Converting a graduate-level course into a HyFlex modality: what are effective engagement strategies?

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Abstract

Blended courses are rising in business education, and new modalities have emerged to increase flexibility of students. HyFlex courses combine online asynchronous activities with "flexible-synchronous" activities where students choose to attend online synchronously, face-to-face, or online asynchronously through recordings, bringing them full flexibility of participation. Additionally, the flexible-synchronous activities preserve interaction opportunities between students and the instructor and support student learning. This study reports on the transformation of an operations course into a HyFlex modality to enhance student engagement through regular flexible-synchronous sessions as well as equivalent T&L activities across course sections. The study also brings a new perspective by highlighting effective strategies for engaging students in a HyFlex course. First, exploratory qualitative data suggested that the course organization with weekly flexible-synchronous activities, providing regular interaction opportunities and video-recorded, encouraged student engagement. Engagement strategies were also identified using both quantitative and qualitative data. The main strategies were open and trustful interactions for student behavioral engagement, links with practice and learning support for emotional engagement, and links with practice, learning support and instructor's facilitation role for cognitive engagement. The study suggests that HyFlex is a promising course modality for fostering student engagement at the graduate level, especially in large-group business courses.

Keywords

Higher education; Online and blended learning; HyFlex; student engagement; instructional strategies

Highlights

- HyFlex is a promising modality for enhancing student engagement in business education
- Flexible-synchronous sessions ease student learning support and instructor's facilitation role

- Open and trustful interactions promote behavioral engagement of students in HyFlex courses
- Links with practice and learning support foster student emotional engagement in HyFlex courses
- Instructor's facilitation role also encourages student cognitive engagement in HyFlex courses

1. Introduction

According to a recent survey (Donovan et al., 2019), the proportion of Canadian higher education institutions offering online and blended courses has respectively grown to 83% and 78% in 2018, and is presumed to expand further in the future. Benefitting from the rapid evolution of information and communication technologies (ICT), these course modalities derive their popularity from their flexibility in terms of time and/or space, allowing students to better balance academic, personal and professional responsibilities, especially at the graduate level (Abdelmalak & Parra, 2016; Lakhal & Khechine, 2017; Taylor et al., 2018). Online and blended course modalities are also very popular in business faculties (Arbaugh, 2014; Kumar et al., 2019; Popovich & Neel, 2005; Wolverton, 2018). In particular, most Masters in Business Administration (MBA) in [name of institution, location], in which this study was conducted, are offered through online and blended modalities to accommodate the diverse needs of students.

[name of institution] is a multimodal university offering more than a thousand online courses in addition to blended and face-to-face courses. In 2018–2019, alternative course modalities (traditional blended, HyFlex and online) accounted for 26% of total student credits, with a more than 40% increase in the last four years. In particular, the faculty of business administration [name of faculty] has developed a leadership position in online and blended learning, offering such courses since 1997 with the expertise and investment of a dedicated team of learning technologists and instructional designers. The development of alternative course modalities is also a component of the faculty strategic plan to facilitate balance between students' academic, personal and professional responsibilities ([name of faculty], 2016).

Learning outcomes in online or blended courses are considered equivalent to those of face-to-face courses (Arbaugh, 2014, 2016; Kumar et al., 2019; Popovich & Neel, 2005). However, online (often asynchronous) courses have some major drawbacks, such as high dropout rates and students' feelings of isolation (Angelino et al., 2007; Bolliger & Martindale, 2004; Kranzow, 2013), which could be associated with a lack of instructor support resulting in lower student satisfaction than in face-to-face courses (Bolliger & Martindale, 2004; Mullen & Tallent-Runnels, 2006). In contrast, blended courses preserve synchronous student-student and student-instructor interactions and yield higher student satisfaction than face-to-face or online asynchronous courses (Owston et al., 2013). While a "traditional" blended course usually refers to a combination of face-to-face and online asynchronous teaching and learning (T&L) activities (Garrison & Kanuka, 2004; Garrison &

Vaughan, 2008), new blended modalities have also emerged during the last ten years, whether for cost-optimization purposes or to increase the flexibility and accessibility of higher education for students. These new modalities, labelled blended online (Power, 2008), blended synchronous (Lakhal et al., 2017, 2020), synchromodal (Bell et al., 2014), multi-access (Irvine, 2009; Irvine et al., 2013) or HyFlex (Beatty, 2007, 2019) courses, replace face-to-face sessions with online synchronous sessions for some or all students. Specifically, HyFlex courses combine online asynchronous T&L activities with "flexible-synchronous" T&L activities where students can choose to attend online synchronously, face-to-face, or online asynchronously through recordings and videos. In business faculties, this emerging course modality could be particularly well-suited for MBA students, who often have very diverse backgrounds and needs.

Out of a total of 583 courses at [name of faculty, institution] in 2019, 157 were online (mostly asynchronous), 67 were traditional blended and 43 were HyFlex courses. In keeping with the assumption that one size does not fit all, numerous courses are offered through multiple sections and modalities that enable students to enroll in the one best fitting their styles or needs. At the graduate level, especially, alternative course modalities at [name of faculty] made up 45% of total courses in 2019. In a context where 71.5% of graduate students were registered part-time in 2019, offering almost half of courses in online, traditional blended or HyFlex modalities helps students to balance studies with their work and family responsibilities. Particularly, a growing percentage of courses are now offered in a HyFlex modality given its large flexibility of participation and regular opportunities for interaction with the instructor and other students, especially at the graduate level. This study monitored the transformation of blended and online sections of a graduate level course in operations management into a HyFlex modality at [name of faculty].

3. Problem

An increasing number of courses are delivered in multiple course sections and modalities, enabling students to enroll in the one fitting their needs and preferences. However, offering the same course in multiple modalities raises an additional challenge of providing equivalent T&L activities to all students. On the one hand, students in face-to-face (or traditional blended courses) have multiple opportunities to interact with the instructor and other students, but they may expect the instructor to take most responsibility for T&L during face-to-face sessions. On the other, students in online asynchronous courses often suffer from a lack of interaction opportunities and have to bear all the responsibility for their learning. Therefore, the challenge is "to bridge the divide between students attending on-campus classes and those learning at a distance, in order to give all who are undertaking a particular course or unit of study equivalent learning opportunities" (Bower et al., 2015, p. 1).

By combining face-to-face and online T&L activities, traditional blended courses offer interaction opportunities while sharing the responsibility of T&L between students and the instructor (Zepke et al., 2014). By extending discussions and reflections over time and space, blended courses

represent a fertile ground for optimizing student engagement (Halverson et al., 2014; Halverson & Graham, 2019; Jeffrey et al., 2014; Manwaring et al., 2017; Spring et al., 2016; Vaughan et al., 2013). However, a traditional blended course is not convenient for all students. Indeed, the face-to-face T&L activities can prevent students far away from campus or juggling with professional and personal responsibilities from enrolling. For these students, HyFlex could be their preferred course modality since they can participate in flexible-synchronous T&L activities face-to-face, online synchronously (through virtual classrooms) or online asynchronously (through online recordings or videos) (Lakhal et al., 2020, 2014). Students can also change their attendance mode from one week to another throughout a semester, giving them full flexibility of participation. Additionally, the flexible-synchronous T&L activities organized in HyFlex courses help preserve interaction opportunities between students and the instructor similarly to traditional blended courses. Therefore, the HyFlex modality reconciles the benefits of both asynchronous and synchronous courses, allowing students to select T&L activities best suited to their needs and preferences.

Wolverton (2018), who recommended including synchronous T&L activities in online business courses to increase student engagement, however mentioned that a high level of synchronous communication could be poorly suited to students with high commitments to work or family and less flexible schedules. Nevertheless, she indicated that synchronous T&L activities could also foster the engagement of students experiencing online learning for the first time. By combining asynchronous and flexible-synchronous T&L activities with full flexibility of participation, HyFlex courses could therefore also represent fertile ground for student engagement. Described as "the holy grail of learning" by Sinatra et al. (2015, p. 1), student engagement has important repercussions, especially on perseverance, in-depth learning, student satisfaction and academic success (Christenson et al., 2012; Halverson & Graham, 2019; Kahu, 2013; Mandernach, 2015; Manwaring et al., 2017). For business faculties, fostering student engagement also ranks first among the Association to Advance Collegiate Schools of Business (AACSB)'s objectives, whose accreditation considered a measure of quality.

Furthermore, student engagement is recognized as being directly impacted by context (Christenson et al., 2012; Lawson & Lawson, 2013) and, as such, it needs to be studied in specific modalities, such as HyFlex courses. It is also malleable through pedagogy, i.e., through instructors' strategies (Christenson et al., 2012; Kahu, 2013; Lawson & Lawson, 2013). However, little research has been done on HyFlex, and most publications are about accommodating students (Abdelmalak & Parra, 2016), their satisfaction or even their performance in such courses (Lakhal et al., 2014). To the best of our knowledge, only Binnewies and Wang (2019) have attempted to address student engagement and corresponding instructional strategies in a HyFlex course. Though they described some T&L activities to engage students, their results mainly focused on a general assessment and the perceived usefulness of these activities according to students' perceptions rather than measurement of student engagement in the course. Since student engagement depends on the context and is malleable

through instructional strategies, it needs to be addressed in HyFlex courses specifically. To fill this knowledge gap, this study explores students' perceptions about the HyFlex modality in relation to student engagement and corresponding instructional strategies, over two consecutive years.

4. Conceptual background and literature review

4.1 HyFlex courses

The term HyFlex was first introduced by Beatty (2007, 2014) as a combination of Hybrid (i.e., traditional blended in this study) and Flexible (i.e., students' choice of attendance). Beatty (2007) proposed to build a HyFlex course on four main principles: (i) learner choice, (ii) equivalency, (iii) reusability and (iv) accessibility. The first, learner choice, consists of *enabling students to choose a participation mode* (face-to-face, online synchronous or online asynchronous) throughout the semester, i.e., a student can attend the course face-to-face one week and participate online asynchronously another. The second principle refers to *providing equivalent T&L activities for all students*, i.e., activities that "lead to equivalent learning" (Beatty, 2007, p. 3). The author however noted that equivalency does not imply equality: students choosing the online asynchronous mode might, for instance, participate in discussion forums while students attending face-to-face or online synchronously might interact with the instructor in real time. The third principle, reusability, entails that *all T&L activities and resources should be available for all students*, i.e., all documents related to T&L activities, recordings of flexible-synchronous sessions or discussion forums. Finally, the fourth principle consists of providing resources or training (for instance, technological) so that "flexible participation is a real option" (p. 3) for the students.

4.2 Student engagement

Student engagement is a complex and multi-faceted construct that dates back from the 1980s, with studies such as the one of Astin (1984) defining it as "the amount of physical and psychological energy that the student devotes to the academic experience" (p. 518). While the first studies referred to psychological and behavioral dimensions of engagement (e.g., Newmann, 1992; Wehlage et al., 1989), Marks (2000) introduced emotional engagement through students' interest by defining student engagement as "the attention, interest, investment, and efforts students expend in the work of learning" (p. 154-155). These early studies are consistent with current views of student engagement describing it as the investment and energy devoted by student in learning (e.g., Halverson & Graham, 2019), here considered in a course context.

The most widely accepted and prevalent dimensions of student engagement in recent studies in North America are behavioral, emotional and cognitive (Bond et al., 2020; Christenson et al., 2012; Kahu & Nelson, 2018; Lawson & Lawson, 2013; Schindler et al., 2017), for which numerous authors refer to Fredricks et al. (2004, 2016)' three-dimensional psycho-social definition based on a qualitative literature review. In a course, *behavioral engagement* refers to the students' participation in T&L activities, as well as compliance with rules or norms. *Emotional engagement* refers to students' emotional reactions and to their sense of belonging in the course. Finally,

cognitive engagement relates to students' psychological investment in T&L activities in order to master complex content, as well as their use of learning or metacognitive strategies.

However, there are also more broad definitions of student engagement that consider students' participation in decision-making (Buckley, 2018), as partners with instructors and the institution to engage in teaching and learning (Healey et al., 2016). These align with Zepke (2017, 2018) (or earlier work of Reeve, 2012, 2013) arguing for including students' agency into engagement, students "determining their own learning goals" (Zepke, 2017, p. 8) and acting "as partners with others in research and governance of classroom and institutional structure" (p. 12). While the later broad view of student engagement is dominant in the United Kingdom (Buckley, 2018), it would not suit to the context of this study in North America. However, student engagement should be considered from holistic approaches (Tight, 2020) considering that it is a complex construct resulting from interactions between students and context, "within an educational interface at the intersection of the student and their characteristics and background, and the institution and its practices" (Kahu & Nelson, 2018, p. 59). Kahu (2013) or Kahu and Nelson (2018) situated the three behavioral, emotional and cognitive engagement dimensions at the center of a sociocultural framework involving psychosocial (e.g., teaching practices, student skills), structural (e.g., university culture, student family) and sociocultural (e.g., political environment) influences, in which student engagement is connected to both its influences and outcomes. Very recently, Bond and Bedenlier (2019) also proposed a very large bioecological student engagement framework consisting of a multilayer system highlighting the various influences to student engagement.

In this study, we are specifically interested in the microlevel of a course and on instructional strategies that are among Kahu and Nelson (2018)' psychosocial influences of student engagement. We refer to the psycho-social perspective from Fredricks et al. (2004), focusing on behavioral, emotional and cognitive engagement dimensions that are also at the center of previously cited frameworks (Bond & Bedenlier, 2019; Kahu & Nelson, 2018). The psycho-social perspective has the important benefit to distinguish student engagement itself from its antecedents (e.g., individual characteristics, instructional strategies) and consequences (e.g., student performance or retention) (Halverson & Graham, 2019; Kahu, 2013). It has been used to define student engagement by other authors in blended modalities (Henrie et al., 2015; Manwaring et al., 2017) or other technology-mediated environments (Bond et al., 2020; Schindler et al., 2017). Note that no individual or sociocultural influences such as these described by Kahu (2013) or Kahu and Nelson (2018) are considered here. Rather, this study focuses on how instructors can improve "what students do, think and feel […] in instructional settings" (Zepke, 2018, p. 433), for which behavioral, emotional and cognitive engagement are the widely accepted dimensions in the literature (Bond et al., 2020; Fredricks et al., 2016; Reschly & Christenson, 2012).

4.3 Studies on HyFlex courses

While still in uncharted research territory, there have been a few scientific studies on HyFlex courses. Most of these publications investigated student satisfaction with the HyFlex course modality (Abdelmalak & Parra, 2016; Binnewies & Wang, 2019; Kyei-Blankson & Godwyll, 2010; Kyei-Blankson et al., 2014; Lakhal et al., 2014; Miller et al., 2013) or student performance (Lakhal & Khechine, 2016; Miller et al., 2013).

More specifically, Miller et al. (2013) developed and implemented the lecture part of an undergraduate Statistics course in the context of a Hyflex section offered to 161 students. The authors also indicated that their study was the first to discuss the implementation of HyFlex for large courses. Through surveys (n = 69) and a focus group, they compared the HyFlex course section to face-to-face sections of the same course in terms of student satisfaction, learning and performance. Students appreciated the HyFlex modality, especially the flexibility of attendance and being able to replay a lecture recording if they did not understand specific content. However, although students had the opportunity to watch previously recorded lectures, they were all supposed to attend these in real-time (either face-to-face or online synchronously) even if some students did not. Furthermore, students indicated that extra ICT tools (i.e., a polling system and a chat backchannel) enhanced their participation in the course. They also mentioned that ICT increased their interest in and understanding of the course content. Regarding student learning and performance, the results showed that there was no significant difference in terms of learning and grades between students within the HyFlex section and the face-to-face sections of the same course.

Lakhal et al. (2014) conducted a study among students (n = 376) enrolled in an undergraduate information management systems HyFlex course. The study aimed to investigate the equivalence of learning experiences across delivery modes in terms of student satisfaction and academic performance in the course. No significant differences were found between students across modes on satisfaction, multiple choice test, and written exam scores. Nevertheless, significant differences were observed on continuous assessment scores, and the authors suggested that HyFlex courses be further investigated to ensure equivalent T&L activities for all students.

Abdelmalak and Parra (2016) investigated students' perceptions of a HyFlex course at the graduate level in an educational learning technology program. The study, grounded in andragogy principles for adult learners (Knowles, 1995), followed a qualitative approach based on interviews (6 students), observation notes and recordings of flexible-synchronous T&L activities. The results indicated that the HyFlex course made it possible to accommodate students but also learning styles or preferences, which encouraged their choice and sense of control over learning. Students also mentioned that the availability of recordings helped them to keep up with course content if they could not attend the flexible-synchronous T&L activities. Therefore, this study confirmed that HyFlex courses could be the preferred modality for graduate level and adult students despite a small sample size.

4.4 Studies on engagement in HyFlex courses

More recently, Binnewies and Wang (2019) developed an undergraduate Hyflex course on Information Technology, which was offered to 91 students across two campuses. The study explained how their design carefully focused on equitability and student engagement (though they did not define the term "engagement"), which was evaluated through surveys at mid-term (n=66) and end of semester (n=33). Very interestingly, the authors reported having developed short video lectures addressing the same content as flexible-synchronous lectures that were also recorded, since short videos are among the most recommended practices for online asynchronous learning. Therefore, all students had access to multiple versions of lecture course content, thus enhancing their choice and control over learning. To actively engage students in T&L activities, the authors described having embedded reflexive questions in lecture presentations, asked students to use a journal to comment on their learning path, proposed hands-on activities such as problem solving or simulations, and used authentic and peer review assessments. However, the study investigated neither these instructional strategies nor the specificities of the HyFlex modality in relation to student engagement. The results confirmed that most students were satisfied with the HyFlex course, particularly commenting on the usefulness of video clips and recordings that helped them to learn. However, we noted that the results of this study were about students' appreciation of various T&L activities implemented in the course rather than an evaluation of student engagement.

4.5 Specific research questions

While there is a large body of literature about student engagement in either face-to-face or online courses, there are few specific studies about student engagement in traditional blended courses (Halverson et al., 2014), and, to our best knowledge, only one in a HyFlex modality in business education (Binnewies & Wang, 2019), most being situated at the undergraduate level (Taylor et al., 2019). Although these blended modalities are expected to actively engage students over time and space by effectively combining asynchronous and synchronous T&L activities, how student engagement is developed in such modalities is still vague, especially in HyFlex courses. In particular, we know little about instructional strategies fostering student engagement in HyFlex courses. The following research questions are addressed:

1) According to students' perceptions, what components of a HyFlex course modality are related to student engagement?
2) What are effective instructional strategies for fostering the behavioral, emotional and cognitive engagement of students in a HyFlex course?

5. Method

5.1 Course transformation

The Operations course consists of an introduction to the diverse qualitative and quantitative aspects of operations management, e.g., forecasting, project management, waiting lines analysis, quality management, sales and operations planning, inventory management and material requirement planning. Compulsory in most graduate level programs (M.B.A. or M.Sc.), it welcomes 350

students per year, approximatively, in four distinct course sections. A face-to-face course section is offered in the Fall semester, blended and online sections in the Winter, and an online course section in the Summer. The online sections of the course are usually asynchronous, and the number of enrolled students, above a hundred, makes it difficult to sustain effective discussions on the forums. The blended section was initially organized into four full-day face-to-face sessions during a semester (as this initially was standard practice at the faculty), plus online asynchronous T&L activities, mostly text-based. Hence, both in blended and online course sections, the main interactions between students and the instructor consisted of content clarifications in discussion forums. In contrast, the face-to-face course section involved three hours in a classroom per week and allowed much more varied interactions between students and the instructor. Since it is a compulsory course, it also gathers students with very diverse backgrounds. For instance, some students with a more qualitative background (e.g., a communication or law degree) find the quantitative aspects of the course complex and need both time and support to process the content. Furthermore, since a different chapter is covered each week, it is important for students to engage with the course content on a regular basis. Therefore, the course transformation had multiple objectives: enhancing student engagement and support through regular flexible-synchronous sessions as well as providing equivalent T&L activities across course sections. It involved two stages, each responding to one of the above research questions.

5.1.1 New design – stage 1

In Winter 2018, the blended section of the course was transformed to HyFlex by replacing the four full-day face-to-face sessions described above with weekly flexible-synchronous sessions approximately 1.5 hours long. In order to accommodate the largest possible number of students, the sessions were scheduled on Wednesday evenings. At the beginning of the semester, the instructor explained to the students that the flexible-synchronous sessions were devoted to supporting their learning, e.g., synthesizing weekly content, pointing out nuances, clarifying complex topics, incorporating specific content through problem solving and answering questions about content or assignments. The students were thus informed that the flexible-synchronous sessions would not be lectures, and that they were expected to prepare the weekly content through online asynchronous T&L activities. Depending on the specific content, the exact duration of flexible-synchronous sessions would vary slightly from one week to another according to students' questions and needs.

Every week, each student chose to attend the flexible-synchronous session either face-to-face (in a classroom), online synchronously (joining a virtual classroom in Adobe Connect[1]) or asynchronously (watching the session recording). Furthermore, all recordings of flexible-synchronous sessions were placed on the learning management system for the whole semester, enabling students to access them at any time. Out of a total of 51 students in the blended section of the course, between 20 and 25 came in face-to-face every week, while between 6 and 13 students

[1] See https://www.adobe.com/fr/products/adobeconnect/learning.html.

attended the online synchronous sessions (in the virtual classroom). While most other students accessed the session recordings, it is impossible to know who really watched these in full.

To foster interactions between students, teams for collaborative assignments were formed online by the students at the beginning of the semester. In contrast with the initial course design, students were asked to work with the same team for the whole semester. Two face-to-face sessions were also scheduled (in addition to the weekly flexible-synchronous sessions) in the active learning classroom at the faculty. During these sessions, collaborative assignments consisting of case studies were introduced and explained in detail. Then students started working with their teammates while benefitting from the instructor's guidance when needed. The components of the new course design that will be taken into account in the study are: 1) course organization: weekly HyFlex sessions and two face-to-face sessions in teams; 2) follow-up on weekly content in a HyFlex modality (flexible-synchronous sessions); 3) same teams for the whole semester with several collaborative assignments; and 4) two face-to-face sessions devoted to the case studies (collaborative assignments).

5.1.2 New design – stage 2

In Winter 2019, both blended and online sections of the course were converted to HyFlex. Indeed, since the same instructor was in charge of both sections, offering weekly flexible-synchronous sessions to all students seemed the best way to provide equivalent learning experiences. For this reason, the previous face-to-face sessions devoted to the collaborative assignments were also dropped, and both course sections were offered in exactly the same course modality. Out of a total of 168 students (47 in the blended section and 121 in the online section), between 10 and 20 students came in face-to-face each week, while between 30 and 35 students attended the online synchronous sessions. Furthermore, approximatively three quarters of students attending the online synchronous sessions were enrolled in the online course section, showing that the flexible-synchronous sessions were also attractive for students who otherwise would have attended in a completely asynchronous course section.

5.2 Data collection and analysis

5.2.1 Stage 1 – Exploratory qualitative approach

The first stage followed an exploratory qualitative approach, in which students were asked to complete an open-ended questionnaire on a voluntary basis. As a first question, students were asked to link the main components of the new course design with indicators of student engagement. It was also specified that a link should represent a perceived effect of a design component on an indicator, and that there could be none or multiple links between a component and indicators. To ensure neutral responses, indicators were listed without explicitly referring to any dimension of student engagement. A second question asked students to comment on the perceived effects they had identified. Finally, they were asked to share their views about changes or improvements that should be addressed in the course. Out of a total of 51 students, 18 participated in the research

project by filling out the questionnaire (35% participation rate). The data were first analyzed by counting the number of links between each component of the new course design and indicators of student engagement, then grouping indicators referring to the same engagement dimension (behavioral, emotional, cognitive). Next, qualitative data were used to illustrate and triangulate quantitative counts between components of the new course design and the dimensions of student engagement.

5.2.2 Stage 2 – Mixed-method approach

The second stage followed a mixed-method approach with a quantitatively driven concurrent design (Johnson & Christensen, 2017), using a questionnaire with closed and open-ended questions as described below. Out of a total of 168 students, 46 participated in the questionnaire (27% participation rate).

Students were asked to complete a 34-item close-ended questionnaire with a 5-point Likert scale rating their engagement and their perceptions of engagement strategies in the course. A number of 6, 4 and 7 questions measured student behavioral, emotional and cognitive engagement respectively. These questions were inspired by engagement surveys in the literature, e.g., CLASSE (Ouimet & Smallwood, 2005), the Online Student Engagement Scale (Dixson, 2015), the Student Course Engagement Questionnaire (Handelsman et al., 2005), the University Student Engagement Inventory (Maroco et al., 2016), (Alvarez-Bell et al., 2017) and Parent (2017). Only the University Student Engagement Inventory and the Parent (2017) survey referred to dimensions of student engagement. Note that the engagement questions used in this study also served as a starting point for developing a new multidimensional scale of student engagement in blended modalities ([Authors, submitted]). Next, 17 questions rated students' perceptions of the use of instructional strategies in the course, inspired by strategies fostering student engagement in other modalities. Questions were inspired from the above surveys and from those of Bigatel and Edel-Malizia (2018) or Martin and Bolliger (2018). Quantitative data analyses were performed using SPSS 25. First, the reliability and validity of questions related to the three dimensions of student engagement were assessed. Then bivariate correlation and standard multiple regression analyses (Enter method) were performed to highlight effective instructional strategies fostering student engagement (behavioral, emotional, cognitive) in a HyFlex course.

Furthermore, comment boxes were added to all close-ended questions to gather qualitative data from the students in order to explain and enrich the quantitative results. Four open-ended questions were also included at the end of the questionnaire asking students how to foster their active participation (behavioral engagement), affective reactions (emotional engagement), and psychological investment and learning strategy development (cognitive engagement) in the course. The very last question asked students if they would recommend it to another student and why, to gather comments about students' general appraisal of the course. Qualitative data were analyzed using a general inductive approach (Thomas, 2006) and coded in the Nvivo 11 program. First, an

open coding iteration allowed for determining preliminary themes. Next, axial coding was performed to refine categorization and identify emergent themes (Neuman, 2006; Thomas, 2006). The study was approved by the ethical board committee of [Author 1 institution] (number 2018-050 A1).

6. Results

6.1 Research question 1: According to students' perceptions, what components of a HyFlex course modality are related to student engagement?

At stage 1, students were asked to identify components of the new course design having an influence on student engagement (Table 1) and to provide additional comments on the identified links.

Table 1: Links between new course design components and student emotional, behavioral and cognitive engagement, with students' comments

	Emotional engagement	Behavioral engagement	Cognitive engagement
Course organization: weekly HyFlex sessions and 2 face-to-face sessions	14*	18	10
	"The course organization with support sessions allows us to better keep up with the content and be more involved, and it is really motivating for a blended course. This makes it easier to learn the content"		
	"the course organization is very positive. [Otherwise] I would tend to leave study aside, even forget things until the last minute and then be late"		
Follow-up on weekly content in a HyFlex modality (flexible-synchronous sessions)	11	13	10
	"it's stimulating because it enables us to learn the content little by little rather than in an indigestible way"		
	"support sessions allow us to interact with the instructor, ask questions and benefit from questions asked by other students"		
	"having the virtual classes to review at our disposal is very constructive, it allows us to review the concepts when our minds are well rested and can better understand them".		
Same teams for the whole semester with several collaborative assignments	12	4	7
	"develop relationships with teammates who we meet more regularly"		
	"staying with the same group [of students] for all case studies improves team organization"		
Two face-to-face sessions devoted to the case studies (collaborative assignments)	7	18	15

* Numbers are counts of the links between course components and indicators of the dimensions of student engagement, over a total of 18 participants

First, the results suggested that the *weekly HyFlex sessions* have a considerable influence on student behavioral engagement, followed by emotional engagement and cognitive engagement in the course. Students also suggested that the course organization supported their *continuous behavioral engagement in the course*. As for the students who synchronously attended the HyFlex sessions (online or face-to-face), they appreciated the *ability to interact with the instructor and other students*. The *recordings* also fostered their cognitive engagement, one student even commenting that all course sessions (even in a face-to-face course) should be recorded to better support their learning. With regard to collaborative assignments, the fact that students had to stay with the *same team for the whole semester* mostly enhanced their emotional engagement and had a smaller influence on their cognitive engagement in the course. The results also suggested that the two face-to-face sessions devoted to the case studies had a substantial influence on both behavioral and cognitive engagement of students and a smaller influence on their emotional engagement in the course, although almost none students commented on these.

6.2 Research question 2: What are effective instructional strategies for fostering behavioral, emotional and cognitive engagement of students in a HyFlex course?

At stage 2, the goal of the study was to highlight effective instructional strategies to foster student engagement in a HyFlex course.

6.2.1 Quantitative results at stage 2

After preliminary analyses of internal consistency for each student engagement dimension resulting in the exclusion of two items, Cronbach's α were 0.77 for behavioral engagement (5 items), 0.78 for emotional engagement (4 items) and 0.85 for cognitive engagement (6 items), all above the threshold level of 0.70 showing good reliability (Tabachnick & Fidell, 2007). For all subsequent analyses, a single variable was then created for each engagement dimension by computing the mean score of related items. Correlations between the resulting behavioral, emotional and cognitive engagement variables are presented in Table 2 and were all significant ($p<0.01$).

Table 2: Correlations between engagement variables

	Behavioral	Emotional	Cognitive
Behavioral	1		
Emotional	0.51	1	
Cognitive	0.58	0.80	1

Then, correlations between instructional strategies and engagement variables were computed and are presented in Table 3. Significant correlations ($p<0.01$) were moderate to large, ranging from 0.38 to 0.69. For *behavioral engagement* of students, the largest correlations were with *open and trustful interactions* (S17; r = 0.69) and *learning support* (S13; r = 0.60). Regarding *emotional*

engagement, the largest correlations were with *links with practice* (S9; r = 0.68), *instructor's facilitation role* (S15; r = 0.67) and *learning support* (r = 0.66). Finally, for *cognitive engagement*, the largest correlations were with *links with practice* (r = 0.69), *instructor's facilitation role* (r = 0.65) and *learning support* (r = 0.62). Bivariate correlations between engagement strategies were also computed. Significant correlations were moderate to large, ranging from 0.30 to 0.73.

Table 3: Correlations between instructional strategies (S) and engagement variables

	Behavioral	Emotional	Cognitive
S1 Course structure and organization were [poor; low quality; fair quality; good quality; excellent]	0.46	0.49	0.47
S2 Course objectives and requirements were communicated [very unclearly; unclearly; somewhat clearly; clearly; very clearly]	n.s.*	n.s.	n.s.
S3 Instructions for T&L activities were communicated [very unclearly; unclearly; somewhat clearly; clearly; very clearly]	0.43	0.46	0.38
S4 Instructor's feedback was [poor; low quality; fair quality; good quality; excellent]	n.s.	0.41	0.47
S5 Instructor's feedback was [very infrequent; infrequent; variable frequency; frequent; very frequent]	0.45	0.48	0.53
S6 Choices regarding course resources were provided [strongly disagree; disagree; neutral; agree; strongly agree]	0.40	0.44	0.46
S7 You felt autonomous in your learning [strongly disagree; disagree; neutral; agree; strongly agree]	n.s.	0.43	0.43
S8 Requirement level for this course was [very high; high; moderate; low; very low]	n.s.	n.s.	n.s.
S9 Links with practice were [very infrequent; infrequent; variable frequency; frequent; very frequent]	n.s.	0.68	0.69
S10 Interactive technologies (virtual classes, video recordings, forums, etc.) were [seldom useful; little useful; somewhat useful; useful; very useful]	0.40	0.39	0.39
S11 Variety of activities was [not at all adequate; not adequate; somewhat adequate; adequate; very adequate]	n.s.	0.50	0.54
S12 Instructor's attitude (ways of communicating, welcome, caring) was [not at all adequate; not adequate; somewhat adequate; adequate; very adequate]	n.s.	0.49	0.45
S13 You felt supported in your learning [strongly disagree; disagree; neutral; agree; strongly agree]	0.60	0.66	0.62
S14 You developed relationships (personal or professional) with other students [strongly disagree; disagree; neutral; agree; strongly agree]	n.s.	0.44	0.54

S15 Instructor had a guiding role (in your learning, to help you clarify your thoughts) [strongly disagree; disagree; neutral; agree; strongly agree]	0.49	0.67	0.65
S16 Online communication allowed for social interaction [strongly disagree; disagree; neutral; agree; strongly agree]	n.s.	n.s.	0.51
S17 You felt comfortable interacting (in-class or online) [strongly disagree; disagree; neutral; agree; strongly agree]	0.69	0.51	0.49

*n.s.: not significant

Next, multiple regression analyses were performed to evaluate which instructional strategies were the most important to foster each dimension of student engagement. Given the sample size (n = 46), regression models were built on two or three independent variables, according to the strongest correlations ($r \geq 0.60$) described above. Then non-significant variables (i.e., with p-value above 0.05) were removed. Significant regression models ($p < 0.01$) are presented in Table 4.

Table 4: Significant regression models for engagement variables explained by instructional strategies

	Adjusted R^2	F	Independent variables	Standard β	p-value
Behavioral	45.9%	39.24	Open and trustful interactions	0.69	0.000
Emotional	56.2%	29.83	Links with practice	0.46	0.000
			Learning support	0.42	0.001
Cognitive	54.8%	28.24	Links with practice	0.47	0.001
			Instructor's facilitation role	0.38	0.004
Cognitive	54.8%	28.24	Links with practice	0.50	0.000
			Learning support	0.36	0.004

According to multiple regression analyses, the most important strategies were open and trustful interactions fostering behavioral engagement, links with practice and learning support for emotional or cognitive engagement, as well as links with practice and instructor's facilitation role for cognitive engagement.

6.2.2 Qualitative results at stage 2

Qualitative data and analyses at stage 2 confirmed the most important components of a HyFlex modality that can be associated with engagement of students, according to their perceptions.

By allowing *flexible participation*, the HyFlex course fostered behavioral engagement of students, which in turn generated positive affective reactions and thus emotional engagement. Students noted "I was able to follow the content at times that were appropriate for me, which is very convenient

with work, family, life, etc." and "the course structure allowed us to go at our own pace, which is ideal given the realities of the work/study (and family!) balance". *Recordings of flexible-synchronous sessions* also helped enhance behavioral and cognitive engagement of students. They mentioned that "sometimes during a course, we lack time to take notes and to assimilate content simultaneously. Being able to review the course online by watching the recordings gives us a chance to catch up, validate and take up the content when well rested, at our own pace and without distractions". Also, students indicated that such recordings were very useful since they allowed them to "capture the instructor's annotations while listening to clarifications or comments. This allowed us to listen again to the explanations until we had a better understanding of some specific content we could not master before", helping then to master complex course content.

Next, students commented on the *instructor's facilitation role* throughout the semester. They indicated that "the instructor's response time on the discussion forums makes it easy to follow the course remotely", suggesting that the instructor's immediacy fostered their behavioral engagement in the course. They also mentioned the variety of communication channels and commented that "the instructor's ways of communicating have a very positive effect on our ability to follow and understand the course", implying that the instructor's facilitation role through diverse media enhanced their cognitive engagement in the course. Regarding *learning support*, students commented extensively about the usefulness of flexible-synchronous sessions. They stated, "I wouldn't have seen myself go through the course without the virtual sessions. The instructor enlightened me on several concepts", suggesting that they enhanced both cognitive and emotional engagement (through positive affective reactions) of students. They also appreciated such *regular interaction opportunities* as a means of asking questions, which thus fostered their behavioral engagement. They mentioned, "The instructor gave feedback on activities and made sure to answer everyone's questions", as well as "we always have answers to our questions and it's very clear".

Finally, some students commented that interaction opportunities during collaborative assignments or in discussion forums helped develop a sense of learning community in the course, thus fostering emotional engagement of students. Some students also noted that "our team worked remotely but we supported and helped each other, I really like this format".

7. Discussion

This study explored students' perceptions about a HyFlex modality in relation to student engagement. Both qualitative and quantitative data were collected through questionnaires for two consecutive years. It adds to the sparse literature about student engagement in blended or HyFlex modalities (Taylor et al., 2019). This study brings a new perspective by highlighting strategies to foster student engagement in a HyFlex course. First, components of the new HyFlex modality that were related to student engagement were highlighted and illustrated by students' comments. Next, effective instructional strategies fostering behavioral, emotional and cognitive engagement of students in a HyFlex course were identified and commented on, according to students' perceptions.

First, the results suggested that the flexible participation in weekly support sessions and the availability of session recordings in the new HyFlex modality fostered engagement of students. By accommodating students' needs or preferences (Abdelmalak & Parra, 2016; Binnewies & Wang, 2019), it enhanced their behavioral engagement. By increasing their choice and control in learning (Abdelmalak & Parra, 2016; Lakhal et al., 2014), it also stimulated both their emotional and cognitive engagement. In line with Binnewies and Wang (2019), the overlap between flexible-synchronous sessions and recordings means that students could make use of both, for instance participating in a face-to-face session and then watching the online recordings for reviewing before an exam. This also echoes the results of other studies in blended or online courses in which students revealed using online recordings for several purposes, among which more in-depth learning (Evans, 2008; Khechine et al., 2013; Morris et al., 2019). Although instructors can be reluctant to make such recordings available for fear that students would no longer attend synchronous sessions, a careful reflection would be carried out to weigh up potential benefits and drawbacks (Morris et al., 2019).

Furthermore, the results suggested that the weekly opportunities for interaction between students and with the instructor (through the flexible-synchronous sessions) promoted a continuous engagement of students in the course, in line with Watts (2016) who reported that students feel more engaged in an online course when they have synchronous interaction opportunities. The results also suggested that students felt at ease communicating and interacting in the course, which fostered their behavioral engagement. Regular interactions between students and the instructor also enhanced the continuity between online asynchronous and flexible-synchronous sessions. Indeed, the content prepared in online asynchronous T&L activities could be reintegrated in the flexible-synchronous sessions, increasing opportunities for clarifications or content deepening. This echoes Angelino et al. (2007), who stressed on "engaging students as early as possible and keeping them engaged" (p. 9) as a key to enhancing the learning process. The instructor's facilitation role as well as learning support, more generally, fostered cognitive engagement of students by helping them to master complex course content. While engaging students in online asynchronous T&L activities can be delicate, interaction opportunities through diverse media along the semester supported students' learning. Indeed, effective communications between students and the instructor ease students' pathway (Ladyshewsky, 2013; Robinson et al., 2017) and promote their cognitive engagement.

Finally, links with practice were reported to enhance emotional and cognitive engagement of students in quantitative results, although no students commented on that. Even though this could appear an obvious finding in business education, the need to link course content with professional practice and to provide concrete examples, both synchronously and asynchronously, should be emphasized, in line with Binnewies and Wang (2019) or [Authors, submitted2]. This helps students to relate to the course on an emotional level, positive reactions fostering their psychological

investment in learning, thus promoting emotional and cognitive engagement of students in the course. Especially, [Authors, submitted2] found that providing concrete examples to link content with professional or personal life of students in online asynchronous T&L activities, where students have to be autonomous in learning, promoted their emotional and cognitive engagement.

8. Conclusion

Following the transformation of online and blended sections of a graduate level course in operations management into a HyFlex modality over two consecutive years, this study investigated student engagement and effective engagement strategies in the HyFlex course. Exploratory qualitative data collected at year 1 suggested that the course organization with weekly flexible-synchronous activities, which included regular opportunities for interaction and were video-recorded, fostered student engagement and supported them in their learning. Next, engagement strategies were identified at year 2 using both quantitative and qualitative data. The results showed that the most effective strategies were open and trustful interactions for behavioral engagement of students, links with practice and learning support for emotional engagement, as well as links with practice, learning support and instructor's facilitation role for cognitive engagement.

Mainly, the study shows that HyFlex is a promising modality for fostering student engagement at the graduate level, including with large groups. Indeed, flexible-synchronous sessions combined with online asynchronous T&L activities brings lots of flexibility for students while benefitting from guiding in learning from the instructor. In large-group business courses, especially, a HyFlex modality helps optimize engagement of students with very diverse academic backgrounds through supporting them by means of regular flexible-synchronous sessions. When multiple course sections are offered including a face-to-face section, a HyFlex modality also promotes equivalent experiences for all students by including interaction opportunities between students and with the instructor. This study provides important new perspectives for business faculties, especially in operations management education. Implementing regular flexible-synchronous sessions, in particular, is a promising avenue in business education. As a potential avenue for future research, interviewing students would help better understand how engagement can further be fostered in a HyFlex course modality.

In spite of the promising results offered by this study, it had some limitations. First, the participation rates were below 50% of students in both stages. Although we would have liked to receive more input from the students, the results enabled us to draw interesting conclusions about student engagement in a HyFlex course modality. In particular, instructional strategies fostering student engagement were highlighted and offer up new research avenues in this modality. Next, qualitative data were obtained through open-ended questions in a survey as opposed to interviews, which limits their richness and depth. However, the questions did prompt insightful comments from the students that allowed us to relate components of the HyFlex course to student engagement.

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[Authors, submitted2]

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