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Do graduate courses in a HyFlex mode foster emotional, cognitive and behavioral engagement? A consideration

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Abstract

The global pandemic accelerated the adoption of online, blended, and Hybrid Flexible (HyFlex) teaching and learning modalities. The long-term impacts of these changes are still being assessed, but most research to date has focused on undergraduate students in an online setting. In contrast, this study reviews recent research pertaining to HyFlex engagement strategies used by academic staff and personnel with teaching responsibilities at the graduate level and considers how HyFlex courses, the combination of face-to-face instruction and online activities, may foster equivalent learning outcomes, as well as comparable emotional, cognitive, and behavioral engagement. Using a critical reflective approach, the study finds that graduate-level courses taught in a HyFlex mode can offer equivalent learning outcomes, but such outcomes require academic staff development and purposefully designed activities that directly promote emotional, cognitive, and behavioral engagement. Several practical strategies and suggestions to improve engagement are offered.

Introduction

Student engagement is a multifaceted construct and a critical factor for academic performance and student retention (Burke, 2019; Pechenkina et al., 2017; Zepke & Leach, 2010). Student *engagement* is often defined as students' willingness and desire to participate and succeed in the learning process. Student *online learning engagement* has been defined by Yang et al. (2018) as "students' devotion of time, energy, value/interest, attitude, learning strategy or even creative thinking in e-learning environments and the motivational and action processes elicited" (p. 3). Research by Thomas et al. (2014) indicated that "staff and students expressed greater satisfaction with online courses that successfully fostered a sense of belonging among students" (p. 76). A sense of belonging influences a person's emotional and cognitive patterns and is considered key to improving academic motivation, (social) integration, satisfaction (Stephens & Morse, 2022), achievement (Pedler et al., 2021) and retention rates (Peacock et al., 2020). Strayhorn (2018) found that graduate students thrived and excelled "where they feel like they belong" (Strayhorn, 2018, p. 138).

As higher education cautiously enters a post-COVID-19 pandemic era, considerable literature has explored student engagement in various online formats such as Emergency Remote Teaching (Calonge et al., 2022), blended (Lim et al., 2007), and Hybrid Flexible (HyFlex) (Bockorny et al., 2023; Raes et al., 2020). HyFlex courses combine face-to-face (F2F) and online activities and remote participation through video capture technology, allowing social distancing, more equitable access, choice, control, and flexibility. Although research has studied the undergraduate student experience with HyFlex, a literature search revealed few studies that specifically focused on academic staff development in the HyFlex modality, especially at the graduate level. Practical synchronous HyFlex engagement strategies fostering emotional, cognitive, and behavioral engagement at the postgraduate level have also received minimal attention in the recent research literature. Considering this, the purpose of this paper is twofold: (1) to review recent research pertaining to HyFlex engagement strategies used by academic staff in tertiary education courses, specifically at the graduate level, and (2) to propose practical suggestions to help improve (a) emotional, cognitive, and behavioral engagement and (b) sense of belonging in graduate HyFlex courses.

Theoretical framework

The theoretical framework adopted is Fredricks et al.'s (2004) three-dimension engagement framework. Fredricks et al. (2004) introduced a three-dimensional engagement framework that has significant relevance to articles discussing the HyFlex pedagogy. This framework focuses on three critical dimensions of student engagement: emotional, behavioral, and cognitive. Emotional engagement examines students' affective reactions to learning, encompassing their interest, enjoyment, and motivation. Behavioral engagement involves the active participation and involvement of students in educational activities. Cognitive engagement pertains to the extent to which students invest their cognitive efforts in understanding and processing course content. When applied to the context of articles discussing the HyFlex pedagogy—a flexible approach that combines in-person and online learning—the framework's dimensions become instrumental. HyFlex pedagogy demands a high degree of student autonomy and responsibility in managing their learning experiences, making emotional engagement essential to maintain motivation in both online and in-person settings. Behavioral engagement becomes crucial as students navigate various learning modes, requiring them to actively participate regardless of the format. Lastly, cognitive engagement is at the core of effective learning in HyFlex, as students must deeply process information across different modalities. Therefore, Fredricks et al.'s (2004) engagement framework provides a valuable lens to analyze and enhance student experiences within the multifaceted environment of HyFlex pedagogy. Equivalency Theory, proposed by Simonson et al. (1999), is also reflected in the context of this article through engagement in the HyFlex modality. The theory stipulates that online and face-to-face students will achieve equivalent learning outcomes only when they are offered equivalent/comparable learning experiences (regardless of the method of delivery). That is, to achieve equivalence, "course designers [should] create learning experiences of equivalent value for learners regardless of the course delivery medium, allowing that the experiences themselves could be different" (Lapsley et al., 2008, p. 3).

Methodology

This study undertakes a critical reflective approach as its methodological base. It examines the global phenomenon of changes in higher education resulting from COVID-19, as documented in the current literature. The authors opted for a scoping review methodology. A broad examination of the published literature was conducted on the topic without strictly predefined criteria for inclusion or exclusion of studies, aiming to provide an overview of the existing literature and identify the breadth and depth of available evidence. The authors engaged with literature to identify themes and gaps in knowledge. Critical reflection is a widely recognized methodology that can provide an evidence-based "framework for deconstructing… assumptions about knowledge" (Hickson, 2015, p.308). Thompson and Thompson (2018) argued that "theorizing practice is at the heart of reflective practice" (p.x). Its use in professional learning and teaching studies, therefore, assists "practitioners to improve practice" (Fook, 2011, p.55) by describing, critically analyzing, synthesizing, evaluating, and devising a plan of action (Gibbs, 1988).

The methodological process of critical reflection was guided by the primary research question:

> RQ1. Can graduate courses taught in a HyFlex mode foster equivalent emotional, cognitive, and behavioral engagement as in the F2F modality?
>
> To identify practical strategies for graduate students, one supplementary question was considered:
>
> RQ1-1. Is a sense of belonging relevant to graduate students in HyFlex courses?

The study proceeds as follows: first, guided by the critical reflective methodological approach, relevant literature pertaining to the HyFlex modality, student engagement, and online engagement at the graduate level is reviewed; second, findings are presented; third, reflecting on the supplementary question, practical suggestions to help improve (a) emotional, cognitive, and behavioral engagement and (b) sense of belonging in graduate HyFlex courses are offered. The final section draws conclusions from this study.

Background

The HyFlex modality

Although flexible learning modalities have been part of higher education for some time, they have evolved in response to advancements in technologies and environmental changes that demand flexible online learning and teaching options. However, in the past, the need for flexible learning and alternatives to face-to-face teaching were not as significant as they are today. Lockdown conditions advanced the need for and the use of video conferencing technologies, which created a global educational need for better synchronous and asynchronous learning and teaching options, culminating in the *Hybrid-Flexible modality*. HyFlex incorporates elements of blended, online, and hybrid pedagogies by providing students with the flexibility to choose how they engage with peers and professors, course materials and activities, whether in person or online. Particularly, HyFlex extends the flexibility of blended learning by allowing students to choose whether to attend classes in person, participate online, or do both. This flexibility accommodates varying student needs, preferences, and circumstances. In a HyFlex model, students also have the option to participate fully online if they prefer or if circumstances prevent them from attending in person, which is often the case for graduate students. HyFlex is thus a specialized form of hybrid learning, where students have the flexibility to choose the mode of participation for each class session. They can opt to attend in person, participate online, or switch between modes as needed. In short, HyFlex emphasizes student choice and flexibility to a greater extent and requires a more intricate integration of technology to support simultaneous participation from both in-person and online students. Hybrid learning, on the other hand, may involve a predetermined schedule and mode of attendance with less emphasis on student choice and simultaneous engagement. Despite HyFlex being introduced by Beatty (2007) prior to the pandemic, lockdown conditions prompted Kohnke and Moorhouse (2021) to describe HyFlex as a "new" and therefore, a "rarely implemented mode" of learning and teaching (p. 232).

By combining face-to-face and online learning methods, HyFlex has been described in multiple studies as uniquely adaptable to social distancing measures due to its primary characteristics of flexibility and choice for students on how (and where) they engage with a course (Trotter and Qureshi, 2023; Bozan et al., 2023; Detyna et al., 2023; Nelson et al., 2022; Heilporn & Lakha, 2021; Kohnke & Moorhouse, 2021; Romero-Hall & Ripine, 2021; Wilson & Alexander, 2021). Abdelmalak and Parra (2016) argued that "graduate students as adult learners need flexible instruction that extends the boundaries of learning so that learning can occur in the classroom, in the home, and in the workplace" (p. 23).

HyFlex, according to Beatty (2007, 2019), caters to flexibility in engagement and equivalence in learning through the reusability of learning materials that can be implemented across multiple technology options. Courses incorporating video conferencing technologies (e.g. Zoom) along with in-person instruction, provide students with the ability to select synchronous, asynchronous online or face-to-face options and thus have "greater control over their learning and course engagement modes" (Kohnke & Moorhouse, 2021, p. 232). Given this, HyFlex is viewed as being "learner-centered" as the variety of course engagement modalities shift the design principles away from being instructor-focused, in contrast to more traditional blended learning course designs (Wilson & Alexander, 2021, p. 44).

Student engagement

To improve quality and learning outcomes, student engagement in higher education has become a priority (Fernández-García et al., 2021). Engagement connects experiences across three key dimensions: emotional, behavioral, and cognitive. As suggested by Subramainan and Mahmoud (2020), tertiary institutions should identify different aspects of student engagement, its main dimensions and problems, the most important factors influencing students' motivation, and evaluation methods to improve engagement learning outcomes. Previous research suggests that emotional intelligence, resilience, and positive psychology played key roles in this process (García-Martínez et al., 2021). In addition, it is critical that universities support different groups of students, such as international and low-income students. International students may face linguistic and cultural barriers that make it difficult for them to be active learners (Calonge et al., 2023), which suggests a need for initiatives that promote inclusivity, multilingualism, and multiculturalism (Xiao, 2021). All students, but perhaps especially low-income/disadvantaged students may need proactive support mechanisms, academically validating practices in the classroom, as well as customized programs (Swanson et al., 2021).

As academic staff and staff with teaching responsibilities (instructors, teaching assistants, etc.) play a key role in connecting the three dimensions to enhance student engagement, it is important that they adapt to higher education's new requirements, implement innovative learning and teaching strategies such as Challenge-Based Learning, and consider the role of both emotional and behavioral engagement in the courses they teach (Fernández-Garcia et al., 2021). In addition, student performance and engagement increase when they feel integrated into a community (Durón et al., 2018), when a positive dialogue is cultivated, and where a supportive culture of mental health is promoted with clearly established protocols. To facilitate such integration, instructors can launch inclusive events and workshops that promote well-being and help students develop key transferable skills such as teamwork and or socialization (Martín-Hernández et al., 2021) using

a Community of Inquiry (CoI) format (Garrison et al., 1999). Universities should also develop continuing professional development opportunities that help academics integrate interactive learning strategies (online and F2F) into their practice (Oviawe, 2020).

Tertiary institutions have developed online courses to better satisfy students' and academia's needs (Chen & Yang, 2022; Zou et al., 2021). Students' engagement with online courses is essential and necessitates providing students with Teaching Assistants (TAs) and technical support to avoid frustration and negative experiences (Rajabalee & Santally, 2021). To mitigate the impact of those negative experiences, universities need to analyze how academics' expectations (self-efficacy, academic engagement) and students' needs (knowledge, motivation) integrate into this online environment and propose adequate solutions when they do not match or fit (Lobos Peña et al., 2021).

Online engagement at the graduate level

Graduate students in online courses respond to teaching and learning that is emotionally connected. Moreover, graduate students are self-determined adult learners and are more likely to have previous (local or overseas) experience of study through undergraduate degrees, as well as professional experience (Calonge et al., 2023; Holzweiss et al., 2014). Graduate students expect a teaching and learning environment that includes research and advanced content and is focused on skill development for a specific professional field (Holzweiss et al., 2014). To engage graduate students online, it is helpful to include a) experiential learning activities, and b) professional and previous experience to devise individual learning goals, as is using teaching approaches of sharing experiences and taking responsibility for facilitating class discussion (Heilporn et al., 2021). Using learning and teaching strategies that draw on graduate students' existent skills and competencies can thus increase emotional engagement in online learning. Teachers of graduate students should use authentic online learning activities such as problem/challenge-based learning and competency tests to increase engagement (Kuchinski-Donelly & Krouse, 2020). In short, adult learners in graduate courses respond well to online teaching that is (authentic) practitioner-experience-based, passionate and has emotional investment, from both the facilitator and classmates (McDavid & Shepherd, 2021).

Findings based on literature

In response to the primary research question, "Can graduate courses taught in a HyFlex mode foster equivalent emotional, cognitive, and behavioral engagement as in the F2F modality?", the findings examine the literature and utilize Fredericks et al. (2004) three-dimension engagement framework to discuss a sense of belonging, cognitive load, behavioral engagement, and engagement in the HyFlex modality.

Emotional engagement and a sense of belonging online

Emotional engagement relates to the student's feelings of interest, boredom, excitement, and anxiety in the classroom (Fredricks et al., 2004). Wang and Huang (2018) found that students felt excluded in blended learning classes as some instructors tended to disregard or failed to remember [online] students when engaging with [face-to-face] students. Similarly, research by Cunningham (2014) indicated that "both groups (online and campus students) reported seeing the other group as quite separate from themselves" (p. 40). In short, online students felt left out or isolated, despite connections with the course content, instructors (interactions/feedback) and peers that could potentially lead to a sense of connectedness and belonging. Conrad et al. (2022) indicated that even though "many instructors offered synchronous lectures or sessions, not all students were able to participate, and while these were recorded live sessions, it never provided the feeling of being socially present in the same space as other students and the instructor." This sense of disconnectedness, [them and us], felt by online students partially contradicts Raes et al. (2020) argument that Hyflex could be a more flexible and more engaging learning space (than fully online or face-to-face). It also casts doubts on *reusability* and *equivalent learning,* two of the guiding principles of HyFlex which advocate the sharing of all materials with online students as being part of a *single learning community* (Beatty, 2019) and equivalent learning activities in all modes (Beatty, 2007).

Cognitive engagement

Students in online classes may experience various engagement levels, ranging from boredom, interest, frustration, delight, confusion, and enthusiasm. Being able to identify these engagement levels is essential to providing students with personalized pedagogical support (Dewan et al., 2019). Students' behaviors are especially influenced by their cognitive engagement, which reflects their investment in learning to understand and master difficult concepts, participation in class, and effort to improve their academic performance (El-Sayad et al., 2021). Students' cognitive engagement determines their understanding and academic performance, but the willingness to listen, interact, concentrate and (actively) participate in the classroom should be intrinsic and must arise from students (Nagadeepa et al., 2021). Nevertheless, academics can help students by rethinking their assessment (for learning) practices, incorporating authentic course material into assignments, and interacting frequently with them (Walker & Koralesky, 2021). Academics teaching blended/hybrid courses should also take into consideration "the cognitive overload generated by instructors' split attention between online students and face-to-face students," which may have an impact on "instructors' attitudes towards online students" (Lakhal et al., 2020).

Behavioral engagement

Students' participation, persistence, contribution, focus, efforts, and active involvement are essential to perform academic tasks (Nguyen et al., 2018). Several research studies, such as Liu et al. (2019), noted that students showing higher engagement rates achieved higher assessment results and demonstrated more autonomy in their learning. This engagement refers to emotional and cognitive aspects but also to behavior-related issues. Assessments often serve as motivators for students to engage with course materials and if there is a gap in assessment, students may feel demotivated or disengaged, as they may not see the value in actively participating in learning activities (Zhu et al., 2021). According to D'Mello (2021), behavioral engagement broadly refers to learners' participation in learning, including effort, persistence, and concentration. In other words, behavioral engagement pertains to students' investment in the learning task, such as how they allocate their effort towards learning and their understanding and mastery of the material (D'Mello, 2021). It also relates to how they interact with their classmates in, for instance, online group work (Knopf et al., 2021). Higher education institutions (HEIs) should therefore carefully monitor and analyze all indicators that relate to students' behavioral engagement, such as participation in campus life, achievement of intended learning outcomes, attendance, the effort to stay on task, contribution, participation in class/online discussions, involvement in academic activities, time spent on work, and perseverance when faced with challenging tasks (Bowden et al., 2021).

Engagement in the HyFlex modality

Implementation of the HyFlex modality must provide an overall "flexible framework" (Wright, 2016, p. 88). Flexibility helps foster various levels of engagement for students through its synchronous or asynchronous learning options, and therefore, it must also be adaptive to the three dimensions of engagement (Fredricks et al., 2004). That is, it needs to foster positive connections between students' behavioral, emotional, and cognitive engagement within a course (Heilporn et al., 2021). Graduate students, due to the nature of their degree and discipline(s), may need to have access to content regardless of geographical location (when they do fieldwork, for instance) or time constraints (an internship overseas). As a result, students are more likely to engage with the material since they can fit learning into their schedules more easily. This accessibility enables a wider range of students to participate in learning activities, including those who may have other commitments such as jobs or family responsibilities. Additionally, this flexibility caters to individual learning (and navigation) styles and preferences, enabling students to spend more time on challenging concepts while moving quickly through material they already understand. This is often carried out through instructors identifying teaching expectations, demonstrating desired behavior for interactions in face-to-face and online environments, and ensuring student support through clear and timely feedback options (Lohmann et al., 2021). Binnewies and Wang (2019) have suggested these elements are commonly seen through teamwork and peer review activities in HyFlex courses. Heilporn and Lakha (2021) further highlighted that such activities can engage face-to-face, synchronous, and asynchronous students at the same time while encouraging communication in the instructor/student relationship and providing a supportive learning structure.

Despite hesitations prior to COVID-19, universities worldwide have increasingly adopted hybrid modalities since blended teaching and learning positively affect students' performance. The literature points to several benefits of engagement with the HyFlex modality. Students enrolled in hybrid courses achieve similar or better outcomes than those enrolled in face-to-face courses (Green et al., 2018). Hybrid learning is especially useful when academics and students are engaged with innovation and when they focus on academic content rather than its technical aspects (Keržič et al., 2019). In the hybrid learning modality, academics and students establish better relations based on knowledge, performance, as well as emotions and social skills. In other words, hybrid modalities help reinforce students' skills in emotional intelligence (Iqbal et al., 2022). However, students value quality real-time interactions with academic staff (and personnel with teaching responsibilities), and asynchronous discussions and chats seem to negatively affect students' engagement and learning outcomes (Zhu et al., 2021). Koskinen (2018) found, for instance, that graduate students felt little connection with the "content, classmates, and the instructor" in courses that offered little to no interaction (Koskinen, 2018, p. 80).

The interaction equivalency theorem proposed by Anderson (2003) suggested that "deep and meaningful formal learning is supported as long as one of the three forms of interaction (student-teacher; student-student; student-content) is at a high level. The other two may be offered at minimal levels, or even eliminated, without degrading the educational experience" (p. 4). Universities should therefore encourage the integration of thoughtfully planned peer-hybrid learning activities (paragogy) into courses to help, for instance, students develop their critical thinking skills, as well as their engagement with the content (Khan & Iqbal, 2021). The use of various digital tools in hybrid courses such as apps, live chats, AI tools, automated (written/audio) ipsative authentic feedback, virtual teaching assistants or digital assessment may promote students' behavioral and emotional engagement. Academics can explore, experiment with and use different teaching and learning activities and strategies (Khan & Iqbal, 2021) such as interactive simulations, metaverse games, live polling (Houy, 2023), digital bulletin boards/online project management tools, AI-enhanced Video Based Learning (Shehata et al., 2023), online role-playing (RPG platforms, MMORPG *multiplayer online role-playing games*), flipped classroom, challenged-based projects, formative evaluations, interactive diagnostic quizzes or immersive learning tasks/virtual experiments, etc. All these may help provide a similar/comparable learning experience to all students to achieve equivalent learning outcomes. Among these initiatives, Coyne et al. (2018) argued that (short) simulated video resources were one of the most useful tools in a hybrid environment because they increased students' understanding of the academic content and enhanced their interactions with professors, at the

university and at home.

Hybrid initiatives determine students' motivation for learning and the more students are self-directed learners, the higher their acceptance of the technology is in blended or hybrid courses (Shimizu et al., 2019). Furthermore, to improve students' engagement with the online components of courses, universities should consider five main principles. *First, an integrated deliberate and reflective approach*. Academics need to consider several perspectives such as the design of the course (learning and teaching activities and tools) for the online modality, the learning outcomes, the accreditation standards, the exact role and responsibility of the teaching assistants, labs, cognitive load, autonomy and presence, multimodality, formative and summative assessment, team collaboration and monitoring, to propose unique and relevant content to their students (Hultberg at al., 2018; de Nooijer et al., 2021).

Second, previous experience, data, and the untapped potential of social media. Calonge et al. (2019) advocated that "purposeful learning and curriculum design decisions are a fundamental means to enhance participant engagement, motivation and performance in an online course" (p. 100). Academics need to harness data, analyze previous experience (their own and students') and satisfaction with courses facilitated online, reflect, generate actionable insights, and make decisions based on this information (Stephens et al., 2021).

Third, equity, interactivity, and equivalency. Some students may lack access to the necessary means, technology, tools, and bandwidth to fully partake in some aspects of the learning initiatives (Hines et al., 2020). A study by Platt et al. (2014) found that participants perceived fewer opportunities to interact with their instructor and classmates (p. 494) in the online mode. In terms of equivalency, participants did not see online courses as equivalent to face-to-face courses in a general sense.

Fourth, students' mental health. This issue has a great impact on well-being and academic performance, which determines students' enrolment and adaptation (and retention) to university life (Cobo-Rendón et al., 2020). A National Student Clearinghouse Research Center report indicated a 1.4 million university enrolment decline in the United States during the pandemic (NSCRC, 2022).

Fifth, communication and mutual respect. Effective, constant, transparent, and clear communication is essential, as is mutual respect among professors and students (Afzal, 2021) to create and sustain a safe, collegial environment.

Practical suggestions based on literature

Based on the published literature, the RQ and the supplementary research question,

> "Is a sense of belonging relevant to graduate students in HyFlex courses?"

The authors of this article propose several suggestions to improve emotional, cognitive, behavioral engagement and a sense of belonging in graduate HyFlex courses.

Practical suggestions to improve emotional engagement and sense of belonging at the graduate level

To improve emotional engagement and sense of belonging, higher education institutions should consider the three following suggestions.

First, positive social interaction is important to student engagement and a sense of belonging. By deliberately designing and encouraging opportunities for social interaction, such as using synchronous class time to build peer networks, peer-to-peer, and student-to-instructor sharing activities (van Gijn-Grosvenor et al., 2020), emotional engagement can be fostered. Asynchronous activities to build positive social interaction can include the use of discussion boards, chatbots, and other interactive online tools such as quizzes and polling.

Second, to improve emotional engagement and sense of belonging when using Zoom or Teams and to avoid passivity, or a feeling that the student is "watching a lecture" rather than participating in an online class, it is important to use activities like chat functions and breakout rooms to allow students to not only discuss the content in small groups but to also build a sense of engagement and belonging and have their socio-emotional needs met (Saldanha et al., 2021).

Third, teaching staff should demonstrate their passion and emotional investment in their teaching, as well as encourage students to adopt "active to learn" behaviors (Mentzer et al., 2023) such as turning the camera on, unmuting in small group classes, and leading small breaks for movement (for example, a stretch break every 30 minutes, with brainstorming).

These strategies of modelling and promoting active and present participation can help facilitate positive engagement, which has been shown to increase emotional engagement and a sense of belonging (Peper et al., 2021). In fact, Deng (2021) indicated that emotional engagement was vastly more impactful on (online) student satisfaction than cognitive and behavioral engagement. This confirms previous work by Kucuk and Richardson (2019) who reported that data collected from 123 graduate students enrolled in an online program in the U.S. indicated that "emotional engagement was found to be one of the most important determining factors of satisfaction" (p. 207), which also highlights the importance of collecting empirical data.

Practical suggestions to help improve cognitive engagement at the graduate level

Four initiatives may help reinforce students' cognitive engagement and mastery of core concepts at the graduate level.

First, HyFlex courses' learning and teaching activities and assessment tasks should be thoughtfully and purposedly planned and designed to foster deep learning (Hultberg & Calonge, 2017), maximize interactivity and functioning knowledge, and provide an equivalent learning experience for students in synchronous (in person), synchronous (online) and asynchronous (online) modes (Casimiro, 2016; Hollister et al., 2022). As argued by Conrad et al. (2022), "shifting to online teaching is not simply duplicating the learning materials in the digital format" (p. 551).

Second, to increase motivation and interest, a variety of relevant tools and active learning strategies should be experimented with: MOOCs for skills (Calonge & Aman Shah, 2016), Open Educational Resources, live polling, videos and podcasts, games (e.g., https://inworld.ai/studio), chatbots (Calonge et al., 2023), AI tools (Kamalov et al., 2023a), collaborative lecture notes taking, interactive quizzes (e.g., Quizlet), online forums, open-access computer algebra systems (Kamalov et al., 2023b), community sharing initiatives and simulations (Ogunyemi et al., 2022).

Third, promote presence and planned online discussions to allow students to efficiently interact with professors and peers (Tang et al., 2021) and to evaluate students' cognitive engagement levels in these online forums (Kew & Tasir, 2021).

Fourth, encourage instructor-students' interactions and peer (online)-to-peer (classroom) teamwork and assessment (e.g., collaborative digital whiteboards) for students to ask questions, evaluate projects and work together (Wang, 2022), thus fostering an equivalent learning experience for all.

Practical suggestions to help improve behavioural engagement at the graduate level

Higher education institutions should consider the following five suggestions to reinforce students' behavioral engagement.

First, universities should implement a holistic consideration of contexts, dimensions, factors and domains of engagement, and train academics and staff with teaching responsibilities to develop decision-making strategies for the early prevention of disengagement causes (Hasanov et al., 2021) using AI-powered predictive data analytics (Almusaed et al., 2023).

Second, universities should provide flexible learning options to graduate students in terms of time, place, and pace of learning (Kokoç, 2019).

Third, academics must deliberately design online courses that are relevant to graduate students in terms of level, content, and knowledge (Fabian et al., 2022), but also in terms of social support, online support, instructor presence, and management of students' anxiety (Bond & Bedenlier, 2019).

Fourth, academics should consider "pedagogy at the forefront of the design" (Zhang et al., 2022) and integrate cognitively engaging learning initiatives, which involve much more than simply presenting content through PowerPoint presentations and videos (Kennedy, 2020). A study by Houy (2023) indicated that polling and quiz slides had a motivating and engaging effect on students.

Fifth, academics need to design online activities that are compatible with multiple devices and formats and create tasks with real-life applications (Sugden et al., 2021), providing graduate-level students with greater opportunities to apply their course knowledge to their research and their professional lives.

Practical suggestions to implement HyFlex engagement strategies at the graduate level

To attenuate the feelings of isolation described by Conrad et al. (2022) there is a need to provide equivalent learning experiences and to improve social presence in the same space.

Higher education institutions need to rethink and redesign infrastructures and learning spaces (interactive learning and collaboration spaces such as classrooms, meeting rooms and the library/learning commons) to support HyFlex (Detyna et al., 2023). These changes should be made to facilitate in-class and remote instructor-students interactions, and peer (online)-to-peer (classroom) real-time and breakout room interactions, teamwork, and assessment. A recent study by Calonge et al. (2023) details the implementation strategies used at Mohamed bin Zayed University of Artificial Intelligence (United Arab Emirates) to design HyFlex technology-enhanced classrooms. The authors provide examples of well-thought, modular, flexible, optimized classrooms using a human-centered (students and faculty) design-thinking/service design process with purposeful integration of technology to actively engage remote and F2F students synchronously and asynchronously. The article also provides qualitative feedback from both students and faculty highlighting the positive aspects of HyFlex learning space design in terms of flexibility, collaboration, and a sense of belonging.

Conclusion

This study argues that as the HyFlex modality emphasizes blended learning principles and offers flexibility through its synchronous or asynchronous learning options, it is uniquely positioned for the current post-pandemic teaching and learning environment. Graduate students require emotional, cognitive, and behavioral engagement for optimal learning, and as argued, the Hyflex modality can provide it.

By combining face-to-face and online learning methods, HyFlex is adaptable to social distancing measures (if need be) and provides students flexibility and choice for how, where, and when (and with whom?) they engage with course content. To improve connection with the content, classmates, and the instructor, as well as encourage

meaningful interactions, cross-pollination of ideas, motivation in those mandatory graduate level courses, and increased emotional, cognitive, and behavioral engagement, the use of interdisciplinary, authentic and hybrid (research) challenge-based learning (CBL) team (F2F/remote) projects is recommended, using a Community of Inquiry (CoI) format (Garrison et al., 1999). Thus, the HyFlex teaching and learning modality may be able to support and encourage a sense of belonging, as well as emotional, cognitive, and behavioral engagement, while achieving equivalent learning outcomes for online and in-person students IF equivalent learning experiences are intentionally constructed (Simonson et al., 1999). When dealing with low-quality internet access, especially in contexts where students come from low socio-economic backgrounds in the Global North and South (including refugee contexts), integrating HyFlex for non-mandatory courses requires, however, careful consideration and adaptation to avoid exacerbating existing inequalities. No or limited access to real-time high-speed internet or Wi-Fi can pose significant accessibility challenges for students, hindering their ability to participate fully (or at all) in online activities. Ensuring recordings (and downloadable PDFs) are available for those who could not attend live sessions due to connectivity issues is key (Shah & Calonge, 2019; Shah & Calonge, 2023). Other downloadable lightweight resources should be ready so that students can access them offline, and local meetups or study groups for students facing connectivity challenges can be organized to collaborate and engage with course and research materials together.

To foster cognitive engagement, higher education can adopt principles from cognitive load theory applied across platforms, having instructional videos available at crucial points in the learning process and encouraging equivalent meaningful student interactions with both peers and instructors, in all modalities. Furthermore, as argued by Salas-Pilco et al. (2022), "educators from HEIs should be offered in-service training and professional development on the application of emerging technologies and the combination of technological and pedagogical skills to conduct learning activities that promote students' behavioral, cognitive and affective engagement." That is, there is a need for an increase in faculty development and support on HyFlex (Armstrong, 2022), Learning Experience (LX) design (Howell et al., 2023), and Universal Design for Learning (UDL).

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