An implementation case of the HyFlip teaching modality: lessons learned and a path forward

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Abstract

This research offers a case study of implementing the HyFlip modality of teaching at a Catholic university in Western Pennsylvania. Student perceptions were measured before and after the course and the quantitative and qualitative data were analyzed. Overall findings were positive for this modality; however, areas of improvement were suggested in order to further enhance student learning given their general underpreparedness for semi-self-directed learning. One significant finding was the use of recorded lectures for each lesson, which the students found as the most useful aspect of HyFlip.

Keywords: HyFlip, hybrid, online, COVID, learning

Introduction

Much research has been done on teaching paradigms (Watson, Templet, Leigh, Broussard, & Gillis, 2023; Cai, Li, Hu, & Li, 2022; Verde & Valero, 2021); however, only recently has research been conducted on the newer paradigm of hybrid/flipped-classroom learning, dubbed HyFlip (Slonka, 2022). While this paradigm seems to combine the best of all current course modalities, more research needs to be done in terms of implementation to ensure that this paradigm has a wider use than the singular case presented in the seminal research. This study aims to implement the HyFlip modality in two courses (one cyber security and one computer science) at a private, Catholic university in Western Pennsylvania. Students in neither class had been exposed to the HyFlip style in the past, therefore this study's purpose is to answer the primary research question:

RQ1: How does one's perception of HyFlip learning change after initial exposure?

Review of the literature

Traditional/Face-to-face learning

Face-to-face learning, the traditional method one expects when speaking of university classes, is when the instructor and students are in the same place at the same time participating in learning activities. These sessions are regularly scheduled throughout the week and these regular sessions allow the instructor to measure students' progress on an ongoing basis (Top Hat, n.d.). The only learning activities that typically take place outside of this classroom environment are homework assignments. Additionally, since teachers are the primary source of information in this environment, the quality of teaching and all student evaluation depends on said teachers (Gherhes, Stoian, Farcasiu, & Stanici, 2021).

Online courses

Computer-mediated communication (CMC), or producing verbal or written language via computing platforms, is the way online learning is typically defined. There are two general categories of online learning: synchronous and asynchronous. The synchronous method attempts to closely mimic the traditional face-to-face environment by allowing for real-life communication via video conference tools, such as Zoom, Teams, etc. (Li, 2017; Jenks, 2014). Other features of these tools can allow the instructor to get closer to an in-person feel, such as chat rooms, gesture buttons, and breakout rooms (Khonke & Moorhouse, 2020). Some studies suggest that synchronous online learning has high success rates, other studies note the severely forced nature of student-teacher interactions (Cheung, 2021).

Asynchronous learning, on the other hand, allows the act of learning to take place at different times and locations, depending on the preference of the student (Suliman, M., Ta'an, W., Abdalrhim, A., Tawalbeh, L., & Aljezawi, M., 2022). The "learning path" (p. 2) is created by the teacher and can be followed by the students at their own pace, which creates a "learner-centered environment that fosters rich communication between instructor and students and among students" (Comer, D. R. & Lenaghan, J. A., 2012, p. 262; Bates, 1997). There are numerous techniques that asynchronous courses can implement: exams, quizzes, discussion forums, writing prompts, external content, recorded lectures, and frequent/robust feedback (Brown, 2020; Pieratt, J., 2020). Although most people would anecdotally say that performance of asynchronous learners is lower than that of their synchronous counterparts, research does not support this (Schoenfeld-Tacher & Forman, 2021; Belliston, 2020).

Hybrid courses

An attempt is made to combine the aspects of online learning with face-to-face learning in ithe hybrid modality, also called blended learning. Examples of this are face-to-face classes enhanced with technology, courses with reduced face-time, and fully blended degree programs. Face-to-face classes enhanced with technology still meet the normal number of hours during the week; however, they also offer items online to supplement the classroom learning, such as extra videos. Reduced face-time courses, often simply called hybrid courses, so not meet for the normal number of hours during the week. Instead, one or more class sessions are replaced with online/outside learning, such as discussion forums, different assignments, or off-site experiential learning. The last form, blended learning, is a degree program where students can choose each class in the format they prefer (instead of being forced into a modality for each class set by the professor) (Ross & Gage, 2006). This strategy allows the institution and its professors to stop focusing on in/out-of-class time and instead ensure their courses are "joint and provocative exploration[s] of the discipline by teacher and learner in which the roles of teacher and learner are fluid— sometimes the teacher takes the role of learner and sometimes the learner takes the role of teacher" (Caulfield, 2011, p. 4).

Flipped classroom

The flipped classroom has a simple mantra: everything that was "traditionally done in class is now done at home, and that which is traditionally done as homework is now completed in class" (Bergmann & Sams, 2012, p. 13). Professors will record their lectures (or find informative videos online) so that the actual learning is occurring outside of the classroom instead of showing up each day to "perform" (p. 14). This allows students to watch the videos on their own time (as long as they are completed before the next class session) and also allows additional benefits, such as pausing and rewinding, that aren't typically available to in-person learners. Because the classtime is no longer used for initial learning, it can be better utilized to answer questions and help the students gain a deeper understanding of the material. In this modality, the

teacher's role has flipped from information delivery to a much more student-centric model, ensuring that "those who struggle get the most help" (p. 14).

HyFlex learning

Although many people's first introduction to the HyFlex modality, which is a play on the words hybrid and flexible, it has been in use for over a decade. This teaching modality is a combination of both forms of synchronous learning, whereby students are present in the classroom and other students are present via the school's virtual platform (e.g., Zoom). Students are not forced into one modality for the entire semester, instead being allowed to choose whether to be in-person or virtual for each class session. The key, as previously stated, is that the learning is done synchronously as an attempt to treat all students as if they were physically in the classroom. Although many classroom activities need to be altered to account for both physical and virtual students, the learning objectives and outcomes of the course are identical for everyone involved. This modality has found favor with university administrators from a resources perspective, being able to teach two classes worth of students while only utilizing a single campus room (due to many students choosing to be virtual). This also allows administration to save money on faculty salaries now that a single professor can teach a single HyFlex course (only counting as one course within his courseload) instead of two separate sections (Beatty, 2019).

HyFlip learning

Attempting to combine all of the best elements from all existing modalities, HyFlip learning allows students to learn in whatever way they prefer. The three core tenants of HyFlip are asynchronous learning, a flipped classroom, and hybrid class sessions that are optional. Like the flipped classroom model, the learning occurs outside of the classroom and the class sessions are used for higher learning. The difference, however, is that students are not required to attend the in-person sessions. Due to this, the course and its materials must be designed in such a way that those students who choose not to attend and complete the course as if it were fully online can do so without missing out on any learning. This allows those students who are highly motivated and grasp the material quickly to make better use of their time by not being forced to attend class sessions while ensuring smaller classroom environments for those students who wish to attend and work with the professor to gain a better understanding of the material. In other words, HyFlip courses need to be able to operate as fully online/asynchronous courses for those who want that experience and also offer the in-person experience for the rest of the students (Slonka, 2022).

Methodology

This research design is a quasi-experimental pretest-posttest design without a control group. Students enrolled in two 300-level course sections at a Western Pennsylvania Catholic university, who had never taken HyFlip courses before, were given an ungraded pre-test at the beginning of the semester and an ungraded post-test at the conclusion of the HyFlip course, adapted from Peslak, Kovacs, Wang, & Kovalchick (2021). Each (pre- and post-test) was delivered via Microsoft Forms, which the researcher does not recommend due to its inability to export data in SPSS format, and configured to allow anyone with the link to participate. This disabled the requirement for Microsoft 365 sign-in and thus made the participants anonymous.

The pre-test consisted of 23 questions, which included a number of demographic questions to allow the researcher to better analyze the results. The post-test added three additional questions at the end to better frame the results:

- The grade I am on track to receive is as high or higher than the grade I thought I would receive at the beginning of the semester.
- If you answered "No" to the previous question, did you exhaust all avenues to help increase your grade (e.g., attend class sessions, email the professor for clarification, attend office hours, schedule zoom sessions with the professor, etc.)?
- Is there anything else you'd like the professor to know (this is anonymous and off-the-record).

Due to inconsistent participation by the students, the total number of students between the pre- and post-test groups varied, with two dropping out by the end.

The results of the tests were analyzed in SPSS and where statistical significance wasn't achieved the researcher holistically analyzed the data within the greater context of the study. All analysis was to answer this study's primary research question:

RQ1: *How does one's perception of HyFlip learning change after initial exposure?*

Results

A number of demographic questions were asked in order to gain an understanding of the makeup of the population. Table 1 details some general descriptive information about the students (n=14). The majority of students were resident, full-time males in the 18-22 age bracket. Given that this study was conducted via a 300-level course, it is expected that the majority of students were Juniors and Seniors.

Table 1: Descriptive information

		Pre-test	Post-test
Age	18-22	93%	83%
	23-30	7%	17%
Gender	Male	79%	92%
	Female	21%	8%
Status	Full-time	100%	100%
	Part-time	0%	0%
Rank	Sophomore	21%	25%
	Junior	43%	33%
	Senior	36%	42%
Living Situation	Resident	72%	67%
	Commuter	28%	33%

Even though Table 2 could still considered descriptive information, it does contains data points that allowed the researcher to gain a deeper appreciation for and add context to the students' responses to the quantitative part of the tests.

Table 2: Participant contextual information

		Pre-test	Post-test
Outside Obligations	Obligations	36%	50%
	No obligations	64%	50%
Major	Computer Science	14%	8%
	Cyber Security	58%	76%
	CS/Cyber (Dual)	14%	8%
	MIS	14%	8%
Reason For Taking	Required	65%	59%
	Elective	35%	33%
	Interest	0%	8%
Taken Online Before	Yes	86%	100%
	No	14%	0%
First Online During COVID	Yes	86%	75%
	No	14%	25%
Work Better	No direct supervision	65%	59%
	Direct supervision	35%	41%
Time Mgmt. Skills	Good	79%	67%
	Poor	21%	33%
Being In The Classroom	Not essential	100%	16%
	Sometimes helpful	0%	84%
Learn Best By	Doing	72%	84%
	Seeing	22%	16%
	Hearing	6%	0%
Consider Fully Hybrid Degree	Yes	72%	33%
	No	28%	67%

The remaining test questions were Likert scale questions that either ranged from Very Ineffective to Very Effective or Strongly Disagree to Strongly Agree (no neutral) and were analyzed with both Chi-Square and Independent Samples T-Test. The Chi-Square analysis revealed two test questions with significant findings, shown in Table 3.

Table 3: Chi-Square analysis

Question	Do you perceive the OVERALL effectiveness (how well you learn) of HYBRID courses as:		
	Chi-Square 11.246	**Sig.**	0.024

Question	HYBRID courses with recorded lectures enhance learning by allowing students to pause and re-watch.		
	Chi-Square 10.307	**Sig.**	0.016

The same test questions were also analyzed with the stronger Independent Samples T-Test. Questions were first coded based on Levene's test for equality of variances to determine the proper t-value: assuming equal variances or not assuming equal variances. After this coding, only one test question had a significant result, shown in Table 4.

Table 4: Independent samples T-test

Question	HYBRID courses with recorded lectures enhance learning by allowing students to pause and re-watch.		
	t 2.815	**Eta squared**	0.248 (Large)
	2-sided Sig. 0.014	**Cohen's d**	1.026 (Large)

The two most commonly used techniques for effect size were calculated, also shown in Table 4. The eta squared value of 0.248 is greater than the standard value of 0.14 for a large effect size and the Cohen's d value of 1.026 is greater than the standard value of 0.8 for a large effect size, thus indicating that this difference would be clearly visible to the naked eye.

Discussion

Although the overall outcome of this study characterized the HyFlip modality in a positive light, this may not immediately be apparent were one to merely browse the raw numbers. Beginning with the question on the students' perception of the overall effectiveness of hybrid courses, the difference between the pre- and post-test was a shift from 100% positive marks to a more equal spread across the spectrum. Although no students rated hybrid courses at the lowest level, Very Ineffective, there were some who rated it as Somewhat Ineffective or Ineffective when none marked those ratings during the pre-test. A similar shift was seen for the question on students' perceptions of whether recorded lectures enhanced learning. Whereas the large majority of students Strongly Agreed that recorded lectures enhanced learning on the pre-test, a downward shift was seen on the post-test. Unlike the previous question, however, only a small number of students moved their ratings into the negative realm.

This initially looks like students were displeased with the HyFlip modality by the end of the semester, but a more holistic approach to this information is necessary to fully understand the meaning. While the large majority of students rated themselves as having good time management skills before the course, this shifted in the other direction by the end of the course. With HyFlip putting more of the onus on the student to

control/direct their learning, students were painfully made aware that they did not possess the time management skills necessary to stay abreast of their workload when a professor wasn't pressuring them in person multiple times per week. A similar shift was seen with students rating themselves on working with or without supervision. A higher percentage realized they needed supervision by the of the class.

Especially in the computing fields, where it is mandatory to be highly motivated and a self-learner, these findings are disappointing. In addition to Slonka's (2022) noted benefits of bring the best of all modalities into one, HyFlip learning is also structured similarly to how a computing professional will be learning for the rest of his career.

Introducing students to this style of learning near the end of their college career should offer them an advantage, a jump-start to their career so they are not blindsided by the self-motivation required in "the real world". However, as many professors can anecdotally attest and many studies have corroborated (Purcell et al., 2012; Seemiller & Grace, 2016; Chillakuri, 2020; Pfaltzgraf & Insch, 2021), Gen Z students are arriving at college with lower levels of preparation, less social skills, and little motivation to do any more than minimally required to earn a passing grade.

The additional questions at the end of the post-test offer some insight into this problem. 50% of the respondents said they thought their final grade for the course would end up lower than they initially imagined; however, 84% of those students admitted that they did not exhaust all avenues to help increase their grade, such as attending the optional class sessions, emailing the professor for clarifications, attending the professor's office hours, scheduling zoom meetings with the professor if they were unable to be on campus, etc. With students being unwilling to take any small step to ensure their success, there is little that can be done from the faculty perspective.

Multiple students noted in the open-ended question at the conclusion of the post-test that they did the minimal necessary work.

> *"[...] the structure gave me no reason to put in anything more than minimal effort."*

> *"With this class being fully hybrid I didn't take it as seriously as I believe I should have resulting in late assignments or doing them at the last minute."*

The data, however, was not entirely grim as anecdotal evidence suggests that motivated students found the format of the course helpful with one putting those thoughts into writing on the post-test:

> *"Thank you for making this semester fun and efficient"*

Suggestions

The results of this study leads the researcher to offer two suggestions for future implementations of the HyFlip modality. The first suggestion lies with the level of clarity for exam instructions. While all weekly lectures and demonstrations were done in video format the exams were industry-style projects that were only presented as textual instructions. This was to done to encourage students to ask questions and work with the professor in an employer-employee style. Most students did not seek clarification and performed poorly. In addition to adding video explanations for each exam, one student suggested that a better explanation of the exam style at the beginning of the course would be helpful:

"[..] I think it would be better to preface this fact more clearly at the start of the class. You do not need to explain how or why - just the fact that you are."

The second suggestion relates to the level of participation required for the course. While the intention of the modality is purposeful in not requiring in-class participation to accommodate those students who choose to take the "fully online" route, the results of the study strongly highlight the need for imposed motivation. A method of participation should be implemented on a weekly basis to ensure that students stay involved and have to do more than the minimal amount of work.

While this method can be left up to the professor of each course, one suggestion would be to require the students do one of two things each week: either attend one of the in-class sessions participating in the additional activities or make a detailed online discussion post that covers the highlights of that week's content, the areas thought to be most applicable in an industry environment, and any areas that are still unclear to encourage more collaboration.

Limitations

The obvious limitation to this study is that it was only conducted on two class sections during a single semester at a single university. In order to elucidate all potential pitfalls of this teaching modality it must be studied across a wider number of students, a wider number of majors, and a wider number of universities. It is also important for future researchers to understand that this teaching modality may not be prudent for certain majors. In the computing field, where this modality most closely mimics the lifelong learning-style students will have to adopt in industry, it is a good fit for majors in this area.

Conclusion

This research implemented the HyFlip modality in two course sections, measuring students' perceptions before and after taking the course. Results revealed two key areas for improvement, given the general underpreparedness of college students. Further studies are necessary, implementing these suggestions, to arrive at a complete model that better prepares computing students for industry than current teaching models.

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