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Development and Validation of a Questionnaire to Assess Students' Perception of Hyflex Learning Modality

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Abstract

The HyFlex learning modality, a response to the need for inclusive and high-quality education, has introduced significant transformations in some aspects of the Philippine education system. With students being the primary beneficiaries, understanding their perspectives on the HyFlex is crucial for its effective implementation. This research aims to create and assess the reliability and validity of a questionnaire in gauging students' experiences in a HyFlex environment. Results from early surveys and focus-group discussions have generated a 25-item questionnaire. The researchers have administered the questionnaire to 460 students in the HyFlex environment using Microsoft Forms. Exploratory factor analysis has reduced the items to 23 and generated four factors: interpreted as perceived teacher support, utilization of HyFlex, learning engagement, and learning efficacy. These factors explain 55.1% of the variance. Confirmatory factor analysis and reliability analyses confirm the questionnaire's validity and reliability. Results from the initial questionnaire application suggest that students generally perceive HyFlex positively.

Keywords

HyFlex learning, development and validation, questionnaire development, flexible learning, synchronous hybrid learning

INTRODUCTION

In recent years, educational institutions have been increasingly exploring innovative approaches and modalities to meet the diverse needs of students and ensure equitable quality education, especially in the teeth of the COVID-19 pandemic. One such approach that has gained significant attention is the Hybrid-Flexible (HyFlex) setup, which combines elements of online and face-to-face learning (Vilhauer, 2023). This instructional setup provides students with flexibility by enabling learners, whether they are abroad, experiencing illness for an extended period, or facing other circumstances that prevent in-person attendance, to still engage in the lesson and interact with the teacher and fellow students from a location of their preference (Raes et al., 2019). It also allows students to choose how they engage with course materials and participate in various learning activities such as recitations, exams, or project presentations (Abdelmalak & Parra, 2016; Beatty, 2007). The development and implementation of the HyFlex model stem from the imperative to address the call for equitable quality education, as outlined in the Sustainable Development Goals (SDGs).

Among the 17 SDGs established by the United Nations, SDG 4 focuses explicitly on ensuring inclusive and equitable education for all. The goal emphasizes the importance of providing learning opportunities that are accessible, relevant, and of high quality. In this context, the hybrid-flexible (HyFlex) setup offers a promising approach by integrating in-person and online learning elements, enabling students to choose how they participate in their education flexibly (Vilhauer, 2023). A HyFlex model accommodates diverse preferences, circumstances, and learning needs by providing the option to attend in-person classes or access the same content and resources remotely through online platforms (Liu et al., 2018; Szeto, 2014; Wiles & Ball, 2013).

Despite the growing popularity of the HyFlex model, there remains a research gap concerning students' perception of this instructional modality. While several studies (Lightner & Lightner-Laws, 2013; Szeto, 2014; White et al., 2010) have investigated the effectiveness and outcomes of HyFlex implementation, no existing validated questionnaire specifically assesses students' perception of HyFlex. Understanding students' perspectives, attitudes, and experiences within the HyFlex setup is crucial for informed decision-making regarding course design, instructional strategies, technology integration, and resource allocation, thereby ensuring the effective implementation of this modality.

Therefore, this paper aims to address this research gap by presenting the development and validation of a questionnaire that assesses students' perceptions of the HyFlex setup. By capturing students' feedback, preferences, and challenges related to the HyFlex model, educators and administrators can gain valuable insights into the strengths and limitations of this learning modality. These insights can then inform necessary adjustments and improvements, enabling the implementation of HyFlex to optimize student learning experiences, engagement, and achievement.

Given the growing adoption of the HyFlex learning modality, it is critical to understand how students perceive this learning modality. While the benefits of this learning modality have been well-documented, the absence of a validated questionnaire to assess students' perceptions leaves a gap in the literature. Such a gap hinders educators and administrators from understanding one critical aspect of evaluating the effectiveness of the learning modality. Hence, we aim to address this lack of a valid and reliable questionnaire that captures students' perceptions of this learning modality.

In the present study, we developed and validated a questionnaire to investigate students' perceptions of the HyFlex learning setup. Specifically, it aimed to address the following research questions:

a. Does the developed instrument achieve construct, face, and content validity?
b. Is the developed instrument reliable?
c. What are the results obtained from the initial application of the developed instruments?

METHODS

Research Design

This present study employed a type 1 developmental research design described by Richey and Klein (2005), focusing on a specific instructional product, program, process, or tool. This research design typically encompasses product design, development, and evaluation and may involve validating specific design techniques or tools. The design is particularly suited for creating and assessing a questionnaire to evaluate students' perceptions of the HyFlex setup.

Moreover, within the framework of the type 1 developmental research design, we adapted the specific research process utilized by Funa et al. (2022) to structure the stages of creating the questionnaire. This research process intends to create and validate survey instruments, which is also the goal of the present study. Figure 1 illustrates the various stages of creating the questionnaire, which assesses students' perception of HyFlex Learning.

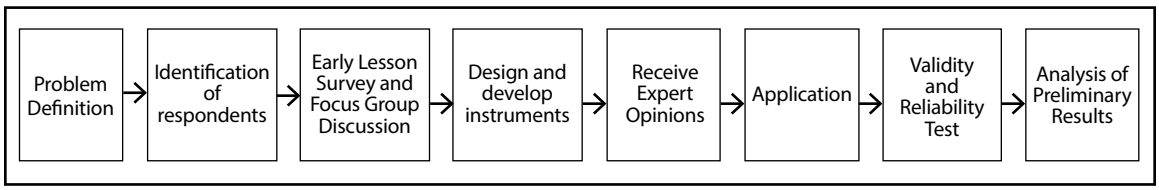

Figure 1. *Research Process on Instrument Development (adapted from* Funa et al., 2022*)*

The research team began the development of the instrument by defining the research problem presented in the introduction. To gather preliminary feedback, the first researcher conducted an early lesson survey (ELS) via Microsoft Forms in his purposively chosen class, comprised of 28 college students enrolled in a general education subject. This course was selected due to its diverse representation of students from various academic programs, ensuring a wide range of perspectives. The teacher implemented the HyFlex modality in this class by allowing students to choose between attending in-person sessions or participating synchronously online. This setup provided flexibility and accessibility, which are key principles of the HyFlex approach (Beatty, 2019). The ELS was conducted three weeks after the class had been using the HyFlex modality, ensuring that participants had sufficient exposure to provide meaningful and informed feedback regarding their experiences, preferences, and challenges with the learning modality.

This methodological approach aligns with best instrument development practices, as Funa et al. (2022) and DeVellis (2017) highlight. Funa and colleagues demonstrated the utility of combining individual surveys and FGDs to capture specific and shared experiences. At the same time, DeVellis emphasized the importance of gathering qualitative data to ensure that generated items reflect the multifaceted nature of constructs. By employing both ELS and FGD, the study ensured a robust and comprehensive dataset to inform the development of a valid and reliable questionnaire.

To gain specific insights into instructional practices within the HyFlex setup, we asked three main open-ended questions adapted from the Center for Innovative Teaching & Learning at Indiana University Bloomington Kurz (2020): 'What should the teacher KEEP doing?', 'What should the teacher STOP doing?', and 'What should the teacher START doing?'. This approach, known as the 'Keep, Stop, Start' feedback method, has been widely recognized as an effective tool for gathering actionable insights to inform reflective teaching practices. The method encourages students to reflect on their learning experiences and provides instructors with specific, practical feedback to improve instructional strategies.

While the source is a blog post, it is authored by a reputable center dedicated to advancing innovative teaching and learning practices, making it a credible and practical reference for this study. Furthermore, the principles outlined in Kurz (2020) align with established practices in educational research. For instance, Hoon et al. (2015) highlight the effectiveness of the 'Stop, Start, Continue' feedback method in fostering constructive student feedback and its impact on improving teaching quality. By incorporating this approach into our methodology, the study ensured that students' feedback captured their experiences comprehensively, facilitating the refinement of instructional practices in the HyFlex modality.

The first question, "What should the teacher STOP doing?" aimed to uncover any methodologies or behaviors students found unhelpful or disruptive within the HyFlex modality. The second question, "What should the teacher KEEP doing?" sought to identify effective learning strategies and teaching behaviors that positively contributed to students' learning experiences in the HyFlex setup. Lastly, "What should the teacher START doing?" intended to gather suggestions for new approaches or behaviors that could enhance the learning experience within the HyFlex modality.

The qualitative data from these open-ended questions were reviewed systematically to extract key insights and recurring patterns. Students' responses were directly transformed into questionnaire items, focusing on comprehensively capturing their experiences and feedback.

Simultaneously, the second researcher conducted a focus group discussion (FGD) with his classes via Microsoft Teams to identify students' perceived benefits and difficulties in the HyFlex learning setup. The objectives of the FGD were to gather in-depth qualitative data on students' experiences with the HyFlex modality, focusing on aspects such as engagement, accessibility, and overall satisfaction. The FGD interview guide included questions on the perceived advantages and challenges of the HyFlex setup, specific instances of successful or problematic interactions, and suggestions for improvement.

Eight college students from the same class participated in the FGD, and precisely one section was handled by the second researcher. These participants were also purposively chosen because they had experienced the HyFlex setup, providing relevant context for collecting qualitative data. The students' ELS and FGD responses were recorded, transcribed, and reviewed systematically to identify recurring themes and patterns. This process involved identifying recurring themes and patterns in the data, which were then used to formulate the initial set of questions for the instrument.

While the participants were recruited from a single instructor's class, efforts were made to include diverse students in terms of educational level and background to capture various student experiences in the HyFlex modality. Participants were selected based on their availability, willingness to share their experiences, and ability to articulate feedback on the HyFlex setup. However, the researchers acknowledged that this sample, drawn from a single class, may not fully represent the diversity of student experiences, particularly across different academic programs and levels.

The data from the ELS and FDG were used to formulate our instrument's initial set of questions. Table 1 presents selected verbatim transcripts, their corresponding data sources, and the questionnaire generated based on each transcript.

Table 1. *Transformation of data from ELS and FGD to Questionnaire Items*

Item in the Questionnaire	Sample Verbatim Transcripts	Data Source
HyFlex learning is applicable and beneficial to the subjects I am currently enrolled in.	*"Sa mga subjects na medyo mahirap, mas nakakatulong talaga yung HyFlex kasi pwede kong balikan yung mga lessons."* (Under challenging subjects, HyFlex helps because I can go back and review the lessons.)	Focus Group Discussion
Hyflex provides opportunities for engaged learning.	*"I feel involved in discussions kasi kahit online, nakakasabay ako."* (I feel involved in the discussion because even if I am online, I can still keep up with the lesson)	Focus Group Discussion
HyFlex learning allows me to appreciate and enjoy learning.	*"Mas na-aappreciate ko mag-aral ngayon kasi kahit online or malayo sa school, I can attend the class."* (I appreciate studying more now because even if it is online or I am far from school, I can still attend the class.)	Focus Group Discussion
HyFlex learning allows for efficient time management.	*"Provide a schedule in advance since I can manage my time well in the setup."*	Early Lesson Survey: "What Should the Teacher Keep Doing?"
It is easy to adjust to the HyFlex learning setup.	*"Provide more guidance on effectively using the HyFlex setup at the beginning."*	Early Lesson Survey: "What Should the Teacher Start Doing?"
Hyflex learning improves the quality of my work.	*"Mas na-improve yung mga school works ko kasi mas focused ako kapag nag-aaral."* (The quality of my schoolwork has improved because I am more focused when I study.)	Focus Group Discussion
I have a meaningful learning experience using the HyFlex learning setup.	*"HyFlex gives me a deeper understanding ng lessons dahil pwede kong i-replay yung lectures."* (HyFlex gives me a deeper understanding of the lessons because I can replay lectures)	Focus Group Discussion
Hyflex learning helps me become more productive.	*"I think I am more productive if I have an option."*	Focus Group Discussion
The implementation of HyFlex learning aligns with the required health measures.	*"Ask students to wear masks during class."*	Early Lesson Survey: "What Should the Teacher Start Doing?"

Table 1. *(continued)*

Item in the Questionnaire	Sample Verbatim Transcripts	Data Source
Video recordings significantly contribute to my learning experience.	*"Record the class discussion."*	Early Lesson Survey: "What Should the Teacher Keep Doing?"
HyFlex learning enables me to assess my progress in learning.	*"Activity every after the lesson so we know if we learn something."*	Early Lesson Survey: "What Should the Teacher Keep Doing?"
I can see what my teacher writes on the board during discussions.	*"Write clearly on the board... Annotate in the slides, if possible."*	Early Lesson Survey: "What Should the Teacher Start Doing?"
I am engaged in the lesson.	*"Keep using tools in teams (MS Teams) like polls, chatbox, and breakout rooms to keep us engaged."*	Early Lesson Survey: "What Should the Teacher Keep Doing?"
I am motivated to do my assigned tasks.	*"I am motivated to do my tasks."*	Focus Group Discussion
I am focused on the tasks that I should do.	*"Some task instructions are unclear, so it is difficult to focus."*	Focus Group Discussion
I persevere in completing the tasks assigned to me.	*"Tinapos kong mabuti lahat ng tasks ko kasi mas madali sa akin magtrabaho sa bahay."* (I finish all of my tasks diligently because it is easier for me to work at home)	Focus Group Discussion
I can interact with my classmates during discussions.	*"Create opportunities for students (online and face-to-face) to collaborate during lessons."*	Early Lesson Survey: "What Should the Teacher Start Doing?"
I can keep up with the discussion regardless of the modality (online or in-person) I use.	*"Sometimes forget that there are students online."*	Early Lesson Survey: "What Should the Teacher Stop Doing?"
Teachers are patient with the difficulties encountered by students who attend class online.	*"Some teachers are being dismissive of the online students' technical difficulties."*	Focus Group Discussion
Teachers save and upload annotated lessons during class.	*"Upload slides with notes in the teams."*	Early Lesson Survey: "What Should the Teacher Start Doing?"
Teachers utilize the technology well during class.	*"Using iPad or digital annotation for online students"*	Early Lesson Survey: "What Should the Teacher Keep Doing?"
	"Some teachers are not yet familiar with using teams."	Focus group discussion
Teachers utilize varied activities that are appropriate to HyFlex learning.	*"Conduct fun activities instead of the typical quizzes… where online students can join too."*	Early Lesson Survey: "What Should the Teacher Keep Doing?"
Teachers make sure that the audio is loud and clear.	*"When the teacher is at the back of the room, we can hear them if we are online."*	Focus Group Discussion
	"start testing the audio setup before class to avoid any issues during the lesson."	Early Lesson Survey: "What Should the Teacher Start Doing?"
While online, I do not have trouble joining classroom activities.	*"Sometimes students online cannot join classroom activities."*	Focus Group Discussion
I can interact with my teachers and ask them questions during discussions.	*"approachable and responsive to students' questions during and even after class hours."*	Early Lesson Survey: "What Should the Teacher Keep Doing?"

To guide data transformation into questionnaire items, the researchers followed established principles of scale development, as DeVellis (2017) outlined. DeVellis emphasizes the importance of generating items that accurately reflect the measured constructs while ensuring clarity and relevance for the intended population. In the current study, the process involved systematically reviewing the qualitative data from the Early Lesson Survey (ELS) and Focus Group Discussion (FGD) to extract recurring themes and patterns. These themes informed the creation of initial items, ensuring alignment with the constructs under investigation and the study's objectives. Additionally, the researchers adhered to best practices in item development, such as using simple and direct language, avoiding ambiguity, and tailoring the content to the context of the HyFlex learning modality.

After transforming data into questionnaire items, the researchers designed and developed the instrument and then gave it to three experts for their opinions regarding its structure, language, syntax, and overall content. These three experts ensured each item was clear, relevant, and aligned with the study's objectives. These components are essential in developing scale items (DeVellis, 2017). DeVellis emphasizes the importance of systematically developing scale items through rigorous procedures, including expert review. The researchers revised the instrument based on the experts' feedback.

The researchers then sought the assistance of the school's Guidance Counselor, Directors, and Executive Directors in distributing the questionnaire to the target population. The questionnaire was made accessible to every student in the institution. This census-like approach ensured broad coverage, and the researchers confirmed statistical representativeness by achieving the minimum required sample size. They administered the questionnaire for one month and calculated an acceptable number of samples based on Yamane's formula using the total population of 1755 and a margin of error of 5%. Based on the result, a minimum of 326 samples is needed to say that the perception of the whole population is well represented with a confidence interval of 95%. After the team attained the desired number of respondents, the results of the application were analyzed. The data analysis and results are discussed in the subsequent parts.

Study Group

The study was conducted in a private higher educational institution in the Philippines. The institution implemented the HyFlex learning modality in all its programs and its pilot year of implementation during the study.

Students (n = 460) using the HyFlex learning modality at the time of writing voluntarily answered the developed instrument via Microsoft Forms. The answering of the online survey was only limited to those who have verified school email addresses. Table 2 displays the profile of the 460 surveyed students. The majority of the respondents are female (48.04%), first-year college (33.04%), students from the School of Management (29.96%), and utilized online learning mode 50% of the time (30.22%).

Instrument

The researchers developed the Students' Perception tool on the HyFlex Questionnaire (SPHQ). It consists of four main sections: the letter addressed to the respondents, a consent form (including a guardian's consent form and student's assent form for SHS students), their demographic profile, and their perceptions of HyFlex learning. The letter to the respondents serves the purpose of explaining the study's objectives. The consent form includes reminders about voluntary participation, a confidentiality statement, compliance with the Philippines Data Privacy Act of 2012, and clarification that there are no direct benefits for participating in the survey.

The respondents' demographic profile section collects personal information such as gender, age, year level, school, course or strand, and the extent to which students typically engage in the HyFlex learning setup (rated on a scale of 1 to 5, with one (1) representing 100% online and five (5) representing 100% in-person).

The section on students' perceptions of HyFlex learning utilizes a 4-point Likert scale, ranging from 4 (strongly agree) to 1 (strongly disagree), and consists of 25 statements based on codes generated from an initial survey conducted by the first researcher and insights from focus group discussions led by the second researcher.

The SPHQ was created using Microsoft Forms and distributed via email and the school's Learning Management System. The link to access the instrument was available for one month. The data collected through this instrument were analyzed to evaluate its reliability, as well as its construct, content, and face validity. Additionally, the data provided initial insights into the students' perceptions of HyFlex learning, as discussed in subsequent sections of the paper.

Table 2. *Profile of the Respondents*

Demographic Profile	Frequency	Percentage
Gender		
Male	218	47.39%
Female	221	48.04%
Non-binary	10	2.17%
Prefer not to say	11	2.39%
Year Level		
Grade 11 SHS	64	13.91%
Grade 12 SHS	68	14.78%
First Year College	152	33.04%
Second Year College	77	16.74%
Third Year College	52	11.30%
Fourth Year College	45	9.78%
Fifth Year College	2	0.44%
School		
School of Architecture	3	0.65%
School of Computing and Information Technologies	77	16.74%
School of Engineering	31	6.74%
School of Management	124	29.96%
School of Multimedia and Arts	93	20.22%
Senior High School	132	28.70%
Commonly used HyFlex learning setup		
1 (100% online)	84	18.26%
2	106	23.04%
3	139	30.22%
4	101	21.96%
5 (100% in-person)	30	6.52%

Data Collection

Before distributing the questionnaire to the intended respondents via Microsoft Forms, the instrument underwent evaluation by three professors with expertise in education research and experience in hybrid learning. These evaluators consist of a psychometrician, a PhD candidate in Mathematics Education, and an English instructor teaching using hybrid mode for three years. They provided feedback on the grammatical structure and redundancies in the questionnaire items and suggested including demographic information like respondents' school and grade level. Additionally, the evaluation processes aimed to ensure the questions were appropriate and comprehensible for the intended audience.

Following the revision of the questionnaire based on experts' feedback, the instrument was evaluated by another set of 10 individuals pursuing graduate degrees in education. These evaluators were selected for their advanced training and knowledge in the field, which ensured their ability to assess the SPHQ's content and face validity critically. The evaluators followed a structured protocol adapted from Funa et al. (2022).

Face and content validity is an essential initial step in developing a tool or questionnaire because it addresses whether the item adequately measures aspects of the construct (Rubio et al., 2003).

Moreover, Rubio et al. (2003) emphasized the importance of engaging experts to rate questionnaire items systematically, focusing on clarity, relevance, and alignment with the study's objectives. Additionally, they advocated for calculating the inter-rater reliability to ensure consistency and objectivity among evaluators. This study analyzed the 10 evaluators' ratings, and the inter-rater reliability was calculated. Such an approach aimed to ensure that the SPHQ was refined to meet rigorous content and face validity standards.

After ensuring the face and content validity of the SPHQ, the researchers facilitated the dissemination process. The students were given one month to access the link and complete the survey, allowing ample time for participation. The data collected from the survey were then examined to assess the instrument's validity and reliability. Then, the researchers tested the questionnaire's construct validity and internal consistency.

Data Analysis

To analyze the acquired data and quantitatively address the first research question regarding the instrument's validity, the team employed exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to evaluate the construct validity of the questionnaire. EFA was used to identify any redundancies among the questionnaire items and group the questionnaire items into distinct factors representing perceptions of HyFlex learning. Subsequently, CFA was conducted to verify whether the identified factors fit the data adequately, even though the study did not initially start with a theoretical model. As Visser-Wijnveen et al. (2012) noted, CFA is crucial in instrument validation as it assesses the alignment between data and the hypothesized structure. Here, the hypothesized structure is the factor model derived from EFA.

Furthermore, to ensure face and content validity, the questionnaire was rated by a panel consisting of 10 experienced educators with a minimum qualification of either a master's degree or five years in teaching, who evaluated the clarity, relevance, and representativeness of the items. Inter-rater agreement among ten evaluators was measured using Krippendorf's alpha, a statistical measure that evaluates agreement among multiple raters assessing the same set of items (Krippendorff, 2019). To address the second research question, the researchers calculated Cronbach's alpha to determine the internal consistency of the factors identified through EFA and confirmed by CFA. Finally, descriptive statistics, including frequency, mean, and standard deviation, were employed for the third research question to summarize the responses. A 4-point Likert scale ranging from 4 (strongly agree) to 1 (strongly disagree) was used, and Pearson's R correlation was utilized to examine the relationships between the generated factors within the model. This correlational analysis was critical for understanding how the identified factors interact and influence one another, which aligns with the study's third research question.

RESULTS

Construct, Face, and Content Validity of SPHQ

Before distributing the SPHQ to the target population, the researchers first sought the help of different experts to structure its content and face validity. The first set of experts includes a psychometrician, a PhD candidate in Mathematics Education, and an English instructor. These experts ensured the questions were suitable and easily understood by the target audience. After resolving the feedback, the researchers asked for the help of ten experts in the field of education to rate the face and content validity of SPHQ. The research team tailored the questions from the face and content validity questions of Funa et al. (2022). The mean scores for the content and face validity items are 3.11 and 3.30, respectively. These scores indicate that the ten experts believe the questionnaire effectively captures the students' perception of HyFlex learning and is appropriate for measuring their perception of this learning modality. Then, the team generated Krippendorff's alpha, which yielded a value of 0.620. This value suggests high agreement among the experts regarding the content and face validity of the developed questionnaire.

The initial process of factor analysis involved checking various assumptions to ensure the suitability of the data set. Firstly, the data's normality was examined by inspecting the skewness and kurtosis. Based on the results, the skewness and kurtosis of the items are within |3| and |10|, respectively, indicating that the items are not "severely skewed" and not problematic (Kline, 2016, pp. 76-77). The Kaiser-Meyer-Olkin (KMO) test yielded a value of 0.953, indicating that the samples are highly suitable for factor analysis. This result suggests that the data set possesses the necessary characteristics for meaningful factor analysis.

Furthermore, Bartlett's test was conducted, resulting in a p-value lower than 0.05. This result implies that the variables within the data set are well-suited for factor analysis. In summary, the results obtained from the KMO and Bartlett's tests affirm that factor analysis can be effectively conducted using the variables of the developed instrument.

Table 3. *Exploratory Factor Analysis Result for SPHQ*

SPHQ items	Rotated Factor Loading			
	1	2	3	4
1. The implementation of HyFlex learning aligns with the required health measures.	0.678			
2. HyFlex learning allows for efficient time management.	0.649			
3. HyFlex learning enables me to assess my progress in learning.	0.564			
4. I find it easy to adjust to the HyFlex learning setup.	0.536			
5. Video recordings significantly contribute to my learning experience.	0.513			
6. HyFlex learning is applicable and beneficial to the subjects I am currently enrolled in.	0.488			
7. Hyflex learning improves the quality of my work.	0.470	0.418		0.537
8. Hyflex learning helps me become more productive.	0.469	0.424		0.511
9. HyFlex learning allows me to appreciate and enjoy learning.	0.433			0.620
10. I persevere in completing the tasks assigned to me.	0.403	0.632		
11. I am motivated to do my assigned tasks.		0.741		
12. I am engaged in the lesson.		0.685		
13. I am focused on the tasks that I should do.		0.674		
14. I can interact with my classmates during discussions.		0.459		0.440
15. I can keep up with the discussion regardless of the modality (online or in-person) I use.		0.435		
16. Teachers utilize the technology well during class.			0.716	
17. Teachers utilize varied activities that are appropriate to HyFlex learning.			0.685	
18. Teachers save and upload annotated lessons during class.			0.671	
19. Teachers are patient with the difficulties encountered by students who attend class online.			0.645	
20. I can interact with my teachers and ask them questions during discussions.			0.407	
21. Teachers make sure that the audio is loud and clear.			0.403	
22. Hyflex provides opportunities for engaged learning.				0.650
23. I have a meaningful learning experience using the HyFlex learning setup.				0.621

Exploratory factor analysis (EFA) was then performed using the varimax rotation method. A factor was retained if its eigenvalue was more significant than 1.0 in determining the number of factors. Table 3 shows that four elements were generated. Additionally, the rotated factor values range from 0.403 to 0.741 (Table 2). Items were allocated to factors based on the highest factor loading, indicating the strongest association of each item with a particular factor.

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Four distinct factors were identified based on the factor categorization resulting from the EFA to capture students' perceptions of the HyFlex learning modality. These factors include modality utilization, learning engagement, perceived teachers' support, and learning efficacy. The factors are defined as follows:

- Utilization of the modality encompasses students' perception of how effectively they utilize HyFlex learning to meet their learning needs. It examines how students find the modality beneficial in their educational pursuits.
- Learning engagement gauges the level of active involvement and engagement experienced by students within the HyFlex learning environment. It measures their sense of immersion and participation in the learning process.
- Perceived teachers' support assesses students' perception of the support and guidance provided by their teachers in the HyFlex learning setup. It evaluates the extent to which students feel supported by their teachers in their learning journey.
- Learning efficacy reflects students' perception of how effectively the HyFlex learning modality assists them in achieving their learning goals. It examines their belief in the modality's effectiveness in facilitating academic progress.

Items with high loadings on each factor were grouped accordingly to ensure that the categorization aligns with the underlying structure revealed by EFA. Notably, items 1 to 6 were assigned to the utilization of the modality factor, items 10 to 15 under learning engagement, items 16 to 21 were placed to perceived teachers' support, and items 7, 8, 9, 22, and 23 were associated with the learning efficacy factor.

To establish the construct validity of the items, the researchers verified the generated factors from EFA by conducting a CFA on the identified factors. Firstly, they made use of the chi-square test to determine the goodness-of-fit. The p-value is less than 0.05, which indicates that the generated factors are not a good fit. However, Hooper et al. (2008) stated that the number of observations significantly affects the Chi-square test, so there must be other indexes to evaluate the model fit. Hence, several fit indices were used to verify the fit of the confirmatory factor structures of SPHQ, such as comparative fit index (CFI), Tucker-Lewis Index (TLI), and root mean square error of approximation (RMSEA). The result shows that CFI and TLI are 0.924 and 0.914, respectively, more significant than 0.90, indicating that the factor model is a good fit. Although the RMSEA was 0.070, higher than the ideal threshold of 0.05, it still falls within an acceptable range for model fit, suggesting that the hypothesized model is reasonably close to a good fit (Visser-Wijnveen et al., 2012). The factorial model is shown in Figure 2.

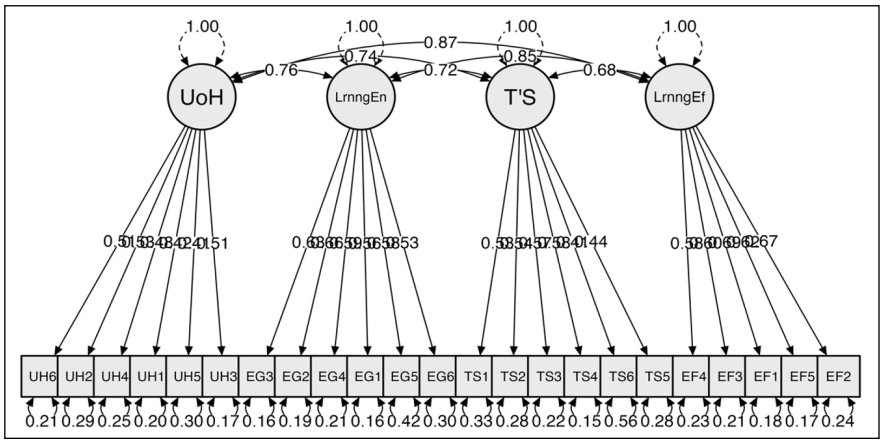

Figure 2. *Factor model of SPHQ items*

Reliability of the Instrument

The researchers used descriptive statistics, cumulative variance percentages, and Cronbach's alpha values to evaluate the instrument's reliability. Table 4 presents the reliability analysis results for the questionnaire, using Cronbach's alpha as the measure of reliability. Cronbach's alpha assesses the internal consistency or reliability of the items within each factor (George & Mallery, 2019). These coefficients indicate the extent to which the items within each factor are interrelated and consistently measure the same underlying construct.

According to George and Mallery (2019), higher Cronbach's alpha coefficients generally suggest greater internal consistency and reliability. The Cronbach's alpha coefficients for all four factors exceed the threshold of 0.70, indicating that the questionnaire demonstrates satisfactory internal consistency and can be considered reliable. The coefficients of 0.855, 0.895, 0.834, and 0.907 for utilizing HyFlex, learning engagement, perceived teachers' support, and learning efficacy, respectively, further reinforce the instrument's reliability. Moreover, we calculated the Cronbach's alpha for the entire instrument and yielded a value of 0.949, suggesting a high internal consistency among the items of SPHQ.

Table 4. *Descriptive Statistics, Cumulative Variance, and Cronbach's alpha of the Four Factors*

Factors	M(SD)	Cumulative Variance	Cronbach's alpha
Utilization of HyFlex	3.544 (0.521)	0.438	0.855
Learning Engagement	3.221 (0.622)	0.486	0.895
Teachers' support	3.238 (0.558)	0.528	0.834
Learning Efficacy	3.319 (0.665)	0.551	0.907

Initial Results

Based on the final form of the developed and validated questionnaire, we analyzed the perception of 460 student respondents towards the HyFlex learning modality. The results indicate that the respondents' utilization of HyFlex learning, learning engagement, perceived teachers' support, and learning efficacy generated mean averages of 3.54 (SD = 0.521), 3.22 (SD =0.622), 3.24 (SD = 0.558), and 3.318 (SD = 0.665), respectively (Table 4). This result implies that the student-respondents generally perceive the HyFlex learning modality positively. They perceive it as a practical and helpful approach to their learning needs while feeling reasonably engaged, supported by their teachers, and achieving their learning goals effectively.

In terms of utilization of HyFlex, the result suggests that, on average, students perceive a relatively high level of effectiveness and usefulness in utilizing the HyFlex modality for their learning needs (Table 5). Although "high level of effectiveness" might seem related to "learning efficacy," it refers explicitly to how well students feel they can use HyFlex to address their learning needs, which is central to this first factor.

Item UH1 got the highest mean of 3.64 (SD = 0.62). This result indicates that students value adherence to health protocols in the HyFlex learning setup, reflecting their concern for their well-being and safety. While this concern reflects their general well-being and safety, it might be less relevant in a post-pandemic context. Therefore, it is essential to clarify that this item was included to gauge historical concerns about health protocols during the pandemic. This item could provide insights into how these factors have influenced their perception of HyFlex learning's effectiveness and usefulness. Meanwhile, more than half of the respondents strongly agreed that Hyflex modality allows efficient use of their time (71.30%) and supports them in assessing their learning (55.65) and that class recordings are beneficial to their learning (71.73%). This result implies that the flexibility in terms of the learning options provided by using HyFlex saves students' time and consequently provides them more time for self-assessment.

Additionally, student respondents reported that, on average, they feel comfortable and capable of adapting to the HyFlex learning setup (M = 3.50, SD = 0.69). In particular, nine out of ten students found adjusting to this learning modality easy.

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Finally, UH6 generated a mean of 3.43 (SD = 0.69), indicating that the respondents believed the HyFlex learning setup was compatible with their courses.

Table 5. *Percentage Distribution of Respondents' Perception of HyFlex Learning Modality in terms of utilization*

Items	SD *f (%)*	D *f (%)*	A *f (%)*	SA *f (%)*	M (SD)
UH1. The implementation of HyFlex learning aligns with the required health measures.	7 (1.52)	13 (2.82)	110 (25.87)	321(69.78)	3.64 (0.62)
UH2. HyFlex learning allows for efficient time management.	18 (3.91)	21 (4.57)	93 (20.22)	328 (71.30)	3.59 (0.76)
UH3. HyFlex learning enables me to assess my progress in learning.	6 (1.30)	23 (5.00)	175 (38.04)	256 (55.65)	3.48 (0.66)
UH4. I find it easy to adjust to the HyFlex learning setup.	8 (1.74)	29 (6.30)	146 (31.74)	277 (60.22)	3.50 (0.69)
UH5. Video recordings significantly contribute to my learning experience.	13 (2.83)	16 (3.38)	101 (21.96)	330 (71.73)	3.62 (0.69)
UH6. HyFlex learning is applicable and beneficial to the subjects I am currently enrolled in.	10 (2.17)	22 (4.78)	190 (41.30)	238 (51.74)	3.43 (0.69)

Note. SD = Strongly Disagree (1.00 – 1.49), D = Disagree (1.50 – 2.49), A = Agree (2.50 – 3.49), SA = Strongly Agree (3.50 – 4.00)

Table 6. *Percentage Distribution of Respondents' Perception of HyFlex Learning Modality in terms of Learning Engagement*

Items	SD f (%)	D f (%)	A f (%)	SA f (%)	M (SD)
EG1. I persevere in completing the tasks assigned to me.	9 (1.96)	28 (6.09)	198 (43.04)	225 (48.91)	3.38 (0.69)
EG2. I am motivated to do my assigned tasks.	13 (2.83)	73 (15.87)	202 (43.91)	172 (37.39)	3.16 (0.79)
EG3. I am engaged in the lesson.	12 (2.61)	61 (13.26)	229 (49.78)	158 (34.35)	3.16 (0.75)
EG4. I am focused on the tasks that I should do.	6 (1.30)	69 (15.00)	194 (42.17)	191 (41.52)	3.24 (0.75)
EG5. I can interact with my classmates during discussions.	25 (5.44)	76 (16.52)	185 (40.22)	174 (37.83)	3.10 (0.87)
EG6. I can keep up with the discussion regardless of the modality (online or in-person) I use.	10 (2.17)	56 (12.17)	190 (41.30)	204 (44.35)	3.28 (0.76)

Note. SD = Strongly Disagree (1.00 – 1.49), D = Disagree (1.50 – 2.49), A = Agree (2.50 – 3.49), SA = Strongly Agree (3.50 – 4.00)

Table 6 shows the respondents' perception of HyFlex regarding learning engagement. The findings on the perceived learning engagement indicate that students generally feel moderately engaged in the learning process under the HyFlex.

Item EG1 generated a mean score of 3.38, with 48.91% of the respondents strongly agreeing with the statement. This data implies that most students persevere in completing the tasks within the HyFlex learning environment.

Meanwhile, with a mean of 3.16, results from items EG2 and EG3 suggest that the respondents have moderate motivation and engagement in classroom lessons and activities. Interestingly, almost 50% of the students answered 'agree' while only 38% answered 'strongly agree' in EG3. This result means that more respondents have a moderate level of engagement in HyFlex rather than a strong level of engagement.

Additionally, EG4 got a mean of 3.24, implying that a considerable proportion of students reported that they are focused on the tasks they must accomplish.

Moreover, item EG5 got the lowest mean (M = 3.10, SD = 0.87) compared to the remaining items under the learning engagement indicator. The result shows that while most respondents reported that they can interact with their classmates, there is still a need to improve classroom interactions under the HyFlex learning modality.

Lastly, eight out of 10 respondents said they could keep up with the discussion regardless of their chosen modality. This finding suggests that many students felt confident following and participating in classroom activities under HyFlex learning.

Table 7. *Percentage Distribution of Respondents' Perception of HyFlex Learning Modality in terms of Teachers' Support*

Items	SD f (%)	D f (%)	A f (%)	SA f (%)	M (SD)
TS1. Teachers are patient with the difficulties encountered by students who attend class online.	16 (3.48)	42 (9.13)	167 (36.30)	235 (51.09)	3.35 (0.79)
TS2. Teachers save and upload annotated lessons during class.	13 (2.83)	41 (8.91)	176 (38.26)	230 (50.00)	3.35 (0.76)
TS3. Teachers utilize the technology well during class.	10 (2.17)	46 (10.00)	195 (42.39)	209 (45.44)	3.31 (0.74)
TS4. Teachers utilize varied activities that are appropriate to HyFlex learning.	10 (2.17)	27 (5.87)	204 (44.35)	219 (47.61)	3.37 (0.70)
TS5. I can interact with my teachers and ask them questions during discussions.	5 (1.09)	39 (8.48)	200 (43.48)	216 (46.96)	3.36 (0.68)
TS6. Teachers make sure that the audio is loud and clear.	40 (8.70)	145 (31.52)	198 (43.04)	77 (16.74)	2.68 (0.85)

Note. SD = Strongly Disagree (1.00 – 1.49), D = Disagree (1.50 – 2.49), A = Agree (2.50 – 3.49), SA = Strongly Agree (3.50 – 4.00)

Table 8. *Percentage Distribution of Respondents' Perception of HyFlex Learning Modality in terms of Learning Efficacy*

Items	SD f (%)	D f (%)	A f (%)	SA f (%)	M (SD)
EF1. Hyflex learning improves the quality of work that I do.	13 (2.83)	64 (13.91)	161 (35.00)	222 (48.261)	3.29 (0.81)
EF2. Hyflex learning helps me become more productive.	15 (3.26)	68 (14.78)	158 (32.35)	219 (47.61)	3.26 (0.83)
EF3. HyFlex learning allows me to appreciate and enjoy learning.	11 (2.39)	44 (9.57)	161 (35.00)	244 (53.04)	3.39 (0.76)
EF4. Hyflex provides opportunities for engaged learning.	12 (2.61)	43 (9.35)	190 (41.30)	215(46.74)	3.32 (0.75)
EF5. I have a meaningful learning experience using the HyFlex learning setup.	11 (2.39)	43 (9.35)	186 (40.44)	220 (47.83)	3.34 (0.75)

Note. SD = Strongly Disagree (1.00 – 1.49), D = Disagree (1.50 – 2.49), A = Agree (2.50 – 3.49), SA = Strongly Agree (3.50 – 4.00)

Moreover, results in Table 7 suggest that students report a moderate level of support from their teachers, indicating that while they feel reasonably supported in their learning journey, there is room for improvement.

Item TS1 got a mean score of 3.35(SD =0.79), implying that students see their teachers be patient in dealing with online students' challenges. A mean of 3.35 (SD = 0.79) for item TS2 indicates students' appreciation of the availability of annotated online lessons. This is because when teachers save and upload class lectures, students can facilitate their understanding and review of the class contents.

Interestingly, the surveyed students believed that it is not always the case that teachers ensure they are audible during class; 8.7% and 31.52% strongly disagreed and disagreed with TS6, respectively.

Additionally, for every ten students involved in the survey, five strongly believe that teachers utilized technology well during class. This data denotes that most learners perceive that their teachers can enhance the learning experience by effectively utilizing technology. This result is related to the respondents' answers in item TS4 (M = 3.37, SD = 0.70), which suggests that teachers employ different teaching strategies appropriate to HyFlex learning.

With a mean of 3.36, students claimed they could interact with their teachers during discussions to an average extent, indicating that teachers in the HyFlex setup promote active participation during the lesson. Lastly, regarding learning efficacy, the result denotes that, on average, respondents believe the HyFlex learning modality is somewhat effective regarding their learning outcomes.

Firstly, Table 8 shows that most respondents (83.26%) see HyFlex learning as a means to enhance the quality of their work. One reason for this is the possibility that students could better focus on their academic work and produce higher-quality outputs because of the flexibility provided by HyFlex.

Secondly, for every ten students, eight agreed (32.35%) or strongly agreed (47.61%) that their productivity had increased as they engaged in Hyflex learning. This increase could be attributed to the adaptability of the learning environment, allowing students to utilize their preferred modes of instruction and optimize their learning process accordingly.

Furthermore, nine out of 10 students, or around 88%, expressed appreciation and enjoyment of learning through the Hyflex approach. The flexibility and personalized learning experience provided by Hyflex likely contribute to a more positive and engaging learning environment for students.

Additionally, most respondents (46.74%) strongly agreed that HyFlex learning provides them with opportunities for engaged learning. The combination of face-to-face interactions and online resources offers diverse learning experiences and promotes active participation, fostering more profound engagement with the course content.

Lastly, students found the overall learning experience under the Hyflex setup meaningful. This result suggests that the combination of flexibility, personalization, and opportunities for engagement provided by Hyflex Learning contributes to a sense of purpose and fulfillment in the learning process.

Table 9. *Correlations among the four factors from the model*

Variable	Utilization of Hyflex	Learning engagement	Teachers' Support	Learning Efficacy
Utilization of Hyflex	-			
Learning Engagement	0.661*	-		
Teachers' Support	0.628*	0.649*	-	
Learning Efficacy	0.753*	0.774*	0.600*	-

*Note: *p < 0.01*

Table 9 presents the existence correlation values calculated using Pearson's r tests of correlation with a level of significance set at 0.05. This result indicates the interrelationship between different dimensions of students' perception of HyFlex learning.

In particular, the positive correlation of 0.661 ($p < .05$) suggests a moderately strong relationship between the utilization of HyFlex learning and the level of student engagement. This data implies that students who perceive themselves as effectively utilizing the HyFlex modality are more likely to be actively involved and engaged in their learning experience.

A correlation of 0.628 ($p < .05$) indicates a moderate positive relationship between using HyFlex learning and students' perception of teachers' support. This result indicates that students who feel they effectively utilize HyFlex are more likely to perceive a higher level of support and guidance from their teachers within the HyFlex learning environment.

It also reveals that there is a strong relationship between the utilization of HyFlex learning and students' perception of learning efficacy ($r = 0.754$, $p < .05$). This is indicative that students who effectively utilize the HyFlex modality are more likely to perceive higher effectiveness in achieving their learning goals.

Results also show a significant relationship between learning engagement and perceived teachers' support ($r = 0.649$, $p < .05$). This indicates that students who feel more engaged in their learning experience also perceive a higher level of support and guidance from their teachers.

The positive correlation of 0.774 ($p < .05$) reveals a significant relationship between learning efficacy and engagement. This means that students who feel more engaged in their learning experience are more likely to perceive higher efficacy in achieving their learning goals.

Lastly, a significant relationship exists between teachers' support and learning efficacy ($r = 0.649$, $p < .05$). This positive correlation suggests that students who perceive higher levels of support and guidance from their teachers also tend to have a more excellent perception of efficacy in their learning outcomes.

DISCUSSION

In line with the pursuit of equitable quality education, the emergence of the Hybrid-Flexible (HyFlex) learning modality in the Philippine educational system has significantly responded to the challenges posed by the pandemic. As this transformation primarily affects students, their perception of HyFlex is crucial. Understanding their views and experiences can offer valuable insights to educational leaders, enabling them to refine and enhance the design and implementation of this modality.

This paper presents the development and evaluation of the HyFlex questionnaire, designed to measure students' perception of the HyFlex learning setup. The validity and reliability of the SPHQ were examined, demonstrating its face, content, and construct validity. The construct validity analysis revealed that the four-factor 23-item model derived from EFA is a good fit, as evidenced by fit indicators and factor loadings (Mallah et al., 2021). Furthermore, the internal consistency analysis revealed that the items within each factor and the overall instrument exhibited reliable levels of internal consistency.

The results indicate four distinct dimensions of students' perception: Utilization of HyFlex, Learning Engagement, Perceived Teachers' Support, and Learning Efficacy. Interestingly, three of these dimensions align with the elements of the Community of Inquiry (CoI) framework introduced byGarrison et al. (2010). Learning engagement, reflecting students' involvement in the HyFlex classroom, shares similarities with the concept of Social Presence, which encompasses a sense of belonging in an online environment. Perceived teachers' support, indicating the extent to which students feel supported by their teachers, aligns with the notion of Teaching Presence within the CoI framework. Similarly, learning efficacy, which assesses the effectiveness of the HyFlex modality in facilitating student learning achievement, is akin to the concept of Cognitive Presence.

Meanwhile, the dimension of utilization of HyFlex may be an intersection of the three elements of the CoI framework. This finding suggests that students' perception of the HyFlex learning setup is related to the essential elements of a conducive learning environment that fosters meaningful learning experiences for learners. This finding also supports the work of Chaves (2022) regarding the Presence of CoI in instructional strategies and its crucial role in students' perceived learning and satisfaction. In her study involving 104 students of an educational institution in the Philippines, Chaves (2022) underscores the importance of integrating each element of the CoI (social, cognitive, and teaching) to facilitate learning and attain students' satisfaction effectively.

Based on the analysis of the surveyed students' answers using the developed questionnaire's final version, the results show that the respondents generally hold positive perceptions of the HyFlex learning modality. The findings demonstrate that the respondents perceive HyFlex as a practical and helpful approach to their learning needs. These findings align with the research conducted by Athens (2023), Eduljee et al. (2023), and Kohnke and Moorhouse (2021), who also reported that students generally hold a favorable perception of the HyFlex learning modality. This positive perception is attributed to its flexibility, which helps students adapt their learning experience to their needs and preferences. One manifestation of this flexibility is when students can manage their time more efficiently and engage with course materials according to their chosen approach. Moreover, parallel to the findings of this study, Beatty (2007) and Vaughan (2007) posit that such flexibility is also linked to students' ability to monitor their progress more independently, which emphasizes the value of the HyFlex model to support self-directed learning.

In terms of engagement, the study highlights that students believe that the HyFlex learning modality enhances their interaction with content, peers, and instructors by offering multiple modes of engagement. This finding is supported by Vaughan et al. (2013), who similarly argue that blended learning models provide various pathways for student interaction, regardless of their chosen modality, which effectively fosters engagement. Daniels (2019) further supports this by noting the importance of video recordings in hybrid courses, which allow students to review content and reinforce their learning—an aspect that the current study also found to be valued by most students.

Teacher support, particularly in addressing technical challenges, emerges as a crucial factor in the HyFlex learning environment. The results show that effective use of technology by teachers enhances students' perceptions of support and contributes to a positive overall learning experience. This aligns with the findings of Bower et al. (2015) and Shea and Bidjerano (2009), who emphasize the teacher's Presence in blended and hybrid learning environments. Beatty (2019, 2007) also underscores the need for effective technology use in HyFlex learning, ensuring students' seamless and satisfying experiences.

The study further finds that HyFlex learning enhances the quality of students' work and productivity by allowing them to work at their own pace and revisit materials as needed. This flexibility, which leads to increased productivity, is mirrored in the works of Athens (2023), Beatty (2019), and Shea and Bidjerano (2010). These sources collectively suggest the positive impact of HyFlex on student productivity and the quality of work, emphasizing how the resources and flexibility provided by HyFlex enable students to manage their schedules effectively, leading to better academic outcomes.

Moreover, when students successfully utilize HyFlex, they perceive it as an effective tool that aids them in attaining their desired learning outcomes. Active engagement in the learning process promotes a sense of effectiveness and confidence in students' abilities and creates an environment where teachers' support is noticeable and valued. Lastly, providing adequate support and guidance by teachers positively influences students' perception of their learning effectiveness. The findings parallel the result of the systematic review conducted by Raes et al. (2019) about the benefits of the HyFlex learning modality.

This study has several limitations. Firstly, a limitation lies in its sample size of 460 relatively mature learners, specifically senior high school and college students, which may not fully represent the diverse student population in the broader educational landscape. This could impact the findings' generalizability and the questionnaire's external validity. However, the study's methodology and results are valuable for future research on the HyFlex learning setup.

Secondly, the composition of the questionnaire itself should be considered. While efforts were made to develop a comprehensive instrument, the selected items did not fully capture certain aspects of students' experiences in the HyFlex learning modality.

Additionally, applying the questionnaire through Microsoft Forms may have introduced biases or limitations. For instance, the online format could have influenced participants' responses or limited opportunities for further clarification or exploration of their experiences.

Lastly, while the exploratory and confirmatory factor analyses revealed promising results regarding the validity of the SPHQ, it is essential to note that these analyses are based on the specific sample and context of the study. Therefore, caution should be exercised when generalizing the findings to other populations or educational settings.

CONCLUSION

In this study, the development and validation of the SPHQ, designed to assess students' perception of the HyFlex learning setup, has been completed. SPHQ has demonstrated its comprehensibility and suitability among the target population. Importantly, it has shown validity and reliability, making it a valuable tool for research purposes. However, further validation is necessary, specifically regarding its sensitivity to change, particularly about the HyFlex setup implemented within an institution or the type of learner involved in the learning process. This ongoing validation process will enhance the questionnaire's ability to capture and measure shifts in students' perception of the HyFlex learning modality, allowing for more nuanced and accurate research findings in various educational contexts.

The positive perceptions of utilization, engagement, support, and efficacy highlight the potential of HyFlex as a viable modality to enhance students' learning experiences and outcomes. These findings provide important insights for educational institutions and instructors seeking to adopt and optimize the HyFlex approach, as students perceive it positively, and it aligns with their learning preferences and needs. Moreover, these implications from the initial application emphasize the importance of using HyFlex effectively and its role in enhancing student experiences and outcomes in the learning environment.

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