IMPLEMENTING HYFLEX IN TEAM-BASED LEARNING: A CASE STUDY IN UNDERGRADUATE BIOLOGY

Introduction

Hybrid-Flexible (HyFlex) instruction offers students multiple options for how they "attend" class and typically include face-to-face, synchronous online, and asynchronous online participation. While this flexibility supports student autonomy, providing all three options can introduce cognitive load and decision fatigue (Athens, 2023; Morrison et al., 2025). Despite this, students consistently report valuing the flexibility that HyFlex models provide (Adeel et al., 2023; Athens, 2023; Bockorny et al., 2024; Yang et al., 2024; Morrison et al., 2025).

Most existing research on HyFlex learning focuses on lecture-based courses, particularly those offering synchronous online options or lecture recordings as asynchronous alternatives (Athens, 2023; Bockorny et al., 2024; Yang et al., 2024; Malczyk, 2019). A few studies have examined student experiences in interactive or discussion-based HyFlex formats (Adeel et al., 2023), but little is known about how they operate in team-based learning courses.

There is some evidence that teams can function effectively in HyFlex environments (Magana et al., 2022), and that team-based formats generally promote better attendance than lecture-based courses in traditional settings (Jakobsen et al., 2014). However, research directly examining the impact of teamwork on attendance in HyFlex contexts remains scarce. Students often identify scheduling flexibility as a top priority in course delivery formats (Adeel et al., 2023), and some even prefer asynchronous or in-person options over synchronous online learning (Malczyk, 2019). These findings suggest that when designed thoughtfully, asynchronous alternatives in team-based courses may still meet students' needs.

Notably, many HyFlex models are implemented with unlimited flexibility (Adeel et al., 2023; Bockorny et al., 2024; Yang et al., 2024), but structured policies with boundaries may be more effective in preserving engagement. The present study explores how undergraduate students in a large, team-based undergraduate biology course responded to a bounded flexibility HyFlex policy that allowed them to miss up to three class sessions and complete asynchronous make-up work instead.

This study analyzes participation behavior to better understand how students used this flexible structure and whether their teamwork preferences or satisfaction influenced that behavior. The research questions guiding this work are:

1. *To what extent did students use the option to miss class and complete the asynchronous makeup assignment?*
2. *To what extent do students' initial collaboration preferences and end-of-semester team satisfaction relate to their use of the asynchronous make-up assignment?*
3. *Which patterns emerged in student attendance and use of the asynchronous make-up option over the course of the semester?*

Research Design

Below, I describe the setup of the course, the HyFlex policy, and data collection and analysis.

Class Structure and Team-Based Learning

Applications of Biomedical Sciences is a general education biology course for undergraduate non-science majors, primarily first-year students. This study included two sections, totaling 291 students. The class met once weekly on Mondays for 80 minutes (12 class periods); all other coursework was asynchronous. Class sessions were structured around team-based activities, with brief instructor-led introductions and wrap-ups. Most of them were case studies, but some were team-based debates.

Students were assigned to permanent teams of six using CATME, which uses surveys to form teams and provide feedback. Each section had about 25 teams. Teams remained fixed throughout

the semester. In-class work was completed collaboratively in shared Google Docs that were monitored by a teaching assistant for completion.

In addition to weekly teamwork, each team delivered one collaborative presentation. For a separate course project, students could work individually or with a teammate. Participation was graded individually each week. Paired students received the same project grade.

HyFlex Participation Policy

Students could miss up to three of the 12 class sessions and still earn full participation credit by completing an asynchronous makeup assignment. One participation grade was dropped, so students were not required to make up every missed class. Full credit was awarded for either attending class or completing the makeup assignment. While some students earned partial credit (e.g., late arrival or incomplete makeups), this study examines who earned any credit per class.

Makeup assignments mirrored in-class activities. On case study days, students completed an instructor-designed H5P module over the same case study, including video-based questions, interactives, and an infographic. On debate days, students debated a generative AI opponent (see author, in press). Those uncomfortable with AI could request an essay-based alternative. Assignments were submitted via the learning management system (D2L) and due the day after class; instructions stated that students could request extensions, which were always granted, including through the end of the semester in exceptional cases.

Although the syllabus specified a three-make-up limit, this was not strictly enforced. Students who requested additional make-ups were allowed to complete them (the instructor did not track approvals). The cap was designed to maintain team-based collaboration. Students also completed three CATME peer-feedback surveys with structured reflections.

Data Collection and Analysis

I collected data for all enrolled students (N = 291), including: number of class sessions missed, number of makeup assignments completed, number of participation zeroes (before and after the drop), final course grade (4.0 scale), and grade excluding participation. While course grade did not relate to the research questions, I included it to order students in the heat map. I also extracted CATME data on students' course project collaboration preferences before they were assigned to teams and end-of-semester team satisfaction scores, calculated as the mean of three Likert-style items. For the heat map and chi-square tests of independence (completed in Microsoft® Excel), I rounded the scores to the nearest whole number. All expected cell frequencies were greater than 1 and most were 5, which generally meets the test assumptions.

Results

Results are described below per research question.

Research Question #1: Class Absences and Makeup Work

Seventy-two percent of students (n = 210) earned full participation credit (students could miss up to one class period; see Table 1). Of those students, 61% (n = 130) did not need to complete any makeup work to earn full credit. Eighty-six percent (n = 251) stayed within the HyFlex policy limit of making up no more than 3 class periods. Most students who exceeded the limit did so by just one (10%; n = 29) or two (2%; n = 6) additional make-up activities. While these were typically instructor-approved, they were not formally tracked. Five students who exceeded the limit by more than two sessions did so under special arrangements.

Despite the policy to drop the lowest participation score, many students still completed make-up work for all missed class sessions. Among students who missed one class (n = 76), all but two students did the makeup activity for the missed class, among those who missed two classes (n = 57), all but 10 completed both, and similarly for those who missed three.

Table 1. Number of students by class absences, make-up completions, and participation zeros. Final two columns reflect totals after dropping each student's lowest score (per policy).

Number of Class Periods	Absences (# of students)	Make-up Activities (# of students)*	Participation Zeros (# of students)	Absences (after one drop)	Participation Zeros (after one drop)
zero	54	56	108	130	210
one	76	87	102	57	38
two	57	60	38	38	22
three	38	48	22	23	9
four	23	29	9	24	3
five	24	6	3	10	4
six	10	3	4	1	2
seven	1	1	2	4	0
Eight or more	8	1	3	4	3

*For chi-square tests, four through eight were combined.

Research Question #2: Impact of Teamwork Perceptions

To explore whether students' collaboration attitudes influenced their use of the make-up option, I grouped students based on their initial course project preference: working individually (n = 65), with a partner (n = 102), no preference (n =77), or no response (n = 48). As shown in the heat map (Figure 1) and the statistical analyses ($\chi^2(9, N = 195) = 5.84$, $p = 0.44$, excluding "no response"), variation in makeup activities was not impacted by these preferences.

I also examined team satisfaction at the end of the semester, which was high, averaging 4.39 out of 5 (SD = 0.76). I did not observe any consistent trends in make-up usage ($\chi^2(6, N = 198) = 8.70$, $p = 0.47$, combining scores 1 and 2 and excluding "no response"). Of the two students who gave the lowest score (1), one missed two classes, the other missed three, and both made up two. Among the five students who rated their satisfaction as a two, class absences ranged from 1 to 6 and varied in how many corresponding make-up activities they completed.

Research Question #3: Patterns in Attendance and Makeup Work

Student absences ranged from 7 to 27% (Figure 2). The first class had the lowest absence rate, and attendance fluctuated modestly across the semester. Higher absence rates appear to align with external events on some Mondays, including the day after spring break, St. Patrick's Day, the Monday following Easter, and one of the first warm spring days.

No strong pattern emerged between absence rates and participation zeros. Some high-absence days showed more missed make-ups, but not consistently. Each debate makeup assignment (weeks 3, 5, 8, 10, 12; Figure 2) appears to be completed more often than the makeup assignment for the previous class period, possibly due to the shorter AI-based makeup task. In contrast, H5P-based assignments used for other sessions may have required more time and effort.

Discussion

This study examined how undergraduate students in a large team-based course utilize a HyFlex asynchronous option for in-class activities. As seen in prior work (Athens, 2023), most students used this option at least once and within the policy's limit of three make-ups. Timing likely played a greater role in participation decisions than team-related attitudes. Usage peaked around specific calendar events (e.g., post–spring break and holidays) rather than steadily increasing, as previously observed (Athens, 2023).

Students' initial collaboration preferences and end-of-semester team satisfaction scores did not appear to influence whether they used the asynchronous option, even though a common

complaint of HyFlex learning is the lack of peer-to-peer connection (Morrison et al., 2025). However, it remains unclear whether students attended class primarily due to the collaborative format, although students tend to prefer HyFlex modes that offer some sort of collaboration (Bockorny et al., 2024). The design of the asynchronous assignments, which required individual effort, may have created a higher workload than attending in-person sessions.

The option to drop the lowest participation grade added complexity to interpreting attendance behaviors. While some students may have attended consistently to avoid missing content, others may not have been aware of the drop policy, even though it was noted in the syllabus and gradebook. Still, the high rate of students completing all activities- either in class or asynchronously- suggests that this safety net may have been unnecessary, especially given the policy's built-in flexibility and the instructor's openness to extensions.

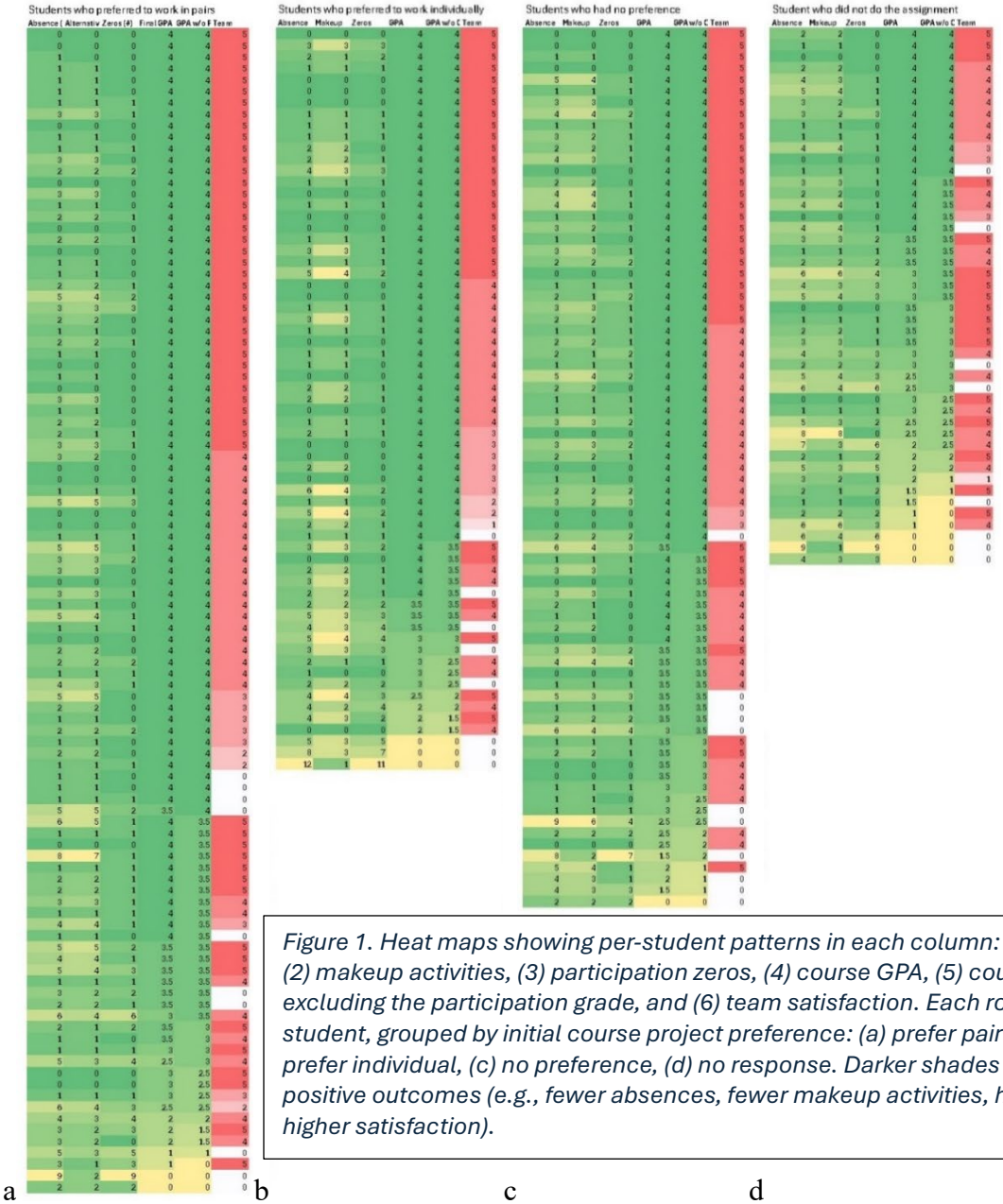

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Figure 1. Heat maps showing per-student patterns in each column: (1) absences, (2) makeup activities, (3) participation zeros, (4) course GPA, (5) course GPA excluding the participation grade, and (6) team satisfaction. Each row is a student, grouped by initial course project preference: (a) prefer pair work, (b) prefer individual, (c) no preference, (d) no response. Darker shades indicate more positive outcomes (e.g., fewer absences, fewer makeup activities, higher GPA, higher satisfaction).

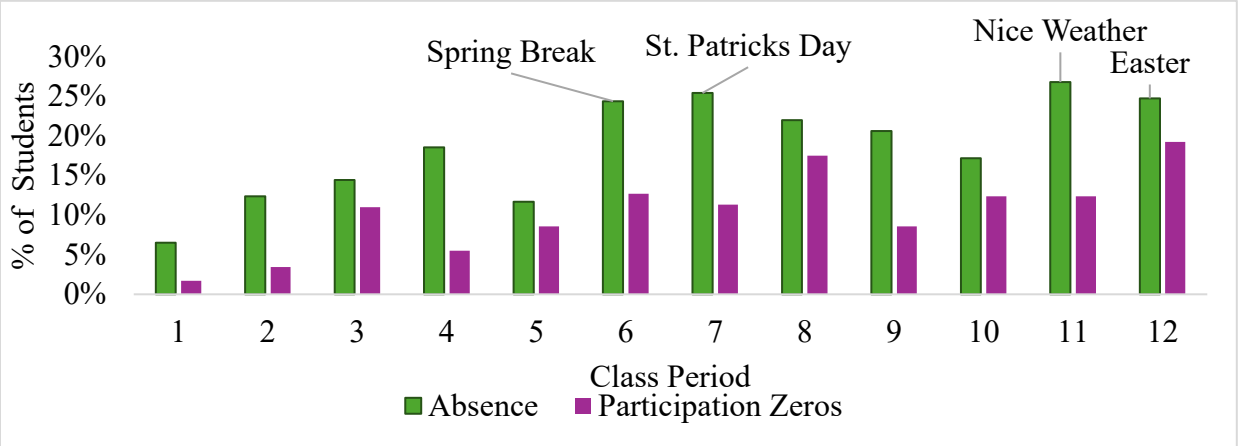

Figure 2. Student absences and missed make-up completions ("participation zeros") by class session. Key dates are labeled.

Overall, this case illustrates a successful application of a bounded HyFlex approach. Students had clear limits that may help overcome concerns of a lack of motivation attributed to HyFlex (Morrison et al., 2025), while maintaining one of the greatest benefits of HyFlex: flexibility (Morrison et al., 2025). This combination of structure and support appeared to foster strong participation, suggesting that such a model can be workable even in large, team-based courses.

References

Adeel, Z., Mladjenovic, S.M., Smith, S.J. Sahi, P., Dhand, A., Williams-Habibi, S., Brown, K., & Moisse, K. (2023). Student engagement tracks with success in-person and online in a hybrid-flexible course. *The Canadian Journal for the Scholarship of Teaching and Learning, 14*(2), ar. 12. https://doi.org/10.5206/cjsotlrcacea.2023.2.14482

Athens, W. (2023). Self-regulation, motivation, and outcomes in HyFlex classrooms. *Educational Technology Research & Development, 71*, 1765-1783. https://doi.org/10.1007/s11423-023-10243-y

Bockorny, K.M., Giannavola, T.M., Mathew, S., & Walters, H.D. (2024). Effective engagement strategies in HyFlex modality based on intrinsic motivation in students. *Active Learning in Higher Education, 25*(3), 455-472. DOI: 10.1177/14697874231161364

Jakobsen, K. V., McIlreavy, M., & Marrs, S. (2014). Team-based learning: the importance of attendance. *Psychology Learning and Teaching, 13*(1), 25-31. http://dx.doi.org/10.2304/plat.2014.13.1.25

Magana, A., Karabiyik, T., Thomas, P., Jaiswal, A., Perera, V., & Dworkin, J. (2022). Teamwork facilitation and conflict resolution training in a HyFlex course during the COVID-19 pandemic. Journal of Engineering Education, 111(2), 446-473. DOI: 10.1002/jee.20450

Malczyk, B.R. (2019). Introducing social work to HyFlex blended learning: A student-centered approach. *Journal of Teaching in Social Work 39*(4-5), 414-428.

Morrison, L., Kay, R.H., Atkinson, H., Mann, A., & Tepylo, D. (2025). Exploring the emerging landscape of Hyflex teaching and learning in higher education: A scoping review. *19th International Technology, Education, and Development Conference*. DOI: 10.21125/inted.2025.0421

Yang, H.H., Yin, Z., & Zhu, S. (2024). Examining students' acceptance of the large-scale HyFlex course: An empirical study. *British Journal of Educational Technology, 56*, 42-60. DOI: 10.1111/bjet.13477