Blended learning in higher education:

N-TUTORR overview of blended learning and its impact on the student experience

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Prepared by Dr Sarah Carroll[1], with Dr Moira Maguire[2] and Dr Carina Ginty[3]

Green paper

[1]*N-TUTORR Stream 1 Data Analyst, Atlantic Technological University*
[2]*N-TUTORR Stream 1 Co-Lead, Dundalk Institute of Technology*
[3]*N-TUTORR Stream 1 Co-Lead and ATU lead, Atlantic Technological University*

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About this document

This document is an output of Stream 1 of the National Technological University TransfOrmation for Recovery and Resilience (N-TUTORR) project. N-TUTORR is an innovative collaboration across the technological higher education sector in Ireland. It aims to transform learning, teaching and assessment by focussing on enhancing the student experience and developing the capabilities of all staff, to achieve a sustainable pedagogical and learning environment, informed by the UN Sustainable Development Goals.

This document is a green paper, designed for discussion rather than as a final policy statement, and intended to serve as a foundation for dialogue and collaboration. We welcome and value feedback and suggestions in shaping the evolution of the concepts and ideas presented here.

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iii.   List of Abbreviations

CD-ROM	Compact Disk-Read Only Memory
CLHT	Class lectures, Hybrid Tutorials
CLOT	Class Lectures, Online Tutorials
CLTW	Class Lectures, Tutorials, Web-Enhanced
LMS	Learning Management Software
N-TUTORR	National Technological University TransfOrmation for Recovery and Resilience
OLCT	Online Lectures, in-Class Tutorials
QQI	Quality & Qualifications Ireland
STEM	Science, Technology, Engineering and Mathematics
SWOT	Strengths, Weaknesses, Opportunities, Threats
TU	Technological University

Executive Summary

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1 Executive Summary

Blended learning was originally used in the 1990s to describe a mixture of face-to-face and computer-mediated learning. Since then, related practices and definitions have evolved to widen this to online-mediated learning, and to factor in purposeful curriculum design to enhance the learner experience. A recent definition by Bozkurt and Sharma (2021 p.2) defines blended learning as referring to:

> *"…combining onsite and online learning by blending the strengths of one modality and neutralizing the weaknesses of the other to provide flexibility to learners, instructors, and educational institutions. The flexibility can be afforded to time, space, path, and pace through sequential or parallel designs"*

Although blended learning models had been in practice since the 2000s, the COVID-19 pandemic greatly accelerated the frequency of both practice and research as education institutions worldwide incurred an emergency pivot to online learning (Singh et al., 2021). Often used interchangeably with the term 'hybrid learning', 'blended learning' can be used to refer to both combining various delivery modalities in teaching, and also mixing together different pedagogical techniques.

Consistently, a notable theme in the literature is the ambiguity that exists in defining blended learning and describing the associated benefits on the learner experience. This review seeks to provide an overview of blended learning in the higher education space, to inform relevant decision-makers across the technological university sector in Ireland, as an output of the National Technological University Transformation for Recovery and Resilience (N-TUTORR) programme.

The overarching aim of the N-TUTORR programme is to transform learning, teaching, and assessment by focussing on transforming the student experience and developing the capabilities of all staff to address a sustainable pedagogical and learning environment. The N-TUTORR programme is funded under the National Recovery and Resilience Plan (NRRP), supported by the EU Next Generation Fund. The programme is a partnership between the five technological universities (Atlantic Technological University, Munster Technological University, South East Technological University, Technological University Dublin, and the Technological University of the Shannon), and two Institutes of Technology (Dundalk Institute of Technology and the Institution of Art, Design and Technology), supported by the Technological Higher Educational Association (THEA).

The work described in this green paper sought to provide an overview of the effect of blended learning on student-related outcomes and propose recommendations for an N-TUTORR working group. First, the overall objective and research questions underpinning this work are presented (Section 2). Next, this green paper provides a short overview on the various definitions and models used in association with blended learning (Section 3). The effects of blended learning on the student experience, in particular on academic performance, students' preferences and challenges and benefits are described (Section 4). Finally, the research questions are

discussed according to identified themes in the literature, which then informs the recommendations for the N-TUTORR working group (Section 5).

Finding highlights:

- Blended learning has seen an evolution of definitions, with recent definitions emphasising the need for thoughtful and purposeful curriculum design, and not solely using shifting curriculum designed for in-person instruction into online delivery modalities.
- We propose the following definition: 'Blended learning describes the combination of face-to-face and remote delivery modalities, including online and offline, asynchronous and synchronous, that is carefully and thoughtfully designed to enhance and support learning in a way that maximises the benefits of one modality and mitigates the weaknesses of others, whilst taking individual student needs into consideration'.
- Models associated with blended learning include enriched virtual, flipped learning, rotational hybrid, flex, a la carte, and HyFlex.
- To be considered blended, it has been suggested that there must be between 30-70% of an online component. Whilst this may be useful to compare and contrast different blended learning models, this approach is not employed by QQI.
- Due to vast range of methodologies, theoretical lenses, and contexts, it is difficult to ascertain whether blended learning has an effect on student academic performance. However, the consensus in the literature is that it has little effect, if any.
- Students prefer blended learning models as it offers the best of both worlds: offering the flexibility of online learning whilst neutralising perceived weaknesses.
- Benefits include increased flexibility, personalisation, learning agency, satisfaction, employability and interaction.
- Challenges include requiring more time management skills, negative attitudes from staff, lack of knowledge and skills, lack of technology and infrastructure, and interpersonal issues such as isolation.
- Well-designed learning management systems and effective staff training are identified as key in successful blended implementation.

This green paper does not seek to be a comprehensive overview of the large field of blended learning in higher education. However, it addresses key research questions, such as the definitions and models associated with blended learning, its impact on student academic performance, student preferences, and the challenges and benefits of implementation in higher education. By providing a concise overview, this report may serve as a valuable resource to inform the various deliverables embedded in the N-TUTORR programme, fostering informed decision-making and sustainable pathways to higher education. It may also act as a useful guide for those in the higher education sector looking to deepen their understanding on the student experience on blended learning, and provide a scaffold for developing future policy and practice.

Introduction

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2 Introduction & research questions

Blended learning is often touted as being able to combine the 'best of both worlds' by facilitating the desirable aspects of traditional classroom teaching whilst mitigating various challenges often associated with online and remote learning (Singh et al., 2021). One of the most attractive features of blended learning is the high level of flexibility that it offers to learners (Ashraf et al., 2021). However, the field of blended learning is inherently intricate, posing challenges for instructors, researchers, and policymakers alike. This complexity is exacerbated by the ambiguity inherent in the terminology, with 'blended learning' serving as a broad umbrella term encompassing various delivery modalities and specific learning models such as HyFlex or flipped learning (Bozkurt, 2022). The interchangeability of terms like 'blended learning' and 'Hybrid learning,' coupled with evolving conceptualisations that shift from delivery modality emphasis to pedagogical techniques and curriculum design (McCarthy & Palmer, 2023), further compounds this intricacy.

Although blended learning models had been in practice since the 2000s, the COVID-19 pandemic greatly accelerated the frequency of both practice and research as education institutions worldwide incurred an emergency pivot to online learning (Singh et al., 2021). This led to a peak in research investigating in 2021 due to this emergency shift (Ashraf et al., 2021). This is seen a variety of subsequent papers looking at 'lessons' learnt, as educators and policymakers endeavour to reflect on what worked, and what didn't, to determine how to proceed in a technology-enhanced word (Singh et al., 2020).

Aligned with this context the N-TUTORR programme is a national initiative for the TU sector informed by findings from several national and EU reports including the 'Next Steps for Teaching and Learning' report (National Forum for the Enhancement of Teaching and Learning in Higher Education, 2021), which considers what the Irish HE sector has learnt from the experience of the COVID-19 pandemic. The ultimate aim of the N-TUTORR programme is to transform learning, teaching, and assessment by improving the student experience and developing the capabilities of all staff to address a sustainable pedagogical and learning environment. Work-package 1.1 of Stream 1: 'Sustainable pathways to higher education' focuses on providing opportunities for learners through flexible course provision and support.

This green paper seeks to provide a concise overview of blended learning and the effect on the student experience aiming to contribute valuable insights to various components embedded within the N-TUTORR programme.

This report was underpinned by the following research questions:

RQ1: What are the definitions and models associated with blended learning?

RQ2: What is the effect of blended learning on student academic performance?

RQ3: What are students' preferences and attitudes towards blended learning?

RQ4: What are the challenges and benefits of the implementation of blended learning in higher education?

The associated findings were used to inform recommendations for the N-TUTORR working group.

Blended learning: an umbrella term for mixed-modality learning

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3 Blended learning: an umbrella term for mixed-modality learning

The first research question guiding this literature review was 'What are the definitions and models associated with blended learning?' (RQ1). The concept of 'Blended learning'; combining in-person instruction with other delivery modalities, has been around since the late 1800s, when the first distance-education course via post was introduced (Singh et al., 2021). Since then, the concept and definition of blended learning has evolved over time in tandem with technological advances such as the use of CD-ROMs, computer-facilitated education, and the internet. There have been numerous attempts to define the term 'blended learning' over several decades (Table 1). As noted in the recent guidelines by the Quality and Qualifications Ireland (QQI, 2023), there is no single definition of blended learning in the literature.

Table 1. Common definitions of blended learning cited in the literature.

Source	Definition
McCarthy and Palmer (2023, p.106)	"Blended learning involves the thoughtful and ongoing development of curriculum, maximising the effectiveness of the teacher as a facilitator of knowledge and enabling student learning where, when and how they are best able to receive it"
Quality and Qualifications Ireland (2023)	"A type of education where teaching, learning and assessment occur using a mix of online and on-site learning with the online components taking place synchronously, asynchronously, or in combination"
Bozkurt and Sharma (2021, as cited in Bozkurt, 2023, p.2)	"Blended learning refers to combining onsite and online learning by blending the strengths of one modality and neutralizing the weaknesses of the other to provide flexibility to learners, instructors, and educational institutions. The flexibility can be afforded to time, space, path, and pace through sequential or parallel designs"
(Ashraf et al., 2021, p.1525)	"Blended learning aims to combine face-to-face (F2F) and online settings, resulting in better learning engagement and flexible learning experiences, with rich settings way further the use of a simple online content repository to support the face-to-face classes"
(Vallee et al., 2020, p.2)	"Blended learning is characterized by the combination of traditional face-to-face learning and asynchronous or synchronous e-learning"
Bernard et al., (2014, as cited in Vo, Zhu and Diep, 2017, p. 18)	"Mix of classroom instruction (i.e., face-to-face) and out-of-class online learning where the online work substituted for class time"
Dziuban et al (2004 as cited in Singh et al., 2021, p.141)	"…an instructional method that includes the efficiency and socialization opportunities of the traditional face-to-face classroom with the digitally enhanced learning possibilities of the online model of delivery"
Graham (2006, p.5)	"Blended learning systems combine face-to-face instruction with computer-mediated instruction"
Garrison and Kanuka (2004, p.96)	"…the thoughtful integration of classroom face-to-face learning experiences with online learning experiences"

The typical description of blended learning refers mixing different delivery modalities e.g. online and in-person. This is reflected by the recent definition provided by QQI (2023, Table 1). However, blended learning can also be used to refer to a mixture of pedagogies and didactical strategies, rather than focusing on delivery modality (e.g. Moore & Gilmartin, 2010). This review will only focus on the former.

Most definitions agree that to be considered blended learning, there must be some combination of traditional classroom learning, (i.e. 'face-to-face' learning), and online/off-site learning, whether this is participating in live lectures or meetings using video-conferencing software; watching pre-recorded videos; or completing computer-facilitated instruction such as e-learning modules. Engaging in instructed lectures or coursework[1] in 'real-time' is often referred to as 'synchronous learning', whereas 'asynchronous learning' is when students engage with coursework and instruction at a time which best suits them (Johnson et al., 2022) In addition, asynchronous and synchronous learning have been described as blended learning models themselves (e.g. Bower et al., 2015 *as cited in* Hrastinski, 2019), however this reports instead views them as terms which describe the orientation of student engagement within blended learning models.

According to Hrastinski (2019), the most commonly cited definitions of blended learning, are by Garrison & Kanuka (2004) and Graham (2006), which focus on the integration of face-to-face instruction with online or computer-mediated instruction (Table 1). More recent definitions have emphasized the importance of thoughtful and purposeful design of curriculum and embedded pedagogy (Table 1), such as that by McCarthy & Palmer (2023). Blended learning is often used interchangeably with the term 'Hybrid learning' (Hrastinski, 2019). Blended learning has dominated usage, although Hybrid has been in more frequent use since with 2020/21, presumably as a result of the COVID-19 pandemic (Figure 1). Due to the much higher use of the term blended learning, that is what will be used throughout this report.

A persistent issue in the literature is that the term Blended Learning can be used quite ambiguously, referring to any and all learning modalities that are neither solely in-person or online learning (Müller & Mildenberger, 2021). Moreover, blended learning can be applied at different levels: activity, course, programme, and institution (Graham, 2006). Furthermore, Ashraf et al. (2021) demonstrated in a systematic review of review studies[2] that more than half of the studies reviewed (58%, *n* = 33) did not mention any specific model in their investigation of blended learning. In addition to being used as an umbrella term, it has also been used in the literature to refer to both multiple different blended models, and to specific online learning pedagogies (Bozkurt, 2022). Moreover, there is also large variety in the ratio by which the online and offline modalities are blended; this could be mostly live in-person, 50% online and 50% offline/live interactions, or mostly online (Boelens et al., 2017). Allen & Seaman (2009, *as cited in* Vo et al., 2017) have recommended that to be considered blended learning, the online component should range between 30-70% of the coursework (Figure 2). However, it should be noted here that this is only one method of defining blended learning, and whilst it is used in this green paper to compare and contrast models, it is not an approach employed by QQI (2023).

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[1] *This report makes multiple references to 'coursework'. In Higher Education in Ireland, 'coursework' is often used to refer to continuous assessment (e.g. Heywood, 2000). However, in this report 'coursework' is used to denote the various learning activities students complete as part of their degree programme.*
[2.] *Ashraf et al (2021) carried out a systematic review of review studies. Selection criteria included systematic reviews, literature reviews, meta-analysis studies, and excluded empirical, descriptive or conceptual papers.*

A   **Google trends 2013-2023**

B   **Web of Science hits 2013-2023**
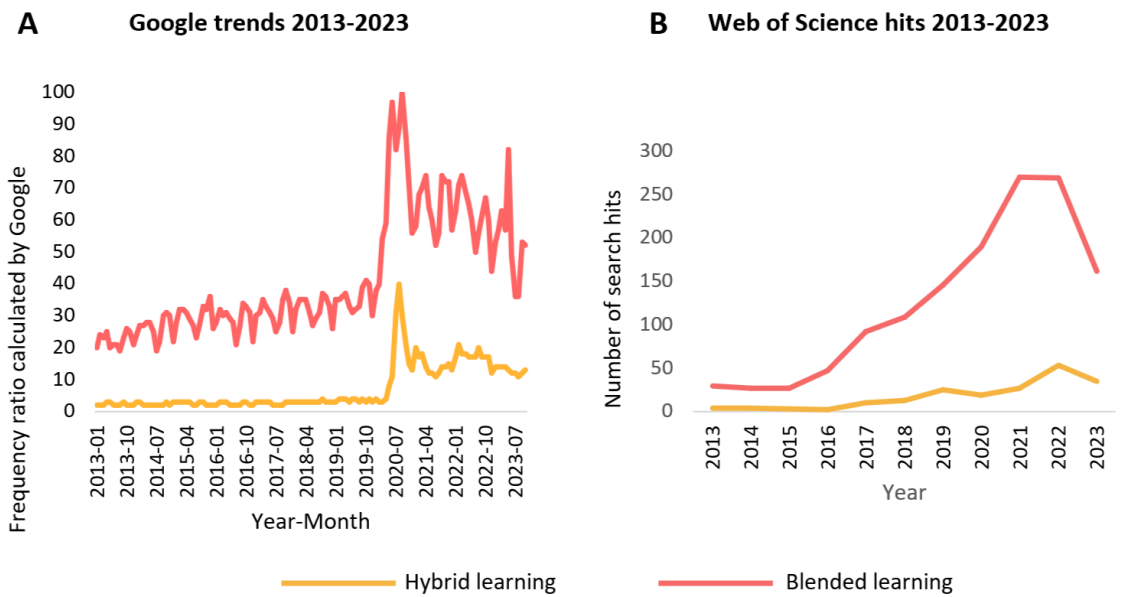
Figure 1. Usage frequency of terms blended/hybrid learning 2013-2023. **A.** Frequency ratio by year of 'Hybrid learning' and 'Blended learning' according to Google trends 2013-2023. Google calculate a frequency ratio 0-100 dependent on overall search numbers per region. **B.** Number of search hits for the terms 'Hybrid learning'/'Blended learning' AND 'higher education' 2013-2023 in journal database Web of Science.

Figure 2. Level of student choice and online learning in delivery modalities.

A list of learning models commonly associated with blended learning are as follows (Figure 2):

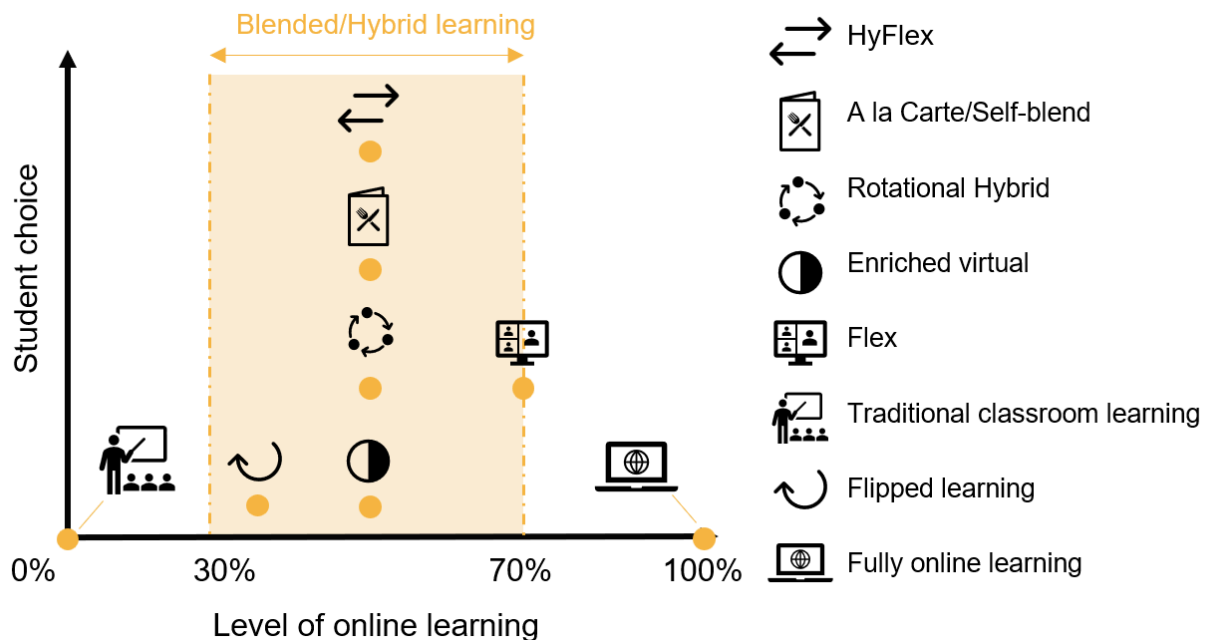- **Traditional classroom or 'face-to-face':** Teachers and students are in the same place at the same time; the teacher controls and regulates the flow of information and knowledge, and the students are anticipated to continue increasing their knowledge of a subject outside of the class (Istijanto, 2023)
- **Enriched Virtual:** Students are mostly engaging in course onsite face-to-face, but are also required to complete aspects of their coursework using online tools (Singh et al., 2021).
- **Flipped learning:** Students engage with preparatory material pre-class online, attend class live in-person, and then optionally made engage with more online material online (Ashraf et al., 2021).
- **Rotational Hybrid/Blended:** Students rotate between different delivery modalities, one of which must be online (Hrastinski, 2019). The proportion of online and offline modalities are decided by the lecturers (Singh et al., 2021).
- **Flex:** Content is primarily online and students can choose from a range of other provided supports, such as small-group instruction or one-on-one meetings with staff (Hrastinski, 2019). This is highly individualized to each student (Singh et al., 2021): some students may choose to engage fully online in this way.
- **A la Carte/Self-blend:** Students have the choice of completing their course-work either fully online or offsite (Singh et al., 2021).
- **HyFlex:** Students have the choice of completing their course-work from three modalities: face-to-face, online synchronous or offline asynchronous (Beatty, 2019). Students can choose *ad-hoc* how they engage with each aspect of their course-work as best suits their needs i.e. they do not need to decide in advance how they will engage over the entire course.
- **Fully online learning:** Students complete all of their coursework online synchronously or asynchronously.

There is a range in the level of student choice enabled by these different delivery modalities (Figure 2). Some modalities, such as fully online, traditional classroom learning, rotational hybrid and enriched virtual, are dictated by the lecturer. Students are required to engage with course material in the prescribed manner. In a systematic review of 20 studies investigating blended learning, Boelens et al. (2017) noted that in most of the selected studies, the delivery modality was decided by the instructor. However, other modalities such as Flex, A la Carte/Self-Blend, and HyFlex, are more flexible and allow greater individualisation and flexibility to students (Figure 1). HyFlex provides the greatest flexibility and level of customisation to students; students can choose ad-hoc on a case-by-case basis whether they want to engage in-person, online synchronously or offline asynchronously. Due to this high level of customisation, it is possible that a HyFlex course does not feature any online-learning; which would occur if all students always chose to engage face-to-to face only and vice versa with online modalities.

The effect of blended learning on the student experience

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4 The effect of blended learning on the student experience

Research into blended learning has been steadily increasing over the last few decades, with a recent peak in 2021 (Ashraf et al., 2021). Studies have largely focused on students in higher education (Ashraf et al., 2021). Common foci related to the effect of blended learning on the student experience include the effect academic performance (Section 4.1), student preferences (Section 4.2), and challenges and benefits of implementation (Section 4.3).

4.1 The effect of blended learning on student academic performance

Investigating the effect of blended learning on student academic performance is the most commonly studied outcome (Ashraf et al., 2021). An analysis of meta-analytical studies published between 2005-2020 reported that blended learning models had some positive effect on student achievement, with effect sizes ranging from small to large (Owston et al., 2020; see Table 2 in the Appendix for effect sizes). In other words, on average, students that engaged in their coursework via blended learning techniques obtained higher scores in their exams compared to students that attended solely face-to-face.

However, Müller & Mildenberger (2021) caution that it is not advisable to make generalisable conclusions from such meta-analyses for several reasons: various evaluation measurements of student performance were used; including self-cited reports and different examination formats; the studies span a wide time range; starting from the 1990s, and most importantly, due to the ambiguous interpretations of blended learning, these meta-analyses pool together a wide range of blended learning contexts, many of which are poorly defined.

In an attempt to control for such poorly defined blended learning contexts, Müller & Mildenberger, (2021) performed a meta-analysis on studies (*N* = 21 studies, *N* = 2505 participants) which featured blended learning modalities where there was a reduction between 30-70% of classroom time compared to control groups. This blended learning bracket of 30-70% aligns with the recommendation given by Allen & Seaman (2009, *as cited in* Vo et al., 2017). Examined studies were published between 2008-2019 and included a range of subjects in higher education. Results indicated a small, but not statistically significant, positive effect of blended learning on student performance (Müller & Mildenberger, 2021).

Looking at recent empirical research, Kortemeyer et al. (2023) investigated whether specific delivery modalities (online synchronous, watching pre-recorded videos or attending live lectures face-to-face) affected grade performance. They collected over 12,000 student surveys in the University of Zurich, examining students' delivery modality usage, obtained grades, and student perceptions. Results from an elegant cluster analysis indicated that the choice of delivery modality did not affect student grade performance. Similar results have been found for the blended learning modality HyFlex, arguably the blended learning modality that offers students the most choice. However, research on HyFlex faces the same challenges as blended learning; the context is often ill-defined and there is a scarcity of studies that investigate a model of

HyFlex that aligns with the standard Beatty (2019) definition (Carroll et al., 2023). However, Carroll et al. (2023) noted in a small systematic review (n = 6 studies) that HyFlex had no effect on student performance when compared to traditional classroom learning.

Looking at the Irish higher education sector, existing empirical research on the effect of blended learning on student academic performance is scarce and rooted within the emergency pivot to online learning during the COVID-19 pandemic. Finnegan (2021) explored how this sudden pivot from face-to-face teaching to online learning affected the achievement of learning outcomes in a final year undergraduate module called 'International Economic Policy'. Using a mixed methods survey (N = 61 participants), results indicated that online learning grades were slightly worse than what was achieved by the previous cohort that engaged face-to-face (Finnegan, 2021). However, Finnegan (2021) noted that both cohorts had large proportions of grades greater than 70%. Moreover, nearly half of students had issues with laptop access and/or reliable internet connection, which may have acted as a confounding variable in the study.

In short, the consensus of the most recently available systematic reviews and selected empirical studies indicate that blended learning has little effect, if any, on student academic performance. Interestingly, in a study examining the effect of different factors on students' overall attitudes towards hybrid learning, (Baker & Marquis, 2020) reported that the expectation that an online learning environment will improve grade performance is not positively associated with students' overall attitudes towards hybrid learning. In other words, the potential effect of hybrid learning on their grade performance is not why students preferred hybrid learning over other delivery modalities. To explore this, an overview of research investigating student preferences regarding delivery modalities is presented in the next section.

4.2 Student preferences regarding delivery modalities

One of the main benefits of blended or hybrid learning is the increased level of flexibility that it offers students (Howell, 2022). In particular, with the delivery models that provide students more choice (e.g. Hyflex, rotational or A-La-Carte) students have more flexibility to engage with coursework in ways that best suit their needs.

Whilst there are numerous meta-analysis studies looking at the effect of blended learning on student-related outcomes, according to Yu et al. (2022, p.08), few have synthesised the research investigating student perceptions towards blended learning. To address this gap, Yu et al. (2022) examined 30 peer-reviewed journal articles that investigated student perceptions. Results indicated that when compared to traditional learning, students hold statistically significantly more positive attitudes towards blended learning modalities, possibly because blended learning "…*can offset the disadvantages of online learning and traditional face-to-face learning"* (Yu et al., 2022, p.8). This aligns with what was found by Istijanto (2023): students who preferred online teaching did so because of the learning effectiveness afforded (e.g. pre-recorded videos and no distractions), the flexibility and efficiency, that it promoted 'green' behaviour, and it facilitated them to learn new technologies. Moreover, students felt

that hybrid learning overcame many of the challenges faced by online-only or face-to-face only learning.

However, when asked to make a choice, students often purport to prefer face-to-face modalities over online synchronous and asynchronous methods (Young and Bruce, 2022; Carroll et al., 2024; Weldy, 2018; Yang, 2021; Unger, 2022). For example, in an investigation of student and faculty attitudes towards hybrid learning, (Young & Bruce, 2020) surveyed 1,206 students and 62 instructors in a university in the U.S. Survey findings indicated that students prefer face-to-face modalities over zoom webinars (i.e. online synchronous), offline asynchronous and hybrid.

Exploring what mediates these preferences requires a more detailed investigation into students' likes and dislikes in blended learning settings. Through a mixed-methods survey (N = 191) administered to students in a hybrid writing course in a university in South Florida, Unger et al. (2022) identified several themes related to students' likes and dislikes. Regarding in-class assignments, student likes included 'learning from peers' (65%), 'working in groups' (52%) and 'live discussion' (49%). Students' dislikes for out-of-class assignments included 'difficult to manage time' (32%), and 'no instant feedback from the professor' (25%). In addition, students who rated the out-of-class assignments lower than in-class assignments were statistically more likely to dislike 'difficulty meeting team' and 'writing instead of speaking', indicating that these were particularly important factors for those students (Unger et al., 2022). These findings suggest that one of the reasons students prefer face-to-face teaching, is that it facilitates more interaction and engagement. Indeed, Harris et al. (2021) found that students feel that live lectures are more interactive and more engaging than pre-recorded lectures. Moreover, Ma and Lee (2020) reported that blended learning is slightly more effective at stimulating students' interest and curiosity during lessons, but not more so than face-to-face lectures.

Typically, experimental studies in blended learning tend to compare traditional classroom learning with other delivery modalities, such as online-only or face-to-face. However, Owston et al. (2019) took a slightly different approach by comparing four different blended learning models: Blend CLTW (Class Lectures, Tutorials, Web-enhanced), Blend CLOT (Class lectures, Online Tutorials), Blend OLCT (Online Lectures, in-Class Tutorials) and Blend CLHT (Class Lectures, Hybrid Tutorials). After the module, participants (N = 2081; CLTW = 261, CLOT = 691, OLCT = 696, CLHT = 160) completed a questionnaire examining course design, interaction, learning and satisfaction. Findings indicated that courses with the combination of Online Lectures and in-Class Tutorials (OLCT) were rated significantly higher than the other models for design and satisfaction. Owston et al. (2019) suggest that may be because it was the blended learning modality that facilitated most of the positive aspects of blended learning, along with the highest amount of interaction with staff and peers. Following this line of thought, students rated CLTW (Class Lectures, Tutorials, Web-enhanced), as the model with the most interaction. Blend CLHT (Class Lectures, Hybrid Tutorials) was rated the worst across the four factors.

Similarly, Harris et al. (2021) reported that when asked to which delivery modality students prefer (pre-recorded lectures with live Q&A, entirely live lectures, pre-recorded only, or no preference), most students (64.9%) prefer pre-recorded lecturers followed by a live Q&A with the lecturer. This option offers the 'best of both worlds' from synchronous and asynchronous learning; students can watch the pre-recorded lectures in a manner that best suits their time and learning needs, and still gain instant feedback and engagement with the lecturer in the follow-up Q&A. Indeed, it has been found that pre-recorded videos allow students to watch lectures according to their own schedule, and it enables them to set pace of their own learning by speeding up or slowing down the videos as necessary (Ma and Lee, 2020). Moreover, having a scheduled live Q&A provides some structure, as students know that that they need to watch the pre-recorded videos and prepare for the Q&A in advance. This is especially helpful for students that may struggle with self-regulation, which is necessary for student success in blended learning settings (Weldy, 2018; Sun & Rueda, 2012, as cited in Yu et al., 2022. Rasheed et al., 2020).

In summary, students hold positive attitudes towards blended learning environments due to the flexibility it affords, yet find pedagogical techniques most often employed in traditional classrooms settings to be more effective for learning and engagement. Deeper explorations of students' preferences in blended learning indicate that students prefer carefully designed environments where the advantages of different embedded delivery models (i.e. face-to-face, online synchronous and offline asynchronous) are maximised to mitigate inherent weaknesses.

4.3   Challenges and benefits of blended learning

In recent years, there has been several reviews on blended and online learning which include a discussion on the benefits and challenges of implementing blended learning in higher education (Ashraf et al., 2021; Boelens et al., 2017; Bozkurt, 2022; Raes et al., 2020; Rasheed et al., 2020; Singh et al., 2021; Van Laer & Elen, 2017). A summary of the review objectives and number of comprising studies are outlined in Table 3 in the Appendix.

Although Van Laer & Elen (2017) focused specifically on self-regulation and not general challenges and benefits, they are included here due to the integral role self-regulation plays in the success of blended learning models (Ashraf et al., 2021). Rather than describing each review in isolation, this report will instead highlight themes identified across them.

4.3.1 Benefits of blended learning models

There are numerous beneficial themes associated with effective blended learning: increased flexibility, increased satisfaction, increased interaction, enhanced employability, increased personalisation and increased learning agency, many of which focus on the positive impact on students (Figure 3). The term 'effective' blended learning used here refers to models of blended learning that have been empirically demonstrated to enhance student-related outcomes.
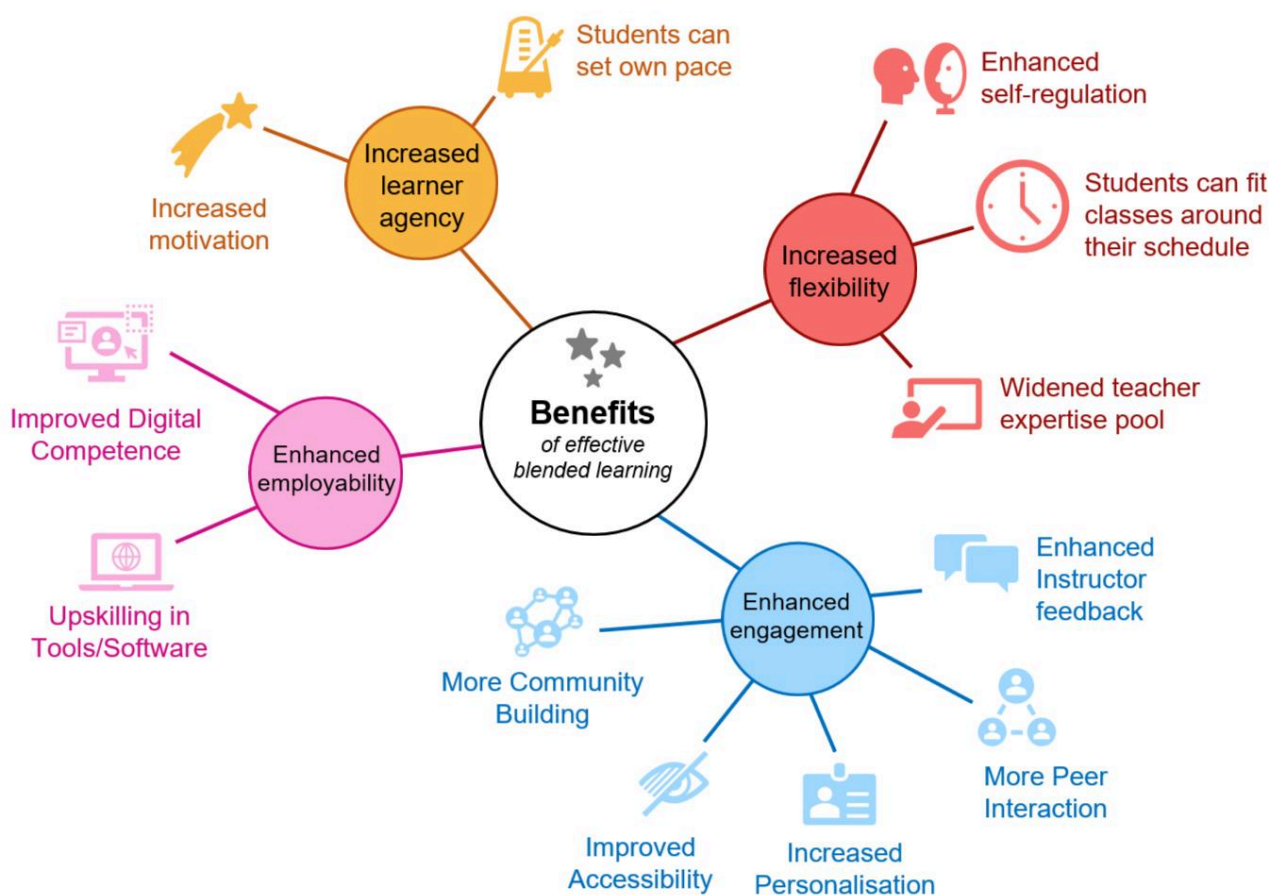

Figure 3. Benefits of Effect Blended Learning for Students. Informed by findings of this green paper.

Increased flexibility: Increased flexibility is the benefit that is mostly commonly associated with effective blended learning (Raes et al., 2020). The distinction is made here with effective blended learning, as it recognises that blended learning that is implemented poorly may lead to undesirable effects. For example, whilst students engaging in successful blended learning models often report advantages such as being able to fit coursework around their schedule and enhanced self-regulation; the flipside is also true (Singh et al., 2021; Van Laer & Elen, 2017). Blended learning models which feature asynchronous learning techniques require students to have a high level of self-regulation (Raes et al., 2020; Rasheed et al., 2020); this can offer great level of flexibility to competent students, but can be overwhelming to students who have not been adequately prepared (Ma & Lee, 2021).

For example, Young and Bruce (2021) reported that graduate students were significantly more satisfied using online and hybrid models compared to undergraduate students, which may be because graduate students may have more experience of this format, and appreciate more the flexibility it offers to schedule coursework around work or family obligations. Blended models also allow for the option of bringing in external experts as teachers, which may widen the range of expertise available to students and improve teaching quality (Raes et al., 2020).

Enhanced learner agency: This increased flexibility and level of self-regulation is also linked with increased learner agency (Rasheed et al., 2020; Singh et al., 2021; Van Laer & Elen, 2017), especially with asynchronous materials such as pre-recorded lectures. Students are able to work at a pace that suits their individual learning needs by controlling the play-back speed of the videos (Singh et al., 2021; Van Laer & Elen, 2017). Students also tend to take more notes when watching pre-recorded videos, compared to synchronous lectures (Harris et al., 2021).

Enhanced employability: Although blended learning models may require an initial investment in training and learning how to use new software and/or technologies, developing the digital competences in these tools can enhance students' future employability (Figure 3). In a survey of 132 undergraduate business students during the emergency switch to online learning as a result of the COVID-19 pandemic, some students appreciated that they had learnt new digital skills and how to use previously unfamiliar video-conference software (Yang, 2021). Raes et al. (2020) also note that engaging in hybrid synchronous learning setting can help to prepare students for roles in technology-enhanced careers.

Enhanced engagement: Blended learning models that utilise well-designed virtual learning environments and learning management systems can increase interaction (Figure 2). This includes increased instructor feedback, more interaction between peers using social media platforms or discussion boards, and a heightening sense of belonging or community (Boelens et al., 2017; Bozkurt, 2022). This is also linked to facilitating personalisation: which can include tailoring content and designs to individual learner needs (Raes et al., 2020) e.g., providing accessibility accommodations for students with disabilities (Singh et al., 2021), or ensuring that there are name-specific references in content to encourage learner ownership (Van Laer & Elen, 2017).

These numerous benefits reflect students' positive attitudes towards blended learning models (Ashraf et al., 2021) and can promote student retention (Raes et al., 2020). Students who participated in blended models have reported increased course satisfaction and engagement (Ashraf et al., 2021).

4.3.2 Challenges of blended learning models

Whilst the benefits of blended learning can be indicative of a well-designed system, the challenges of blended learning may be described as reflecting poorly implemented aspects, in particularly in relation to online elements. This report identified four themes in relation to common implementation challenges for blended learning: time management, lack of knowledge and skills, lack of technology or infrastructure, and interpersonal issues (Figure 4). It is notable that in systematic review of systematic reviews, Ashraf et al. (2021) noted that out of 57 review studies, 47 studies did not mention any challenges at all, which may indicate a reporting bias.
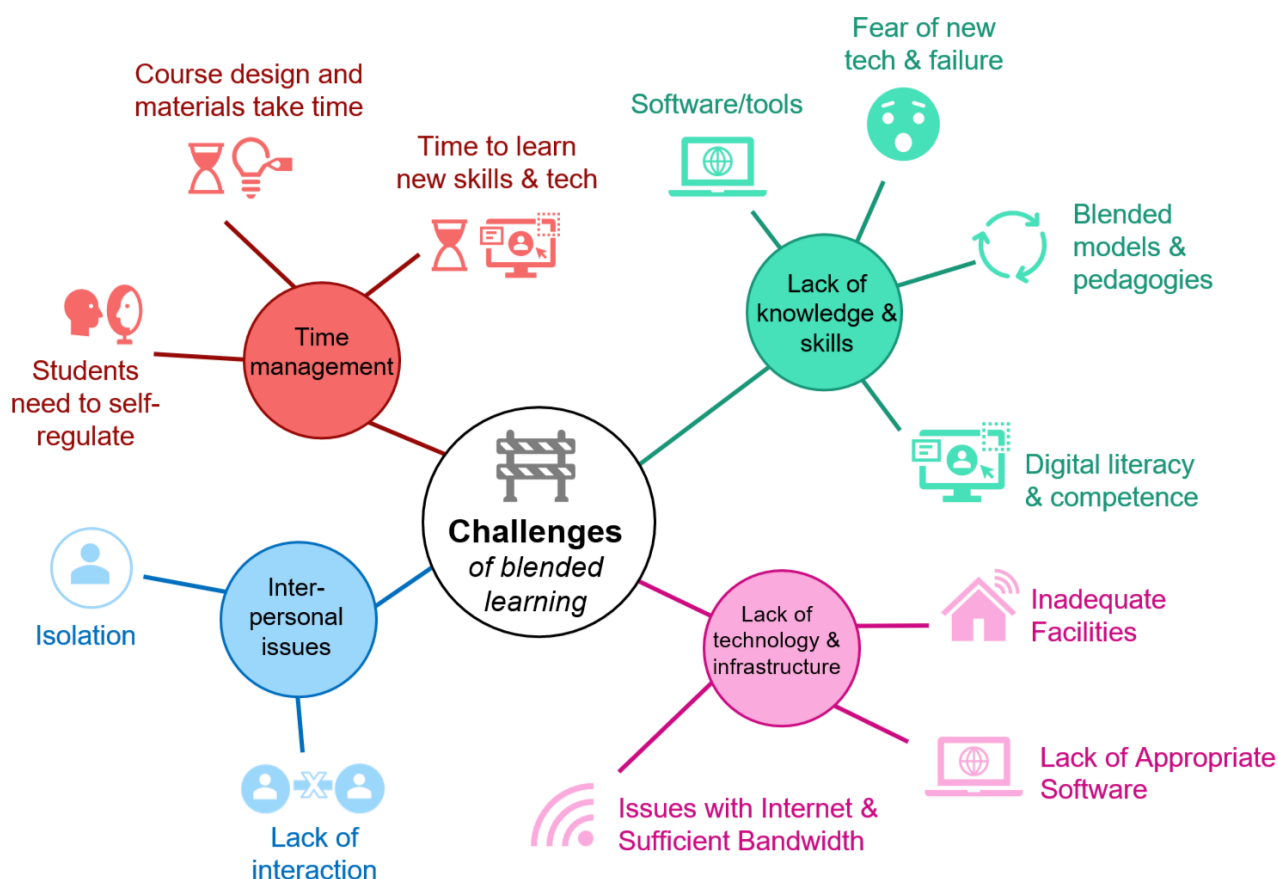

Figure 4. Challenges of Blended Learning. Informed by findings of this green paper.

Lack of technology/infrastructure: Lack of technology and/or infrastructure is a commonly cited challenge in blended learning models. This includes issues with student and staff access to internet, lack of a suitable bandwidth or internet server to deal with high traffic, or insufficient technology or software (Ashraf et al., 2021; Rasheed et al., 2020; Singh et al., 2021). There may also be cases where students may have access to internet or technology, but do not have the adequate space to engage in focused learning from home i.e., a quiet room with a suitable workspace. Lack of internet access is a particular problem in rural areas (Ashraf et al., 2021), and although the emergency pivot to online learning during COVID-19 initiated many improvements, in Ireland there still exists a digital access divide (Accenture, 2020).

There may also be increased cost for students where they need to purchase suitable laptops and /or software (Singh et al., 2021). In addition, effective learner management software is particularly important in the successful implementation of blended learning settings. Diep et al. (2017) found that the LMS only had a significant effect on student course satisfaction and goal achievement when the online element was at 50%; but had no effect when the online element was at 25%. This suggests that student satisfaction in blended learning settings may be at least partly dependent on an effective learning management system.

Lack of knowledge/skills: Lack of technology or software is closely associated with a lack of knowledge and skills, in particular relating to digital competency and literacy (Rasheed et al., 2020; Singh et al., 2021). Both students and staff require suitable training in how to use embedded tools and software to successfully navigate a blended delivery environment, including effective learning management systems. As aforementioned, addressing this challenge by facilitating such training may lead to enhanced employability, as students learn skills which have become necessary in a working world driven by the recent technological revolution. In addition, lack of knowledge or skills in facilitating blended learning models is also a considerable challenge (Ashraf et al., 2021). This is exacerbated by the ambiguous conceptualisation of blended learning. This lack of skills or knowledge can also be associated with negative attitudes including fear of failure and of unknown technologies can also be an obstacle for instructors, resulting in an unwillingness to engage (Singh et al., 2021).

Interpersonal issues: Interpersonal issues associated with blended learning models include lack of humanized learning environment, lack of community or sense of belonging, students feeling isolated, lack of peer and instructor interaction (Ashraf et al., 2021; Boelens et al., 2017; Raes et al., 2020; Singh et al., 2021) (Figure 4). Indeed, in a systematic review of 42 studies investigating students' preferences in online course design and delivery, Konstantinidou & Nisiforou (2022) identified that interaction is an essential component of successful online learning. This includes assessment interaction, feedback, instructor support, and interaction with classmates to instil a sense of community and belonging. This corroborated earlier findings reported by Van Laer & Elen (2017).

Although the Irish literature around this is very limited, Buckley et al. (2021, p.401) noted that most students and staff in Dublin City University reported to experiencing a "strong feeling of disconnect' and reduced interaction with others during the emergency pivot from in-person teaching to online learning during COVID-19. One quote from a staff member emphasised the importance of purposeful planning in blended learning, which was not necessarily achieved during this emergency shift:

> *"Perhaps that is partly due to the fact that it was a sudden, emergency transition…perhaps if planning an online module/programme from the outset, I might feel differently"* (Buckley et al., 2021, p.402).

There is also a risk in blended learning environments that students in different learning groups (e.g. in-person vs. remote) may receive different learning experiences (Raes et al., 2020). Students engaging synchronously online can feel excluded from the onsite face-to-face class, especially when technical issues arise. In parallel, onsite students may feel neglected when instructors need to sort out technical issues to regain connectivity with online students (Raes et al., 2020). Instructors have also noted that remote students can often be seen to be engaging passively, however as noted by Raes et al. (2020), this is often a by-product of classes that employ 'monologue-based teaching strategies', which are not suitable for hybrid learning settings.

Time management: Preparing materials and resources for a blended learning course can take up much more of staff time (Ashraf et al., 2021). As aforementioned, student success in blended learning settings also requires a high level of self-regulation and discipline (Raes et al., 2020; Rasheed et al., 2020). For example, when watching pre-recorded videos, students are more likely to engage in other tasks at the same time, which increases the risk of being distracted (Harris et al., 2021). In addition, both staff and students may need to be allocated time to allow for sufficient training and familiarisation of digital tools and settings.

Most of these challenges; lack of technologies, tools, knowledge and skills, are specifically related to the online portion of blended learning. Many of these challenges may be mitigated by well-designed virtual learning environments and settings specifically designed for blended learning. It's for this reason that blended learning is often described as the 'best of both worlds', mitigating many of the challenges of online learning with the perceived superior experience of in-person engagement (Singh et al., 2021).

Discussion and Recommendations

5

5 Discussion and Recommendations

5.1.1 Discussion of research questions

This literature review aimed to provide an overview into recent research, trends and concepts in blended learning in higher education to inform practical recommendations for the N-TUTORR working group. In this section, the findings associated with underpinning research questions will be discussed. The emergent recommendations for the N-TUTORR working group are in Section 5.1.2.

The first research question was 'What are the definitions and models associated with blended learning?' (RQ1). This review highlighted the ambiguous manner by which blended learning is being used in both practice, policy and research. Often used interchangeably with the term hybrid learning, blended learning typically refers to a mixture of delivery modalities, namely between online and in-person methods. Recent definitions have emphasised the importance of purposive design, and that to be considered blended the online facet should be between 30-70% (Allen & Seaman, 2009 *as cited in* Vo et al., 2017). Described models associated with blended learning include enriched virtual, flipped learning, rotational hybrid, flex, a la carte/self-blend and HyFlex, with Hyflex being the model which offers students the highest level of individualisation and flexibility. Despite this range of specific models, most research papers investigating blended learning do not specify the featured blend, which contributes towards methodological, conceptual and practical ambiguity.

A combination of two recent definitions, by Bozkurt & Sharma (2021) and McCarthy and Palmer (2023) may encompass the meaningful and intentional use of mixed delivery modalities, and emphasise the importance of student-centred flexibility. With this in mind, this report proposes the following definition of blended learning from the N-TUTORR working group:

> *'Blended learning describes the combination of face-to-face and remote delivery modalities, including online and offline, asynchronous and synchronous, that is carefully and thoughtfully designed to enhance and support learning in a way that maximises the benefits of one modality and mitigates the weaknesses of others, whilst taking individual student needs into consideration'*

The first part of the definition acknowledges the "big bucket" approach of combining learning modalities recommended by QQI (2023, p.6), whilst the second part emphasises the importance of thoughtful design. Furthermore, in describing blended learning environments, either in policy, practice or research, care should be taken to specify the model, including the mixture of online and offline components and the degree of flexibility held by students.

The second research question asked; 'What is the effect of blended learning on student academic performance?' (RQ2). There have been several systematic review and meta-analysis studies in recent years investigating this question. However, it can be difficult to get a synthesised answer on this question, as studies use a vast range of definitions for blended learning, research methodologies and ways of

measuring student academic performance. Taking this into consideration, it seems is that blended learning has little effect on student academic performance, if any. It is difficult to discern whether demonstrated improvements of blended learning on student academic performance is specifically due to the blended learning aspects (e.g. different modalities), and not due to careful consideration of pedagogy. There is a lack of controlled experimental designs examining the specific variables mediating possible increases or enhancements of student learning. Future work implementing blended learning design in learning should consider integrating an evaluation strategy to examine whether the modality itself has any impact on student learning. It is difficult to know whether it's due to the delivery modality, or mediating factors such as increased flexibility or pedagogical considerations.

The third research question asked: 'What are students' preferences and attitudes towards blended learning?' (RQ3). Findings emphasise that students highly value the level of flexibility that can be afforded in blended learning models. There have been several studies comparing student attitudes and preferences in f2f versus blended learning modalities. When choosing between online only, face-to-face only and blended learning modalities, students seem to prefer the blended learning models as they offer the 'best of best worlds'; taking advantage of the flexibility afford by blended learning whilst neutralizing the weaknesses. However, it could be argued that the perceived weaknesses of blended learning e.g. interaction or feedback from instructors, are not necessarily due to an inherent weakness, but are in fact the cause of poorly implemented blended learning. There are various ways that interaction can be boosted in well-designed blended systems. For example, Boelens et al. (2017) suggests having an introductory face to face meeting at the beginning of a course, and taking advantage of features in online learning environments to facilitate discussion and engagement between students and also with instructors; using social network platforms, and chat and polling.

Several scholars in the field have emphasised the importance of purposeful design of curriculum and assessment for blended learning contexts (Bozkurt, 2022; Konstantinidou & Nisiforou, 2022; McCarthy & Palmer, 2023; Singh et al., 2021). As aptly noted by Singh et al. (2021, p. 154):

> *"…well-thought-out online education is a complex process, in order to create an engaging learning environment and to provoke student teachers' engagement and interaction during the class, educators need to carefully plan, design instructional strategies, and incorporate elements of online educational pedagogies."*

Whilst blended learning modalities can offer a greater range of flexibility, students with low levels of self-regulation may struggle, especially if they have not been prepared. Laer and Ellen (2021) have identified that scaffolding students; providing specific changes on environments to help them accomplish their given tasks, is a key component of successful blended learning environments.

The fourth and final research questions asked; 'What are the challenges and benefits of the implementation of blended learning in higher education?' (RQ4).
Four beneficial themes associated with implementing blended learning in higher education have been identified in this review: increased learner agency, increased flexibility, enhanced employability and enhanced engagement. This review also identified four challenging themes associated with blended learning: time management, negative attitudes of staff, lack of knowledge and skills, lack of technology and infrastructure, and interpersonal issues. It should be noted that these identified benefits that are associated with effective and successful implementation of blended learning, and challenges are specifically related to poor management of the online portion of online learning. This highlights the fact that blended learning is often seen as the modality which brings the 'best of both worlds'; facilitating the flexibility of online and asynchronous learning with the interaction and instruction associated with in-person learning. Moreover, the findings of this short narrative review emphasised that effective training of instructors and adequate provisions of technology and software are instrumental to the success of blended learning models (Bozkurt, 2022).

5.1.2 Recommendations for N-TUTORR working group
Drawing from the findings and discussion of the research questions in this review, the following recommendations are made:

- Consider incorporating the proposed definition of blended learning informed by this report, and implement consistently across the TU sector.
- Disseminate this green paper amongst policy-makers and practitioners in the TU sector to raise awareness of the concept of blended learning, and standardize definitions and understanding of various terms.
- In describing blended learning environments in policy, practice, or research, specify the delivery modality in question, including the specific mixture of online and offline components.
- Consider performing formative and summative evaluation of blended learning systems in place at N-TUTORR institutions and disseminating findings in a peer-reviewed journal suited to research in higher education.
- In the dissemination of any blended learning systems associated with N-TUTORR, consider providing a rich description of the modalities, pedagogies, models and context, as such detail is currently lacking in the literature.
- Conduct a needs analysis amongst N-TUTORR partner institutions to determine whether students may benefit from offering more blended learning modalities.

- Several themes related to challenges in implementing blended learning in higher education were identified in the literature. Consider surveying staff and students at N-TUTORR institutions to determine whether perceived challenges align with these themes. Include subject matter experts in policy and practice at teaching and learning at higher education in the sampling.
- Evaluate whether current learning management systems in use at N-TUTORR institutions have the necessary functionality to carry out enhanced interaction in blended learning models, and consider delegating funding to address any potential gaps if necessary.
- Consider performing skills needs analysis of staff across N-TUTORR institutions to identify whether staff require additional training in digital education technologies, software and/or pedagogies associated with blended learning, and consider delegating fundings and resources to address any identified needs.
- To raise awareness on the different models of blended learning that exists, and the various reported benefits and challenges, design a self-directed learning short course that would award students and staff a digital badge.

This green paper was not written with the intention of being a comprehensive guide to blended learning in higher education. Instead, it was written to act as an introductory guide and to open dialogue concerning blended learning policies and practices across the TU/IoT sector.

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6

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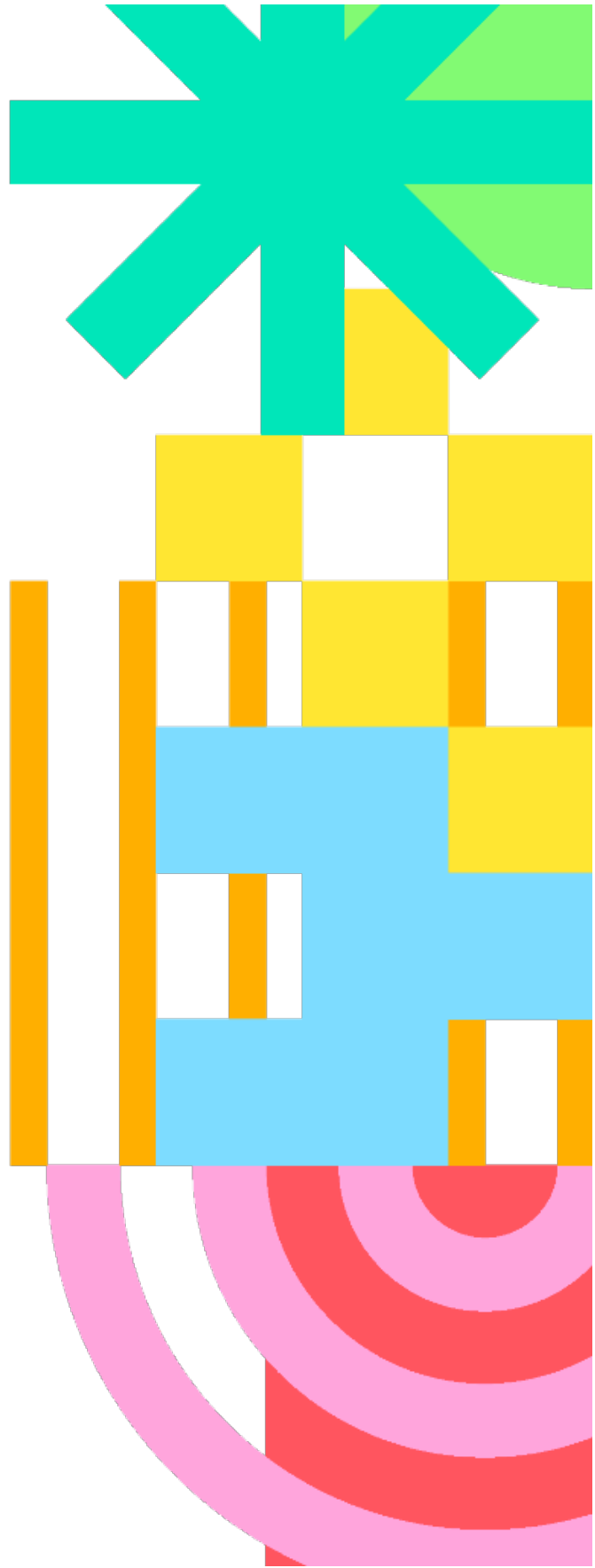
Appendix

7

7   Appendix

Table 2. Meta-analysis effect sizes of BL effect on academic achievement. BL = Blended Learning. Adapted from Owston et al. (2020) with the addition of results from Yu et al. (2022) and Vallée et al. (2020). F2f= Face to Face/traditional classroom learning. Hedges g is a statistical measure of effect size that gives an indication of how great a difference is between group means. Conventionally, values greater than 0.2, 0.5 and 0.8 indicate small, medium and large effect sizes, respectively.
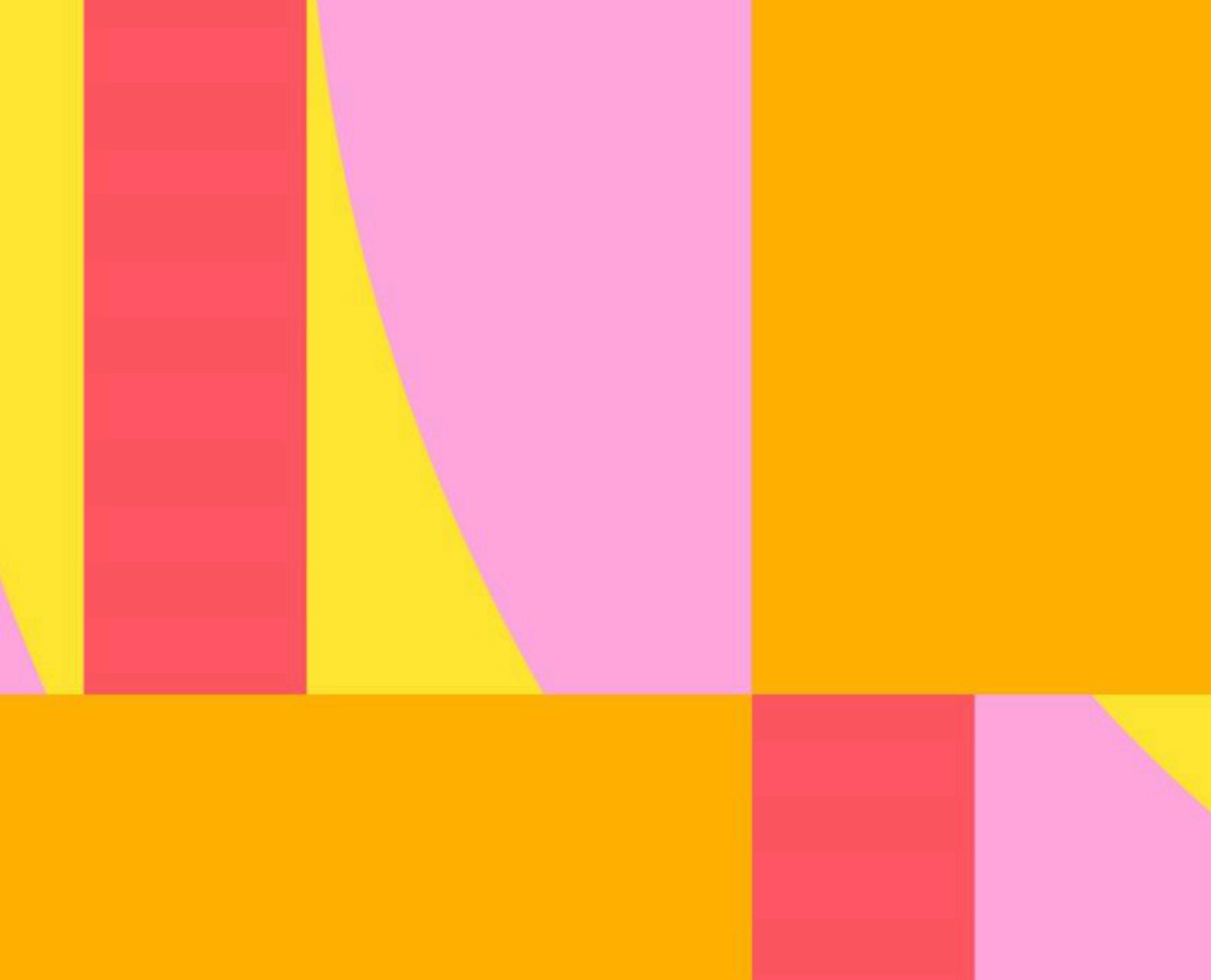
Study	Effect size (Hedges g^+ or as indicated)	No. of effect sizes included in study (k)	Comparison of models and measures
Yu et al. (2022)	.52*	74	Various blended vs traditional
Vallée et al. (2020)	.41	68	Blended vs f2f
Cirak Kurt et al. (2018)	1.04*	32	Blended vs f2f
Vo et al., (2017)	.39	51	Blended to f2f; STEM vs non-STEM
Spanjers et al. (2015)	.34	30	Blended f2f face-to-face with objective performance measures
Bernard et al (2014)	.33	117	Blended vs f2f
Means et al. (2013)	.35	50	blended vs f2f
Zhao (2005)	.49*	51	F2f vs 60-80% online

Cohen's d (considered equivalent to Hedges g+ for samples k > 20)

Table 3. Literature reviews that discuss the challenges and benefits of BL. BL = Blended learning. Links to articles are hyperlinked in Authors.

Authors	Review type	Relevant objective(s)
Bozkurt (2022)	Systematic review (n = 1986 records)	• Identify thematic patterns in blended/hybrid learning
Singh et al. (2021)	Literature review	• Conduct and present fishbone and SWOT analysis to identify challenges faced by instructors as they transition from in-person to online instruction • Provide practical recommendations for successful implementation of blended learning in higher education
Ashraf et al. (2021)	Systematic review of systematic reviews (n = 57 reviews)	• What are the learning outcomes and associated challenges of blended learning?
Raes et al (2020)	Systematic review (n = 47 studies)	• What are the main benefits of synchronous hybrid learning? • What are the main challenges of synchronous hybrid learning settings?
Rasheed et al (2020)	Systematic review (n = 30 papers)	• Identify the challenges in the online component of online learning from a student-, teacher- and institutional-perspective
Boelens et al. (2017)	Systematic review (n = 20 studies)	• Identify challenges present in the design of blended learning
Van Laer & Elen (2017)	Systematic review (n = 95 papers, 2001-2015)	• Identify and define the attributes of blended learning environments that support learner's self-regulatory abilities.