyable using cognitive flexibility theory as a lens in developing a game-centred learning approach. They must also ensure that learners can participate and contribute to game playing. The co-creation of games with participants is highly encouraged to facilitate continuous improvement and enhance learners' personal development.

4.2.2.6 Teaching languages

The importance of adapting pedagogical approaches for teaching languages is underscored by Howard and Scott (2017) (also mentioned in the Context section). They examined the role of flexible learning in teaching pre-service teachers in designing and delivering lessons for students learning Maori as a second language. Their study involved using and combining the widely available technologies such as Moodle and specialist technologies such as Language Perfect. A bespoke pedagogical approach is necessary to effectively integrate the different technologies and recognise that learning a second language is different from learning a subject and that languages are unique. In addition, learning a second language is relative to the learner's native language and the phonetic and writing system. For example, while it may not be easy to learn French if one is a native English speaker, it is probably much easier than if the native English speaker were to learn to read, write and speak in Japanese. Ultimately, flexible learning is indispensable in supporting acquiring a new second language. Its advantages in enabling bespoke pedagogies to be designed and delivered allow learners to learn more naturally, eg at their own pace.

While flexible learning from the viewpoint of online learning is relatively effective, Vaz De Oliveira (2017) argues that a generic approach may not be appropriate when teaching languages. In adopting the systemic-functional linguistics framework, the authors suggest that while there are basic elements that can be developed for teaching languages (teaching English to Brazilian students), educators must anticipate being flexible and adapting according to the individual students (to some degree). Systemic-functional linguistics considers language as inseparable from the social and cultural context of the language. The meaning of the language is embedded in the historical context. In addition, to learn the language is to understand the relativity between the learners' native (first) language and the language learned in creating a pedagogy that is effective for the student.

4.2.2.7 Technology-based pedagogies

There can be no doubt that novel technologies such as those central to adaptive learning are vital. However, Cavanagh et al (2020) also stressed that it is not all about technologies and that any implementation of adaptive learning must be intertwined with an appropriate pedagogical approach and strategy. Firstly, they argue that universities and faculty must first understand how adaptive systems work. This task is not made easier given how vendors use the word 'adaptive learning' as a buzzword to sell their products. Second, they stressed that learning analytics must also play a pivotal role in gaining insight into individual students' performance, especially given that the utility of adaptive learning is personalisation. Third, they suggest that adaptive learning is best suited for challenging subjects/concepts (and not everything). The reason leads to the fourth point: adaptive learning is about personalisation, and, as highlighted, faculty need to adopt flexible teaching approaches to support individual students.

Lewis et al (2016) were part of a team from Australia that developed an international distance education programme for Vietnamese nursing academics. The aim was to build the learning and teaching capacity of the academics. While most aspects of the programme were designed based on well-known models of distance learning, a relatively unique part of this programme was its aim to enable Vietnamese nurse academics to build a national learning community in perpetuating a sustainable model of academic training and professional development. Specifically, the pedagogic design involved developing an asynchronous online discussion group to encourage the more experienced Vietnamese academics to educate their more recently appointed peers and enable the exchange of knowledge and experience. This approach was crucial given Vietnam's unique cultural, professional and institutional aspects that are unlikely to be covered by a formal curriculum developed by Australians. These communities of practice involving more experienced colleagues with many years of experience in the Vietnamese sector enabled the more recently appointed professionals to gain a realistic sense of their soon-to-be practice environment.

4.2.3 Employment

4.2.3.1 Work-based learning and learner engagement

As per Advance HE's Framework, the literature reviewed showed how flexible learning plays a role in the workplace and how work-based learning is a fundamental form of flexible learning. Feldacker et al (2017) explored the former (ie flexible learning in the workplace) as they investigated the use of an online graduate course, 'Clinical Management of HIV', developed by the School of Medicine at the University of Washington by a diverse group of healthcare workers from sub-Saharan Africa. They found that flexible learning was crucial given it can connect students and HEIs that have great distances between them and enable professionals to engage with continuing professional development and life-long learning opportunities. In the latter (ie work-based learning as a fundamental form of flexible learning), Nottingham (2016) highlights this important area that straddles higher education and the workplace. While most research in flexible learning has focused on technology and pre-experience undergraduate students, Nottingham (2016) highlights that work-based learning also has a vital role to play. This view is constructive given there are significant opportunities to broaden our understanding of flexible learning through students who are either based at the workplace or are undertaking substantial work-related elements in the course of their study in higher education. In particular, the author highlights three primary perspectives that can help inform the integration of flexible learning with work-based learning: discipline-centred, learner-centred and employer-centred. By exploring each perspective, educators and HEIs will be advantaged to develop new pedagogies (combining flexible learning with work-based learning) that may be suited for full-time, part-time and distance students and those who require work placements/ internships.

Nonetheless, a paper by Gronseth and Hutchins (2020) highlighted how flexible learning in the workplace is not automatically successful. The advocation of cultivating positive attitudes and behaviours towards self-directed learning and lifelong learning is vital as these habits need to be established before students start their careers. This point is highlighted by Gronseth and Hutchins (2020) in their discussion paper concerning flexible learning in the workplace. They argue that technology is essential in enabling flexible learning regarding 'when', 'where', and 'how' (fast). However, despite the benefits of technologies and flexible learning in developing adult learners and enhancing their career prospects, the take up of flexible learning could be better. While the issue of workers adopting autonomous learning may be contingent on context-specific problems (eg what is being offered in training), Gronseth and Hutchins (2020) argue that there are general principles that firms can use to enhance staff engagement with flexible learning opportunities. They state that engagement is crucial as it addresses the 'why' of learning. According to the principles of andragogy (Forrest & Peterson, 2006), adult learners tend to be more strongly motivated to learn when they need to, eg when they need new skills to solve a problem. Therefore, organisations need to pay special attention to increasing learners' awareness of their learning interactions and motivating learners towards specific learning events or modules. Gronseth and Hutchins (2020) propose the 'Universal Design for Learning' that enables designers of instruction to proactively differentiate as part of the planning process for an instructional experience, ie the 'why' in terms of engaging and motivating the

learner, the 'how' that involves the optimum order of learning events and activities to provide the most effective learning experience and impact, and the 'what' that is associated with the topic and content. In their paper, the authors specifically focus on the 'how' dimension within the Universal Design for Learning framework as a means of thinking about and designing-in learner engagement within flexible learning systems. The principles include: 1) initiating learner interest by providing choice and enabling learners to personalise aspects of their learning environment; 2) sustaining learner focus and motivation by clearly communicating performance expectations, administering formative assessments, providing learning review and feedback, and facilitating micro-credentials to be awarded; 3) supporting self-regulation by guiding learners in goal-setting, enabling learners to adjust their learning approaches, as needed, and building in reflective self-assessment opportunities. They envisage that while adopting flexible learning increases workplace learning, organisations must be more proactive in showing the relevance of the training opportunities to learners and in engaging learners. Providing flexible learning in terms of merely more options may not be enough to entice adult learners to make time in their busy schedules to learn. However, by focusing on motivating learners as a starting point, the modules that are part of an organisation's flexible learning approach will help shape learners' sense of autonomy and self-direction. Organisations can effectively engage learners in the learning processes by using social learning or via synchronous or asynchronous learning formats. Over time, by adopting these practices, a self-reinforcing pattern phenomenon may start to emerge. Ultimately, while the principles for engagement may be effective, the article by Gronseth and Hutchins (2020) underscores why educators must cultivate positive attitudes towards self-directed learning while learners are in university.

4.2.3.2 E-learning and interactivity

Shikino et al (2021) argue that e-learning plays a vital role in flexible learning in the workplace as well. In their study of generalist physicians in Japan, the authors highlight that it is imperative that these physicians are proficient in the funduscopic examination for detecting prevalent eye diseases such as diabetic retinopathy, hypertensive retinopathy, papilledema and retinal haemorrhage. However, the literature they reviewed suggested that traditional teaching and development of these skills are not easily accessible, which reduces physicians' confidence in undertaking these examinations. As a result, these physicians do not perform these examinations as much as they should, even on patients who may need it. Therefore, as an alternative, teaching funduscopic examination to medical interns and students using the flexible e-learning video enhances learners' access to opportunities to improve their skills.

Flexible learning is also vital in the workplace, but there is room for improvement in increasing the take up of learning opportunities. Mayowski and Norman (2020) examined this issue by using gamification technologies and asynchronous learning activities in Adobe Captivate in the training and continuous professional development of clinicians. As part of their research, they incorporated interactive elements in online learning, ie gamified, interactive, online problem sets (which they call 'GIOPS') to supplement short lecture videos and other class materials.

4.2.4 Institutional systems and structures

4.2.4.1 Strategic approach

A strong sub-theme that emerged from the 'institutional systems and structures' aspect of the framework was the strategic approach adopted by some HEIs. Indeed, Whalley et al (2021) argued that flexible learning is an inevitable reality and that HEIs need to be strategic in their development or risk being left behind. Of course, they also note that the adoption of flexible learning is a matter of degree. However, a proactive approach enables HEIs to be more encompassing in how flexible learning is developed, ie reflecting the diversity and inclusiveness and the pace it evolves so HEIs can be selective in their technology investment. The case for a strategic approach is made in an article by Orr et al (2019), discussing how HEIs can leverage technology in the pedagogic design of flexible learning. Their article explored how digitalisation affects the flexibility and openness of higher education provision and how HEIs track their progress. The authors propose that HEIs adopt a strategic approach in doing so. Specifically, they highlight two cross-cutting themes: organisational flexibility and procedural openness, in which digitalisation plays a role. Organisational flexibility is the quality or degree of flexibility that addresses the questions of 'what' and 'how' in selecting and applying digital technologies. HEIs need to decide for themselves the extent to which they want to embed flexibility in their programmes (eg through online and technology-enhanced learning environments) and perhaps even how the university operates (eg online university). Procedural openness is the quality of openness in addressing the question of 'who' (and even 'what', if other applications and devices are involved). Openness is the degree to which the programmes are open to others (students, the HEI's wider community and even the public) and are integrated across the HEI and systems. Building on this notion, Pillai et al (2019) argued that flexible learning provisions need versatile learning ecosystems at the institutional level. Their article proposes a conceptual framework 'versatile learning ecosystem' in which the term 'versatility' is selected. The framework is intended to cultivate institutional versatility to enable collaboration with other institutions in creating flexible learning provisions and opportunities for students. The authors suggest that such a framework starts with hosting an intranet-based e-learning environment that enables institutions to offer courses to students beyond the boundaries of the respective programmes. The ultimate goal is to allow students to select any course of their choice beyond their mandatory options.

The adoption of a strategic approach is echoed in other studies. A paper by Talbot et al (2020) highlights the role of work-based learning programmes in enhancing flexibility in educational provisions. However, the authors emphasise that the advantages of these programmes require a strategic approach by HEIs because work-based learning programmes tend to face cultural and institutional barriers. Nonetheless, they suggest that effective leadership, financial viability (ie programmes that are not loss-making), adherence to quality assurance, adaptability, entrepreneurialism and a cohesive community of practice are some factors that HEIs have to incorporate in increasing the success of these programmes. While significant effort is required, the authors argue that the investment is worthwhile given the flexibility and work-relevant skills they offer to students. The complexity involved in designing and implementing flexible learning is another driver,

as Veletsianos (2020) argues that flexible learning is not just about tools and technologies. In their review paper, Veletsianos and Houlden (2019) suggest that as a concept, flexible learning from a research perspective has grown to be an interdisciplinary and multimethodological subject. This increasing complexity in flexible learning is reflected in its practice concerning HEIs and educators. Therefore, a strategic approach in adopting a systematic approach in planning and implementation is necessary. Flexible learning is a strategic endeavour requiring HEIs to adequately plan and resource the initiatives, develop staff and be prepared to learn and collaborate with other institutions as partners.

As a prime example, Andrade and Alden-Rivers (2019) presented a compelling case study that demonstrated the impact of a coherent organisation-wide approach in instituting flexible learning throughout a university. Their case study was a US university with about 40,000 students with enrolment projected to reach 45,000 by 2025. Coupled with limited physical space and budget for expansion, enhancing and further embedding flexible learning is an essential priority for the university, especially given the general profile of its students, with 78% of its students working from 21 to 31 hours per week, 30% over the age of 25, and nearly 40% first-generation. Several critical enablers allowed the university to promote coherence in being strategic about flexible learning: dedicated resources, shared understanding, vision and strategy and integrating systems and structures. The first involved allocating dedicated resources in developing the university's Framework for Flexible Learning, with clear accountabilities for its implementation. This primary initiative resulted in the establishment of an Office for Teaching and Learning (OTL) that directly reported to the President and Chief Academic Officer, which further emphasised the critical mandate of the OTL. The OTL further developed the university's strategic plan in expanding flexible learning. The unit created a standard structural frame involving reporting lines, roles and capabilities, which also involved restructuring several organisational units. OTL was also highly influential at the operational level as it supported faculty development, instructional design, and the selection and adoption of learning technologies. The second involved creating a shared understanding of flexible learning in terms of place, pace, access and mode. Faculty Advisory Groups were established to help build coalitions of support across the university. In addition, flexible course design workshops were held across faculties to share ideas and influence planning toward hybrid/blended learning and open educational resources. A shared understanding was further rooted through regular internal marketing and communications. The third enabler was a vision and strategy. As the stakeholders across the university began to have a shared understanding, a united vision and coherent strategy were developed. The OTL team created a three-year strategic plan to address the challenges of institutional growth, limited physical space and inclusion. Some of the crucial initiatives implemented include developing online programmes more thoroughly, increasing the number of online and hybrid courses, normalising hybrid delivery, introducing competency-based certificate pathways and further leveraging open educational resources. Finally, the fourth mechanism involved integrating systems and structures. The OTL team drew on Advance HE's Framework for Flexible Learning in Higher Education to identify institutional systems and structures, pedagogical approaches, technologies and employers' needs to create, revise and harmonise across the university. This mechanism was essential to enable the sustainable

growth of flexible learning within the faculties and the institution. The authors reported several positive results. The most noteworthy was that the number of faculty teaching online had increased, and significant numbers of new instructors were teaching online each year. The encouragement to implement flexible learning at institutional and faculty levels also helped increase the number of faculty redesigning their face-to-face courses to online or blended courses. As flexible learning is amplified and accepted by teaching professionals in the institution, faculty development has been extended to provide a certification pathway for faculty who design and teach flexible courses. As a result, the university's instructional design team also deepened their expertise through additional work-based professional development activities. An emergent outcome was developing a quality assurance process for online and blended courses to provide constructive feedback to faculty who teach in these modes. The process is intended to be collegial and developmental to further stimulate and energise the adoption of flexible learning at the core of learning and teaching. In addition, new reporting processes were adopted to provide greater accountability in the new ways of working and give flexible learning even further visibility.

4.2.4.2 National policies

While there are many strategic drivers of flexible learning within the control universities, there are instances whereby national policies play a role (in impeding and amplifying university policies). One such example was highlighted by Joaquin et al (2020), who undertook archival research on the policies adopted by the Philippine government in supporting HEIs in the country to weather problems brought about by Covid-19. The authors also explore similar policies in other countries, namely, Indonesia, Thailand and Vietnam, to gain insight into the comparability of the Philippines' response. Joaquin et al (2020) found that, despite the innovations made by Philippine HEIs in terms of alternative learning modes and technologies for delivering education, there are still gaps and challenges in HEIs' responses. However, their study revealed that these gaps could have been addressed by appropriate government policy. The lack of a coherent approach from the government suggests that there needs to be a deeper understanding and better grounding of what is required from flexible learning and distance education from all institutions, especially government agencies. Another example of government policies influencing flexible learning in HEIs is in Azerbaijan. An article by Teymurova et al (2020) discussed how national policy encouraged mobile learning in local HEIs to promote flexible learning.

4.2.4.3 Bottom-up approach

In contrast to the top-down strategic approach, literature also highlighted the bottom-up 'organic' approach that has emerged in some cases. Walker et al (2018) highlight the use of technology-enhanced learning, which has experienced a sharp rise in recent years, primarily due to HEIs responding to growing student populations. However, they also observed that while a strategic and proactive approach is important, they equally stress the importance of giving educators the space to reflect and experiment with technology-enhanced learning tools. This bottom-up approach allows educators to buy into the use of technology-enhanced learning tools (instead of having it enforced

upon them because it is mandated), which is likely to foster creativity in how educators use technology-enhanced learning tools to develop innovative pedagogies for their students. Students themselves play a vital role in a bottom-up approach. In his Advance HE report about student champions, O'Toole (2016) suggested that student champions play an important role in providing timely, candid and constructive feedback to HEIs. In the context of flexible learning, student champions are vital sources of information as HEIs experiment and prototype flexible learning provisions. In another Advance HE report, a study by Peters et al (2016) echoes the work of O'Toole (2016), which also cuts across many areas of flexible and inclusive learning designs. Exploring the role of students in the development of flexible learning at Newman University, Peters et al (2016) suggest that involving students is imperative and requires a strategic approach driven by the institution. Such an approach allows students to become part of the institutional mechanisms to co-design, co-create and co-implement flexible learning. They cite the example of providing students with choice in selecting the technologies, activities and/or tasks they want to use in their learning.
In addition to enhancing student experience and achievement, flexible learning prepares students to be independent and autonomous learners, which they will need to be when they enter the job market.

The bottom-up approach emerged from the findings in a paper authored by Berga et al (2021). They evaluated the effectiveness of blended learning compared to traditional face-to-face in-person learning. While the study involving 187 second-year undergraduates in a nursing programme revealed a significant difference in self-efficacy and knowledge, students' perceptions of the online learning environment were positive. An insight highlighted by Berga et al (2021) involved the use of blended learning in an evolutionary manner, enabling HEIs to free up capacity, eg classrooms, from an interim perspective, and providing options for courses and the use of teaching resources. Hence, while flexible learning is regarded as a strategic imperative that is often assumed to be best driven from the top, the study by Berga et al (2021) suggest that a bottom-up approach also has its advantages.
As long as these changes require a radical change in institutional systems and quality assurance processes, such an approach allows an HEI to identify what type of flexible learning is suited for its diverse set of programmes and how blended learning should be designed and implemented.
These activities will inform the HEI's strategy when it believes it has achieved critical mass to drive blended learning strategically. The small-scale approach allows for individual programmes to adjust their blended approach to suit their subject's inherent nature and evaluate the effectiveness of such flexible learning methods in terms of student achievement and experience. Flexible delivery entails providing students with options in how, what, when and where to learn and strives to meet the needs of both the institution and the student. Such endeavours require the HEI and its constituents to rethink teaching and learning paradigms and related policies and practices. Student success must be central to these discussions, particularly in terms of supporting new entrants to higher education.

4.2.4.4 Academic workforce development

The final sub-theme parallels the bottom-up approach as the literature suggests focusing on the development of the academic workforce as an institutional imperative in developing flexible learning. Anderton et al (2021) highlighted the important role of HE professionals in being able to flexibly

change the design and delivery of the curriculum in a fluid situation during Covid-19. They also highlighted that there are no tried-and-tested approaches in the science field, especially where practical elements of the programmes are concerned. Therefore, pedagogical approaches are reliant on the capabilities of the tutors. As tutors are the source of novel pedagogical approaches, Anderton et al's (2021) research is linked to the 'institutional systems, and structures' aspect in the framework, especially given the responsibility to develop staff primarily lies with the institution. Such a link is surprising given the sector's growing calls, eg Gupta (2021) that HE institutions need to take the lead in developing staff capabilities that are fit for a more volatile and ever-changing future.

The need to build on staff's learning and development as a result of implementing flexible learning due to the pandemic is an imperative matter highlighted by Tarrayo et al (2021) as they investigated the impact of the adoption of flexible learning in the Philippines. While they found that, in general, HEIs' implementation faced challenges, they were able to overcome them. Nonetheless, the authors stressed the need for HEIs to build on and learn from their experiences to improve on their flexible learning provisions in terms of further developing staff in the design and delivery of flexible learning, the strategic planning and implementation of flexible learning pedagogies, and working with relevant stakeholders to address issues concerning internet connectivity. The acceleration of transitioning into a flexible learning teaching model due to Covid-19 has been challenging for HEIs. Dayagbil et al (2021) reflected on such experiences in the Philippines in their study. In this context, they suggest that HEIs play multiple roles in developing organisational resilience, supporting organisational learning and providing strategic guidance. They highlight organisational learning as an essential factor as it can enable HEIs to adapt and innovate flexible learning provisions for the future.

4.2.5 Key findings from the analysis using Advance HE's Framework

Overall, the arguments and findings from the literature review are broadly consistent with the four aspects of Advance HE's Flexible Learning Framework. The literature reviewed shows advancement in flexible learning in terms of widening its application in different subjects/ fields and even countries. Indeed, given the nature of the teaching of some subjects and how students best learn and acquire knowledge, implementing flexible learning in some subjects may be more straightforward than others. Other subjects, such as languages, may require more exploration and even closely working (eg co-creating) with students to develop approaches that work. Such an approach may be invaluable given a practical approach in teaching one language may not have the desired impact in teaching a different language, which is in addition to the significant cultural contexts in which languages are embedded.

Another key finding is that the implementation of flexible learning is context-sensitivity, which significantly influences the acceptability, feasibility and overall effectiveness of flexibility-based initiatives. Context influences each of the four aspects of Advance HE's Framework. While this is not surprising, it serves as a cue that there are no less obvious and perhaps even counter-intuitive areas that need to be considered by HEIs in the implementation of flexible learning. An example relates to equality, diversity and inclusivity. Some papers have highlighted that flexible learning may also have unintended consequences on certain student groups while having many advantages. The critical message is that even the most innocuous and/or 'mainstream' flexible learning initiative need to be

thought through to ensure that it fits into the HEI's context and meets the needs of its target audience, eg students. As some studies highlight, given its significant investment, flexible learning should be a priority in HEIs.

The findings also show that, in advancing our understanding of flexible learning, studies have taken approaches that provide more granular insight, eg neurodiversity as part of inclusive and lifelong learning. Advance HE's Framework is generally quite comprehensive in terms of broad headings. The next stage of the Framework's evolution involves going further in-depth into each element to discover the associated specificities. For example, the literature shows that educators are combining and/or improvising established pedagogies for flexible learning, highlighting the activities and challenges educators have faced in implementing these initiatives.

Finally, another key finding is that literature shows how the different aspects of the Framework (and their constituents) are linked. The next iteration of the Framework may highlight (as general examples) how the four aspects are interrelated. An example is a mutual reinforcement between technology and pedagogy. While it is accepted that technology should serve the pedagogy, one cannot ignore the fact that the availability and selection of technologies can enhance/amplify or impede the degree of flexibility or 'openness' of curricula. The literature has also shown how pedagogies have been developed to take advantage of new technologies. Both technology and pedagogy need to be considered together. Therefore, using the term 'ecosystem' to describe flexible learning is appropriate given the inherent (and self-reinforcing) links among the four aspects and their different elements.

4.3 Case studies

4.3.1 Case study: flexible learning in the Middle East

The first case study has geographic boundaries in relation to the Middle East represented by a modest number of studies/countries in the region. This literature review also discovered a significant interest and research in flexible learning in the Middle East. Within the context of health sciences students in King Saud University in Saudi Arabia, Alabdulkarim (2021) reported that the institution takes a strategic view on flexible learning supported by research. Their article focused on the micro aspects of technology-enhanced learning that facilitates peer-to-peer interaction and collaborative learning. This interest, amplified by Covid-19, helps to explore and identify viable options, in addition to enhancing students' attitudes towards flexible, collaborative learning pedagogies. In Iraq, a similar study was carried out in the University of Babylon by Al-Azawei, Parslow and Lundqvist (2017). They examined the fit between technology acceptance, e-learning self-efficacy, learning styles and perceived satisfaction. Inviting undergraduate computer science students as participants, the authors found students' intention to use technology contributed to perceived satisfaction. The study discussed that identifying the 'right blend' between face-to-face and technology-enhanced interactions was crucial as it enabled students to feel more comfortable using the technologies. The authors suggested that enhancing students' sense of self-efficacy was important. Training and developmental initiatives

should be provided to students and tutors to improve their ability (and, as a result, their self-efficacy) using the relevant technologies, especially as the institution transitions to flexible learning modes for some parts of the curriculum.

In another study in Saudi Arabia, Alkhunaizan (2019) explored the growing use of mobile learning (eg WhatsApp) with information systems students. Given the relatively advanced infrastructure in the country, mobile learning is an understandable choice in terms of new directions in flexible learning. The author sought to understand better the dynamics in mobile learning as experienced by students. Overall, the study found that learners had positive attitudes towards integrating mobile learning into their courses. In addition, the researcher found that mobile learning was an effective complementary tool but, unsurprisingly, its utility is contingent on its design and integration into the overall curriculum.

Similarly, Al-Shihi, Sharma, and Sarrab (2018) explored students' motivations in using mobile-learning technologies in Oman. They also found that understanding the key drivers for the adoption of mobile learning is crucial in informing the way it is integrated into the curriculum and the intensity of its use. New pedagogic approaches are likely to emerge as there are opportunities for educators to incorporate entertainment-orientated apps and enhanced social learning/opportunities to collaborate with others. Mobile learning, as a form of flexible learning, will amplify the expediency/efficiency of learning anytime and anywhere, on-demand.

Alsobhi and Alyoubi (2019) in King Abdulaziz University explored technologies to support neurodiverse students, especially those who have dyslexia. Their research was driven by the inadequate understanding of how e-learning supports flexible learning in the context of students with learning disabilities, eg dyslexia. As a result, these students are often denied the benefits of technology available to their mainstream counterparts. They developed a 'dyslexia adaptive e-learning management system' (DAELMS) to undertake their quasi-experiment. This system is designed to correlate dyslexia types with students' preferred learning styles, subsequently adapting the learning material presented to the students. DAELMS is a form of adaptive learning system and can include several personalisation options such as presentation, curriculum structure, navigation, assistive technologies and guidance. The researchers recruited student participants to trial the system. In all, 48 students participated in the experiment, of which 11 had dyslexia, 23 had symptoms of dyslexia and 14 were non-dyslexic participants. All participants were undergraduate computer science students, with 16 females and 32 males. The results were encouraging as the system matched the users' dyslexia 'condition' and learning styles with the appropriate learning materials to enhance their learning outcomes.

4.3.2 Case study: critique of flexible learning

The second case study has thematic boundaries in relation to the limitations of flexible learning. While there are clear advantages in increasing flexibility in learning, the concept is not without disadvantages. Houlden and Veletsianos (2019, 2021), using online learning as a focal example, acknowledge the advantages of flexible learning. However, they also highlight that the notion is not entirely faultless. In conjunction with its benefits, there should be more discussion about the concept's

clarity in providing a more balanced view. They highlight that the 'limitations' of flexible learning are rooted in unchecked assumptions about the concept. They suggest that flexible learning appears to be overhyped and presented as a one-size-fits-all solution for modern society.

An example of an unchecked assumption is that flexible learning will liberate students and give them more choice. Choice and flexibility tend to go hand-in-hand and they argue that, for example, the decision of whether a course is delivered online or in a blended learning format is decided by the institution. Students do not really have a choice in terms of which mode of learning they want to take up (Houlden & Veletsianos, 2019). Frequently, most decisions related to a learning module or event have already been decided (the content, the delivery and even the pace of synchronous learning). The choice left to students is the pace at which they engage asynchronous learning. An allied assumption is that most students prefer the nomadic nature of learning. Indeed, while many students may prefer to learn 'on-demand', many others prefer a structured approach at an even pace. In addition, students' circumstances change. What they preferred previously may not be the same at present or in the future.

Further, they highlight from previous research that online learning had unintended consequences for women with family and social responsibilities (Houlden & Veletsianos, 2019). The participants stressed that online learning gives people the impression that studies can be squeezed in between other day-to-day responsibilities, but in fact, they did not have the time and space to study their coursework and had to negotiate intensely to achieve some control over their diaries for their studies.

Similar to the issues discussed by other authors regarding flexible learning in Ghana and the Philippines, for example, Houlden and Veletsianos (2019, 2021) argue that the degree to which flexible learning can be achieved is context contingent. They question the priorities of Canadian universities. They say that the education of indigenous people of Canada is not best served by online learning given the poor internet infrastructure they experience. Online learning for the indigenous people in Canada may exacerbate inequalities instead of enhancing equality. Rather than focusing on online learning, they suggest Canadian universities should prioritise place-based education opportunities and decolonising curricula, especially given the many years of social injustices that indigenous people have experienced. The authors highlight previous studies that found that Canadian HEIs should honour place-based and community-orientated learning that is important and impactful for the indigenous people of Canada.

Another prevailing assumption about flexible learning that needs to be revisited is students' autonomous and self-directed learning. Several flexible learning designs, such as asynchronous learning, assume that learners will be motivated to initiate and complete their tasks (Houlden & Veletsianos, 2021). However, even in face-to-face in-person learning modes with a lecturer and facilitator to stimulate and encourage students, student attendance is still far from desirable. If left to their own devices, will students' commitment to their studies enable them to complete them on time and satisfactorily?

Finally, the advancement of adaptive learning may require students to share more of their data with HEIs. While some of the data shared may be innocuous, there are sets of data, eg student achievement and demographic information, that may be sensitive. The ethical issues and their implications related to technologies to support flexible and adaptive learning have not been fully explored (Houlden & Veletsianos, 2021). So although technologies may offer innumerable and powerful opportunities, some of these prospects may be curtailed by the ethics of collecting, using and sharing student-related data.

Ultimately, rather than enhancing equality, Houlden and Veletsianos (2019, 2021) argue that flexible learning may disempower students even more and privilege those who have the means to own the required technological devices and have access to high bandwidth. They stress that flexible learning is a valuable notion for many students. However, they also caution that institutions must be cognisant and proactive in addressing disadvantages inherent in flexible learning: they suggest that flexible learning designs should account for individual and environmental circumstances. HEIs must be clear about each flexible learning design, and equality must be safeguarded so that all students benefit from flexible learning. In addition to the risk of not ensuring all students benefit from flexible learning, HEIs must be aware of the 'unintended consequences' of flexible learning designs. The flexibility that positions learners as autonomous subjects may inadvertently leave some learners struggling. HEIs cannot assume that autonomous and self-directed learning is a given and must prepare students for flexible learning and provide guidance where possible. Adopting a critical view of flexible learning is vital for the concept to fulfil its promise and be an advantage to all students and HEIs. Any initiative involving flexible learning must take into account and consider equality, diversity and inclusion in every aspect. HEIs must also clarify what flexible learning means to students (which students and how). All students must benefit from flexible learning, and therefore a more considered approach (equality, diversity and inclusion) must be adopted.

5 Conclusions, limitations, implications and recommendations

5.1 Concluding statement

The Context element includes micro drivers (with sub-themes of exploring field-based pedagogies and development of the HE teaching profession) and macro drivers (with sub-themes of Covid-19, professional and vocational development, the affordance of technologies and socially based drivers). There were two central Interventions elements: technological configurations (with sub-themes of digitalising the classroom, gamification and interactivity, learning analytics, personal learning environments, selective deployment of technologies and intuitive technologies for educators) and explorative approach to pedagogies (that included various examples). There were three themes in Mechanism: systems approach (with multiple examples), the role of educators (with various examples, including highlighting the importance of reflexivity and communication). Finally, the Outcomes elements had two main themes: student impact (with sub-themes of student learning and student behaviours in learning) and organisational learning (with sub-themes of learning from trial-and-error and advancing socially orientated aims). The results of the analysis using the CIMO have revealed myriad reasons why flexible learning is adopted, the different forms it takes, and how it is implemented. What appears to be consistent is that it produces positive outcomes in terms of student impact, but this is not without caution and caveat, especially with regards to unintended consequences if adopted purely from an instrumental perspective.

Using the Advance HE's Flexible Learning Framework as a lens, the review found the following in terms of the Framework's four dimensions: technology-enhanced learning (with sub-themes of adaptive technologies, artificial intelligence, learning analytics, specialist/ discrete technologies, ubiquitous technologies and adapting existing TEL technologies); pedagogic approach (with sub-themes of integration of approaches, balancing priorities, entanglement with local contexts, adopting multiple perspectives, cognition-based theories, teaching languages and technology-based pedagogies); employment (with sub-themes of work-based learning and learner engagement, and e-learning and interactivity); and institutional systems and structure (with sub-themes of strategic approach, national policies, bottom-up approach and academic workforce development). The findings chime with the Framework's four aspects. The literature also shows that research focuses more on the influence of context on flexible learning, going more in-depth into each aspect and its associated constituents and making links between these aspects and constituents, which shows that adopting an ecosystem perspective to flexible learning is appropriate.

5.2 Limitations

While the literature reviewed provided a relatively comprehensive view of the trends, issues and student impact resulting from flexible learning, some areas require further investigation. First, while studies looked at student impact of flexible learning, more robust evidence is needed, especially longitudinally. Such a research design will require researchers to implement flexible learning pedagogies over a more extended period. For example, researchers can collect data after every

module/unit throughout an undergraduate programme for the same cohort of students, especially in relation to flexible learning assessments. Data over a more extended period will provide a more consistent pattern of student impact (Bell & Loon, 2015). This data can be compared with archival data of student impact collected from previous cohorts who were not part of a flexible learning curriculum.

Another apparent area that is deserves further investigation is in the area of microcredentials. Grey literature (eg industry-based reports, white papers) have highlighted developments in the design, implementation and coordination of microcredentials. For example, in its 2021 Horizon Report, EDUCAUSE[3] reported several vital technologies and technology-dependent practices that are likely to have a further significant impact on HE and microcredentialing was highlighted (with others being AI, blended and hybrid course models, learning analytics and OER) (Pelletier et al, 2021). In addition, Universities Australia published a report[4] on microcredentials from its Universities Australia Deputy Vice-Chancellors (Academic) Working Group on Microcredentials. Microcredentials have significant potential to have high student impact, but need coordination between universities for interoperability (ie mutual recognition of each other's microcredentials for portability and benefit students). This report is intended to assist Universities Australia's members in designing and recognising microcredentials. The discussion about microcredentials should also extend to flexible learning in the context of employability and for career for progression in the workplace.

Finally, further research is required for the impact of equality, diversity and inclusivity on flexible learning. The literature reviewed in this report has provided conceptual arguments and what is needed now is empirical evidence. These reports have provided compelling arguments as to why flexible learning should not be used as a blunt, instrumental tool as there may be unintended consequences such as the exclusion of some student groups eg neurodiverse students. The research discussed in this report generally supports the notion of flexible learning. The report recognises flexible learning's merits but echoes the position of Advance HE (through its previous reports) that the design, development and implementation of flexible learning must be undertaken in a considered and measured manner. HEIs must be clear for whom flexible learning is for and the degree of benefits that the intended audience will experience.

3 EDUCAUSE is an HE technology association and the largest community of IT leaders and professionals committed to advancing HE. EDUCAUSE is a global non-profit organisation whose members include the US and international higher education institutions, corporations, not-for-profit organisations, and K–12 institutions. It has a community of more than 100,000 individuals at member organisations.

4 www.universitiesaustralia.edu.au/wp-content/uploads/2021/09/210929-Guidance-for-portability-of-Australian-microcredentials-UA.pdf

5.3 Implications and recommendations for policy, practice and research

5.3.1 Policy for the sector

The popularity of microcredentials has instigated a shift in HEIs' thinking in prioritising the development of a curriculum that serves increasingly diverse learners. The maturing landscape has seen new ideas. For example, EDUCAUSE cites the example of a 'credegree', a type of programme that amalgamates a traditional bachelor's degree and an industry-recognised credential. They cite 'micro-pathway' as another example, involving a programme that contains two or more stackable credentials that can be packaged together as a validated qualification. While, as mentioned in the limitation section, there is still much work needed to understand how microcredentials may work in institutions, country-specific higher education sectors may provide leadership in this area to instigate and guide work related to the coordination of its development among HEIs and also employers.
The key starting points are technology and curricula. A degree of standardisation (eg unitisation and credits of curricula and vocabulary) at the start of each university's development is likely to benefit future coordination. Standardisation is crucial, especially if portability is one of the key selling points of microcredentials. The phenomenon of network externality may play a role here. Network externality occurs when the value or utility a user derives from a good or service depends on the number of users of compatible products. The telephone is an example – a single user of a phone (in a traditional sense, not smartphones of the present day) without other users is of no use. The lack of portability of microcredentials is likely to severely limit its impact and envisaged benefits.

Another area with significant potential for exploitation for the benefit of students is OER, in particular, the governance of OER for the sector. As discussed, OER include complete courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge (Andrade & Alden-Rivers, 2019). OER are a promising aspect of technology-enhanced learning from a flexible learning perspective. The OECD (Orr, Remini & Van Damme, 2015) suggests that OER enable HEI to foster new forms of learning (including flexible forms) for the future while reducing barriers to learning opportunities across all segments of society. OER can facilitate this given their 'open' nature, increasing and widening the distribution of high-quality education. As digital technologies, eg apps, are now ubiquitous in daily life, OER are well poised to have a high level of acceptance and use. With institutional support and promotion, the potential of OER are virtually unlimited in their development, use and diffusion in addressing common educational challenges. The 'open' nature of OER also enables continuous enhancement and improvement as it serves as a catalyst for new ideas and innovations that can transform the interaction between students, teachers and knowledge. Indeed, OER can have an extended life cycle beyond their original design. The high diffusion of OER encourages iterations and adaptations as teachers and developers adjust and revise OER to suit their context and purposes. These evolutionary changes increase the richness in OER and can be a catalyst of pedagogical, technological and social change.

Nonetheless, the distinctiveness of OER means that HEIs need to rethink how technology and the teaching profession are allied together. The strategic use of OER also means that HEIs may need to revisit their quality assurance process and procedures. The inherent advantages of OER, ie flexibility and adaptability over different contexts and time, may also pose a challenge to many existing quality-related procedures, given most existing structures and systems are premised on relatively static education materials.

From the perspectives of institutions, the HEI sector as a whole, and governments, OER enable the costs of education, both public and private, to be contained. Indeed, institutions can play a more prominent role in promoting OER. Institutions can encourage, incentivise and even mandate the production of OER. HEIs may not just include the innovative (re)production of OER as part of the career development pathway of teaching and scholarship staff but also embed the (re)use of OER in its training and development initiatives. Similarly, governments can revise their funding to HEIs to incentivise that it accelerates and amplifies the development and diffusion of OER. Both HEIs and governments can create central repositories (such as an App Store) to enhance the discoverability of OER. Finally, as part of the previous discussion, sector policy may involve the governance of OER to enhance the perception of legitimacy and to increase trust in its use – not just about the credibility of the content but also from a technical perspective in that OER are virus-free and do not contain anything else that they should not. A governing body may reflect the similar role that Jisc[5] plays for the HE sector in the UK.

5.3.2 Policy in institutions

As the literature review has revealed, the approach taken by HEIs in the adoption of flexible learning varies; at one end, some take a strategic top-down approach. At the other end, some adopt a bottom-up approach driven by educators and lecturers. There is no right or wrong as institutes must do what is appropriate for their circumstances and contexts. Nonetheless, the key recommendation here is that HEIs should take a proactive stance irrespective of whichever approach is adopted. If an HEI takes a strategic perspective, they are being proactive. Such an approach will involve a clear plan of the type and degree of flexible learning the HEI will design and develop, with a clear view of the audience and beneficiary of flexible learning. The strategic approach will also have a clear work programme in rolling out flexible learning, prioritising programmes, schools and faculties across the university. Such a plan will also detail roles and responsibilities in designing, developing and implementing flexible learning.

Nonetheless, HEI can also be proactive in the bottom-up approach. At the centre of this approach is organisational learning. Organisational learning is not about the ‘doing’ but emphasises learning and capturing the learning. Organisational learning necessitates HEIs to be proactive. Being proactive in this sense involves encouraging programmes and schools to experiment with flexible learning.

5 Jisc was established on 1 April 1993 to deal with networking and specialist information services. Jisc provides national vision and leadership for the benefit of the entire higher education sector

The design, development and implementation of flexible learning can be undertaken by reconfiguring existing budgets and resources. Universities can create a safe organisational climate at the institutional level that encourages calculated risk-taking. Institutions can embed organisational learning processes for educators and lecturers within faculty and institute-level committees, supported by the appropriate policies.

Another area of institutional policy to foster flexible learning is staff development and career development. Staff development involves enhancing staff capabilities, which is crucial given the skills required to design and implement flexible learning (including applying and managing the technologies) can be quite markedly different from the skills needed in traditional teaching formats. Similar to other important initiatives, such as the decolonisation of curriculum (Maringe & Osman, 2022; Osman & Hornsby, 2017), HEIs must provide developmental opportunities for staff. Given the rich and complex nature of flexible learning, these developmental opportunities must be robust (eg for different levels of proficiencies) and comprehensive (eg management of technology in addition to pedagogies). In addition, career development, while related to staff development, is nuancedly distinctive as it involves clarifying/developing career pathways for teaching-based staff, similar to that enjoyed by research staff, to the level of a professorship. An invariable issue in promoting teaching-based professors is the 'equivalence' of research outputs produced by the research counterparts that are trackable and impactful. The development of OER presents an opportunity for the sector and profession to address this issue.

OER can help foster the development of the teaching profession in HEIs. High-quality OER can be used to evidence by staff on teaching and scholarship career tracks for promotion. The use of OERs is similar to how research outputs are used as part of a battery of indicators to inform a researcher's career progression, eg to professorship. The use of OER as an indicator of esteem in the teaching profession is an approach that has been adopted in some UK universities. These HEIs have created teaching and scholarship career pathways for staff, leading to professorships. Given the open access of OER and the ability for others to build and innovate on them, OER are promising artefacts that teaching professionals in HE can use as indicators of achievement, innovation and even esteem in their careers. There is growing evidence of OER being used by teaching professionals as evidence for advancements in their careers. In the last few years, the British Academy of Management (BAM) has been running a dedicated event called the Education-Focused Professorship programme (Anderson & Mallanaphy, 2020). The Education-Focused Professorship programme was initiated to help teaching professionals in the field of management to enhance their scholarship in pedagogy and educational leadership and to evidence their attainments, including using OER. Nonetheless, as mentioned, although OER can play a role in creating a new pathway for the development of HEIs teachers, more prominent institutional structures and support systems need to be in place given OER are unique to other technology-enhanced artefacts.

5.3.3 Practice of flexible learning

While flexible learning is not synonymous with technology, it is difficult to ignore the central role that it plays. Therefore, it is vital that the understanding of present and emergent technologies is central to developing practice related to flexible learning, particularly AI and learning analytics. AI is a double-edged sword. It can, of course, enable and enhance adaptive learning and increase the efficiency of specific education-related processes such as proctoring and improving examination products. However, essay-mills also use AI to avoid plagiarism detection, and the ethics of its use, which involves collecting biometric data to track and monitor progress, can be contentious. AI holds a lot of promise as a technology. In the context of HEI, AI is likely to shape institutional systems as much as it will influence the development of new pedagogical approaches and impact technology-enhanced learning tools/ products used by educational practitioners. In addition, learning analytics will be a growing technology and practice to enhance student achievement, create new curricula and manage programmes and student learning. As part of this, HEIs will have to develop a 'data strategy' to drive innovations from data. Such a strategy will enable educational practitioners to interpret data, adopt evidence-based actions and ultimately cultivate data-informed practices. However, as part of the development of a governance structure and systems, the issue of ethics will play a central role, with similar concerns arising in the use of AI found here as well.

Another implication is the growth of blended and hybrid course models. The pandemic has accelerated blended course models, and while the pandemic is not over, students have voiced their preference to learn in person. The key challenge for educators is to develop a hybrid model that provides 1) the right balance that meets the needs of students and demands of public health; 2) flexibility in reacting to changes to the environment; 3) opportunities to leverage on their capabilities to design and implement blended learning to attract other cohorts of students. There is also a growing confluence between flexible and adaptive learning, with the optimisation of adaptive learning technologies. Of course, the strategic use of technology can enhance flexible learning options for students in a manner that is efficient for HEIs, eg online and blended learning. Also, as some of the studies reviewed suggest, there is no significant difference in student outcomes between face-to-face in-person learning and online/blended learning approaches. However, this may change as the technologies for adaptive learning becomes more effective and pervasively used. Adaptive learning technologies, which leverage AI, refer to technologies that dynamically adjust to each learner's level or type of course. Adaptive learning systems are especially useful when learning needs are not standardised, and each learner has specific requirements, eg different cognitive backgrounds or learning preferences (Capuano & Caballé, 2020).

Recent advances in AI-based adaptive learning include the ongoing European Collaborative MOOC (colMOOC), which aims to make MOOCs more collaborative to support teachers and engage and motivate students, including conversational agents equipped with natural language processing abilities. These 'abilities' enable colMOOC programmes to detect the students' performance and even cognitive state in synchronous discussions and asynchronous forums and intervene in providing enhanced support to students. Such interventions enable more productive conversations and overall

engagement in the course (Capuano & Caballé, 2020). Adaptive learning systems are not just confined to learning-based evaluation and interventions but also include those that are emotion-based. The growing sophistication of sentiment-analysis techniques enables detecting and recognising students' emotions and responses using appropriate affective feedback (Loon & Bell, 2018). The advancement of adaptive learning and its integration in technologies used to increase flexible learning offers many opportunities. In particular, the confluence between technology-enhanced learning for flexible learning and adaptive learning systems enhances access to HE and improves the effectiveness of technology-enhanced learning in terms of student learning and achievement (Loon, 2016). As adaptive learning technologies become more advanced and offer broader utility and benefits at affordable costs, their application in flexible learning is expected to grow. The combination of the two will be a catalyst to innovations in HE. There are, of course, interdependencies among the technological and pedagogical trends (ie AI, microcredentialing, blended and hybrid course models, learning analytics and OER) that will continue to play a meaningful role in increasing the sophistication of the flexible learning ecosystem.

Another area of implication for the practice of flexible learning, as highlighted as part of the discussion on equality, diversity and inclusivity, is the engagement with existing students (different cohorts) and people from non-traditional educational backgrounds in shaping new flexible learning practices. In their study that focused on students on the autism spectrum, Adams et al (2019) found that educators had to revise the 'interactional' aspect of online learning. They suggest that to be inclusive of students on the autism spectrum, flexible learning should also include giving students options within the flexible learning programmes to engage in a synchronous virtual classroom or an asynchronous format (interacting with the machine rather than another person). Ultimately, a crucial implication from their research is highlighting plans and opportunities for student interactions. These interactions may include working directly with one another, with the computer, pacing the curriculum in providing students the time to reflect on the content based on their needs and the ability to refer to a tutor to seek help and support through different mediums.

Allied to this is the practice of reflexivity. Reflexivity here refers to being responsive to student needs and emergent technologies. Reflexiveness enables educators to fine-tune, enhance and align pedagogies with technologies for student impact. An example of why reflexiveness is vital is highlighted in the same study by Adams et al (2019) that involved neurodiverse students. They highlighted a case where practitioners' reflection enabled a more effective design of the course website that was more conducive (Hibbert, 2020) for neurodiverse students. While neurotypical students appreciate course websites with images and colour as they tend to be perceived as attractive, these same elements may be barriers to neurodiverse students as they are a significant distraction and overwhelm the students. Their study found that educators' reflexiveness spurred them to develop two versions of the course websites to cater to student preferences. One version is simply a stripped-down version containing the essentials for the learning to occur.

5.3.4 Flexible learning research

As discussed in the Limitations section, further research is needed in adopting a longitudinal research design to gather more robust evidence about the impact of flexible learning on students and also in the workplace (Loon, 2014). In addition, further research should also investigate flexible learning from equality, diversity and inclusivity perspective in terms of gender, race, ethnicity, socio-economic background and neurodiversity. In addition to microcredentials, a technological standpoint for research should involve OER. The growth of OER has fundamentally enhanced social equity among students, primarily due to reducing the cost of learning resources that are beyond the means of many. In addition to its negligible cost, most OER are also kept up to date as they are primarily hosted online. OER can nurture students' self-directed learning practices (Loon, 2021) and even encourage them to contribute to the development of OER. As mentioned prior, by encouraging the development of OER, HEIs help to support life-long learning and reinforce a career pathway for staff in teaching and scholarship (ie non-research). Hence, the relationship between OER and students' autonomous learning can be further explored. Allied to flexible learning technology, future research should build on the literature reviewed in this report that has highlighted the ethical issues associated with using student-related data in the application of learning analytics and adaptive technologies.

6 Glossary

Term	Meaning
Adaptive learning	The term refers to technologies and/or processes that dynamically adjust to the level or type of course content accounting for individual differences eg an individual's abilities, skill attainment and/or learning styles for the purposes of accelerating learners' performance.
Artificial intelligence	Computer systems that undertake tasks usually thought to require human cognitive processes and decision-making capabilities.
Blended learning	The term blended learning has a number of connotations as it may refer to the combination of delivery, media and methods. The blend in delivery involves the combination of instructional modalities, such as lectures and seminars (tutorials); live (in-class) and directed (out-of-class) learning activities; self-paced and collaborative learning; and even involves the combination of customised and off-the shelf materials.
Flexible learning	Flexible learning is defined in terms of pace, place and mode of delivery, often with an emphasis of these allowing students choices and a degree of control over when, where, how and sometimes what they learn. Pace refers to accelerated and decelerated programmes including part-time learning and the recognition of prior learning. It can also include a variable pace of study within a programme's overall deadlines. Place focuses on work-based learning and includes employer-responsive provision of bespoke programmes and the accreditation of in-company training programmes. Technology also now allows learners to study in places of their choice, ranging from tube trains to home to hotel rooms abroad. Mode relates to the use of learning technologies in delivering flexible learning and enhancing the students' learning experience and includes distance learning and blended learning programmes. A flexibility of mode often underpins other forms of flexibility.
Learning analytics	Learning analytics refers to the measurement, collection, analysis and reporting of data about the progress of learners and the contexts in which learning takes place. Using the increased availability of big datasets around learner activity and digital footprints left by student activity in learning environments, learning analytics take us further than data currently available can.
Lifelong learning	A person's development after formal education. It involves the continuing development of knowledge and skills that people experience after formal education and throughout their lives. Lifelong learning builds on prior learning as it expands knowledge and skills in depth and breadth
Microcredentials	Programmes of study that verify, validate, and attest that specific skills and/or competencies have been achieved. Microcredentials differ from traditional degrees and certificates in that they are generally offered in shorter or more flexible timespans and tend to be more narrowly focused.
Neurodiversity	Neurodiversity refers to the natural range of difference in human brain function, but in workplace and educational contexts, it's an area of diversity and inclusion that refers to alternative thinking styles, such as dyslexia, autism, attention deficit hyperactivity disorder (ADHD) and dyspraxia.

Term	Meaning
Open education resources (OER)	OER are teaching, learning and research materials that make use of appropriate tools, such as open licensing, to permit their free reuse, continuous improvement and repurposing by others for educational purposes – sometimes summarised as the 5R activities: retain, reuse, revise, remix and redistribute. The focus of OER is on the possibility of taking original work from other providers and being able to adapt and repurpose it to produce a new learning resource. In this sense, open means free to access and free to change. It is for this reason that one of the central characteristics of OER is the liberal licensing (eg through Creative Commons), which facilitates this process.
Open, flexible, and distance learning	Nomenclature in describing flexible learning technologies such as MOOCs and open education resources.
Technology-enhanced learning	The use of technology as part of a learning process
Work-based learning	The term work-based learning is widely used throughout the literature, academia and industry to describe a multiplicity of approaches by which one can learn through work. There are many approaches to developing work-based learning modules, courses and projects that use learning at, learning for, and learning through work

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Advance HE

Contact us

General enquiries

+44 (0) 3300 416201

enquiries@advance-he.ac.uk

www.advance-he.ac.uk

Media enquiries

+44 (0) 1904 717500

communications@advance-he.ac.uk

www.advance-he.ac.uk/contact-us

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