Measuring Student Engagement in a HyFlex Environment

Dr. Elaine B. Bohórquez[1], Dr. Sarah Khan[2], Dr. Lina Battestilli[3] and Dr. April Fogleman[4]

[1]Teaching Associate Professor, North Carolina State University
[2]Teaching Associate Professor, North Carolina State University
[3]Associate Teaching Professor, North Carolina State University
[4]Associate Professor, North Carolina State University

Abstract

Technology in higher education continually evolves. Covid-19 revealed an increasing need for flexibility in academics. HyFlex instruction afforded such flexibility and centres on the learner, providing choices to engage students. Previous studies suggest that HyFlex promotes student retention, yet little has been studied on how effective HyFlex has been for the students. During spring 2022, we surveyed 633 university students in courses employing HyFlex learning. The study included undergraduate and graduate students and spanned 6 separate courses in 3 colleges across disciplines, including business management, computer science, nutrition, and physiology. Survey topics included student perceptions of course content and learning technologies, stress related to academics and Covid-19, student engagement and self-directed learning, and overall satisfaction with the course. We found that students whose learning was driven by performance preferred in-person learning over asynchronous options, yet these performance-driven students earned significantly lower grades. Relating student engagement with course resource usage and grade outcomes in HyFlex can guide instructors on adapting current course structures to enhance student engagement and overall perceptions of the course.

Keywords: HyFlex, Hybrid Flexible, engagement, student performance

Summary

HyFlex, for Hybrid Flexible, is a learner-centred model that combines online asynchronous, online synchronous, and in-person learning options with students at the helm. The fundamentals of HyFlex include learner choice, equivalency, reusability, and accessibility (Beatty, 2019), allowing students to be the designers of the learning pedagogy that fits their needs. Students have their choice of modalities and can change learning modes during course progression without compromising academic goals and integrity. In effect, HyFlex allows students to customise their learning experience based on what best suits their personal needs. The HyFlex structure also provided much needed flexibility for students to mitigate education

disruptions in the post-pandemic return to campus (Ho et al., 2023). Previous studies have shown that HyFlex courses have a higher rate of student retention than online or asynchronous courses (Rosen, 2021; Samuel et al., 2023), suggesting that this flexibility positively influences student success. Yet, there are few studies that explore how effective HyFlex learning has been for students.

In this study, we investigate the relationship between the HyFlex course structure and how students engaged with course content to determine how flexibility in academics affects the student experience.

Project Background

At the start of the 2021/22 academic year, instructors and students alike were uncertain about returning to campus in light of the prevailing Covid-19 cases. A fundamental challenge for instructors was to design courses to maintain learning outcomes without compromising the wellbeing of the students. For several faculty, HyFlex provided the answer. Student feedback for autumn 2021 showed that students responded well to HyFlex instruction, which motivated us to study HyFlex design further. In spring 2022, we launched a study to explore the effects of HyFlex on student satisfaction, course performance, and engagement.

Student engagement is a multidimensional phenomenon that refers to the diversity of student activities inside a classroom and across campus and reflects their involvement with peers, instructors, classes, and the institution (Groccia, 2018; Rosen, 2021; Ma and Lee, 2021). Because greater engagement is known to enhance learning (Martin and Bolliger, 2018), we were eager to measure engagement within the context of HyFlex courses. Previous HyFlex studies centred on academic achievement and student satisfaction (Binnewies and Wang, 2019; Ma and Lee, 2021) with little research on engagement. The lack of empirical studies motivated us to investigate engagement in HyFlex courses.

A challenge to understanding engagement in HyFlex revolves around the nature of the HyFlex format. When students have the flexibility to change learning modes as needed, it begs the question: do all modalities of instruction contribute equally to student engagement with the course?

Discussion

HyFlex provides learning equity for students based on their learning preferences. Student engagement has a significant impact on student satisfaction, motivation to learn, and academic performance (Martin and Bolliger, 2018). In this study, we focused on answering the following research questions: (RQ1) Which learning modality affects student engagement in a HyFlex setting? (RQ2) How does student engagement affect course performance in a HyFlex setting? And (RQ3) Does student engagement affect course satisfaction in a HyFlex setting? A popular instrument used to measure engagement is the Student Course Engagement Questionnaire

(SCEQ) (Handelsman et al., 2005; Masland et al., 2022), which has also been modified to measure engagement specifically in online courses (Nasir et al., 2020). We chose to explore SCEQ and its modifications to determine a valid measure of student engagement in a HyFlex setting. We used 15 HyFlex course satisfaction items from Lakhal et al. (2014) and added two items from the ARCS model (Ma and Lee, 2021) to measure the course satisfaction. Since we modified this scale, we conducted the Exploratory Factor Analysis. Visual inspection of the scree plot indicated one factor with eigenvalue greater than one. We also considered the amount of variance explained by this extracted factor, their interpretability, and the cleanness of structure as defined by fewest cross loadings and item loadings above .40 (Costello and Osborne, 2005). We saved the factor loading as regression weights since we used direct oblimin rotation for the factor analysis. For oblique rotations, regression method is recommended (UCLA, 2023).

The study explored the impact of student engagement in 3 areas: student performance, choice of learning modality, and overall course satisfaction. Four dimensions of engagement were measured: interactive, performance, skills, and emotional. Table 1 outlines example survey questions for each engagement type.

Table 1: Example survey questions using a Likert scale of 1-5 for the statement: "In this course, to what extent do the following behaviours, thoughts, and feelings describe you?

Engagement types	Example survey questions
Interactive	• Doing all homework and/or class prep work. • Attending class regularly or logging on to the class web page regularly • Reviewing class notes between classes to make sure I understand the material
Performance	• Getting a good grade • Doing well on the tests/assessments • Going to the professor's office hours or contacting him/her to review assignments or tests or to ask questions
Skills	• Being confident that I can learn and do well in the class. • Participating actively in a small group or discussion board discussions/ activities • Raising my hand or answering questions in class
Emotional	• Really desiring to learn the course material • Finding ways to make the course material relevant to my life • Applying course material practically when possible

We recruited participants from six different courses at both undergraduate and graduate levels. The study employed convenience sampling and, therefore, was not random. We targeted 633 students in total and received 537 usable responses, making our consent rate 84.83%. Self-reported demographic information from respondents showed that a majority were within the age range of 18-24 years (86.6%), were enrolled as full-time students (94.85%), and spoke English as their first language (94.2%). Gender distribution was as follows: 56.6% identified as male, 40.8% identified as female, and 1.5% identified as non-binary. We also surveyed students about their proximity to campus, which revealed that 45.6% of respondents lived on campus versus 54.5% lived off campus with a typical commute time of less than 30 minutes (91.3%).

Table 2: Surveyed Courses

College	Course	Level	# responses (% of total respondents)	Course Structure
Engineering	Intro. Computing MATLAB	Undergraduate (1st year)	246 (45.8%)	Flipped Course In-person labs In-person exams
Management	Information Systems Management	Undergraduate (3rd year)	53 (9.9%)	Flipped Course Online exams
Management	Systems Analysis and Design	Undergraduate (4th year)	57 (10.6%)	Flipped Course In-person exams
Agriculture & Life Sciences	Public Health Nutrition	Undergraduate (3rd year)	37 (7.1%)	Online exams
Agriculture & Life Sciences	Maternal & Infant Nutrition	Undergraduate (4th year)	42 (7.6%)	Online exams
Agriculture & Life Sciences	General Physiology II	Graduate (Masters)	102 (19%)	Flipped Course In-person exams

Outcomes and Impact

To answer RQ1, we explored trends in modality choices among students, shown in Table 3. Of the 3 primary modalities (e.g., in-person, Zoom, and asynchronous), we found that students perceived asynchronous learning as more important and effective than attending class in-person or via Zoom. Additionally, there was a difference between academic levels: graduate students reported higher usage of asynchronous resources (93.6%) than undergraduates (72.5%). Undergraduates used Zoom more

than twice as often as graduate students (59.6% vs. 28.7%, respectively). Graduate students utilised in-person learning less frequently, with 32% reportedly never attending class in-person compared with 11% for undergraduates. These results suggest that modalities' usage is affected by academic levels in which undergraduates appear to be more likely to choose real-time learning, perhaps due to graduate students having outside responsibilities requiring flexibility whereas undergraduates may be seeking the college experience by attending class in real-time.

Table 3: Items used to measure learning modality and instructional support usage on a scale of 1 = "never used" to 5 = "frequently used".

Modality/ Support	Item
Online Delivery	My usage of the online Zoom sessions during this course has been…
In-Person Delivery	During this course, my usage of the in-person class sessions has been…
Asynchronous Delivery	During this course, my usage of the learning resources, such as class recordings, pre-recorded lecture videos, readings and other materials, has been…
Flexibility to Choose	During this course, my usage of choosing between different class content delivery methods (Zoom, in-person, recordings) has been...
Instructor Access	During this course, my usage of the instructor/teaching staff access has been…
Help Resources Access	During this course, my usage of the student help resources (e.g., online forum, virtual office hours, review/practical sessions) has been...

Learning modality choice varies with engagement types (Table 4). Students preferring asynchronous methods, including usage of help resources and instructor access, had greater skill, interactive, and emotional engagement with the course, meaning they were more likely to keep up with course materials, seek out help when needed, and had a strong desire to learn the content.

Students preferring real-time modalities reported lower emotional and skills engagement but higher performance engagement (e.g., "I can do well in this course"), suggesting that real-time interactions with the course and instructor contributes to students' confidence in their ability to perform well in the course.

Although individual modality usage did not impact course grades significantly, it is possible that students utilised a combination of modalities throughout the semester. It would be worthwhile to explore the impact of various combinations on course grades to determine if interaction effects yield significant results.

Table 4: Student engagement type predicts their perceptions of the usefulness of different learning modalities.

	Learning Modalities and Resources					
	Online	**In-Person**	**Flexibility**	**Asynch.**	**Instructor Access**	**Help Resources**
Interactive Engagement	0.027	0.061	-0.017	0.084**	0.249***	0.208***
Performance Engagement	0.036	0.139***	0.046	-0.09*	-0.082	0.028
Skills Engagement	-0.028	-0.082*	-0.013	0.299***	0.13***	0.172***
Emotional Engagement	-0.109**	-0.109**	0.033	0.216***	0.087*	0.143***

***$P < 0.01$
**$P < 0.05$
*$P < 0.10$

For the relationship between student engagement and overall performance (RQ2), we found that students who reported higher performance engagement earned significantly lower course grades, yet interactive, skills, and emotional engagement types did not significantly impact overall course grades (Table 5). These results suggest that performance-driven students may be overconfident in a HyFlex setting.

Lastly, we found that course satisfaction is significantly increased when student engagement (RQ3) is driven by skills and emotion (Table 5). These engagement types may indicate greater intrinsic motivation and could explain their higher satisfaction with the HyFlex structure in which students take charge of how they utilise course options.

Table 5: Students' overall grades and course satisfaction are affected by their engagement with a course.

	Interactive Engagement	**Performance Engagement**	**Skills Engagement**	**Emotional Engagement**
Satisfaction	0.014	-0.342***	0.09*	0.328***
Course Grade	-0.049	-0.283***	0.081	-0.026

***$P < 0.01$
**$P < 0.05$
*$P < 0.10$

There appears to be a gap between how students think they are doing versus how they actually performed in HyFlex courses. Instructors can help to bridge this gap by

providing timely feedback and managing student expectations by communicating the potential benefits of engaging with course content through different modalities.

Conclusion

This study provides intriguing insights into the impact of engagement on students' overall experience in higher education courses. Real-time learning modalities are preferred by students who are focused on their performance in the class yet these same students report having a lower desire to learn and to study on a regular basis. Students who utilise asynchronous learning report a greater active participation and confidence in their ability to learn. The distribution of engagement types across learning modalities offered in a HyFlex setting suggests that relying on one learning modality exclusively may not be sufficient to engage all students in a course.

Although HyFlex instruction allows students to be the designers of their learning methods in a course, we lack a deeper understanding of how it impacts their engagement. To promote student engagement in HyFlex courses, it is imperative to consider how different types of engagement impact the way students utilise various elements of the course and how that engagement translates to objective metrics, such as overall course grade. HyFlex focuses on the perspective that increased flexibility in the learning environment is advantageous to students. Our findings indicate that the benefits of this flexibility for students are not universal. Rather, it depends not only on student preferences but also perhaps outside factors that contribute to their decision-making for choosing learning modalities. By providing students with guidelines for how various modalities relate to course grade and student perception at the start of the course, instructors can inform students on which modalities and resources would support their individual learning goals.

An essential aspect of HyFlex is instructor access. For students who rely on asynchronous learning, instructor access carries the added importance of supporting students outside of the classroom to ensure that learning goals are not missed. Instructors who choose to employ HyFlex, therefore, should take this into consideration when developing the course construct for each learning modality. Indeed, it should be noted that each of the instructors for the courses surveyed in this study made themselves accessible through various avenues to support students as they progressed through the course, regardless of the learning modality they used.

HyFlex offers students the flexibility to opt for the learning modality that best fits their lifestyle and learning goals. To ensure that students get the most out of a HyFlex course, not only must learning modalities be comparable in their execution but students should be encouraged to explore multiple learning options and informed about how different modalities may relate to individual course outcomes. HyFlex has the potential to promote student engagement in each of the 4 dimensions studied, provided that the impact of each learning modality and course resource is communicated to the students at the outset.

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