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Synchronous online learning platforms and student engagement: Exploring high school learning experiences and environments in the Philippines using self-determination theory

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Abstract

In the post-pandemic educational landscape, hybrid learning has become a crucial mode of instruction, prompting educators to assess its effectiveness. This study explores the relationship between classroom learning experience (CLE), environment, and engagement among high school students in selected international schools in the Philippines who engaged in online classes during the pandemic. The purpose of the study is to evaluate how these factors influence student engagement (SE) through the use of Structural Equation Modeling (SEM). A descriptive research design was employed, with data collected from 342 via survey questionnaires. The study is grounded in the Self-Determination Theory, which posits that learning is shaped by environmental and cognitive interactions. Key findings show that although students had 1–2 years of online learning experience, many preferred face-to-face learning due to challenges such as time management and connectivity. Despite these hurdles, students rated the classroom environment positively, particularly in areas like professorial concern over academic rigor (AR) and structure. Engagement was evident across affective, behavioral, and cognitive domains, with differences observed based on student profiles. The SEM analysis revealed a significant relationship between classroom experience (CE), environment, and engagement, with course delivery and assessment (DA) identified as critical predictors of enhanced engagement. Moreover, AR and structure emerged as essential components in shaping the classroom environment. In conclusion, improving course delivery and strengthening academic structure significantly enhance SE in hybrid learning environments. These findings provide actionable insights for educators aiming to optimize student experiences in post-pandemic education.

Keywords: Pure-online classes, Classroom learning experience, Environment, Engagement

Introduction

The global shift to online learning during the COVID-19 pandemic significantly disrupted traditional educational systems, affecting over one billion students worldwide (Kumari et al., 2023). More than 27 million students in the Philippines faced extended school closures, forcing a rapid transition from face-to-face to remote learning. This sudden change posed unique challenges for both teachers and students, particularly in terms of adapting to synchronous and asynchronous online learning platforms (Gantalao et al., 2023). With limited preparation and resources, many educators struggled to maintain effective instruction and student engagement in the virtual classroom (Tharapos et al., 2023).

The Department of Education in the Philippines implemented various strategies to ensure learning continuity, including DepEd Order No. 018, Series of 2020, which emphasized flexible learning options such as modular and online modalities (Gerabon et al., 2024). While public schools often opted for modular learning, some private institutions adopted synchronous online platforms. This approach provided students with real-time interaction with teachers and peers, but it also introduced difficulties in sustaining engagement, particularly as lockdowns extended over an extended period (Ennam, 2024). Maintaining a positive and engaging learning environment became a primary concern for educators as they navigated new ways to foster interaction and motivation in a virtual setting (Lee et al., 2024).

This study aims to assess high school students' online learning experiences and environments in the Philippines through the lens of Self-Determination Theory. Specifically, it seeks to examine the relationship between students' perceptions of their online CE, their learning environment, and their engagement in hybrid learning models. The study will address the following research questions:

RQ1: How do students assess their online CE and environment in terms of course content, guidance, professorial concern, AR, and structure?

RQ2: Is there a significant relationship between students' online CE, environment, and engagement, and what SEM can be developed from the results of the study?

RQ3: How do students evaluate their engagement in online classes in terms of affective, behavioral, and cognitive aspects?

Literature review/study site

This study focuses on three key dependent variables: online CE, classroom environment, and SE. These variables are critical in understanding how synchronous online learning platforms impact high school students' learning experiences, particularly in the context of the Philippines. Before the COVID-19 pandemic struck, institutions from basic to higher levels were starting to utilize the power of technology and the World Wide Web through

conducting online instructions to students. The selection of these variables is rooted in their alignment with the Self-Determination Theory (Deci & Ryan, 1985), which highlights autonomy, competence, and relatedness as essential components for fostering motivation and engagement in educational settings. As passed, Blended Learning has become prevalent in teaching different subjects, and more and more studies have been done to check its effectiveness in terms of learning retention and mastery of lessons to students. These factors significantly influence students' perceptions and behaviors in online learning contexts, making them vital to this research.

Online CE

The online CE plays a pivotal role in shaping students' perceptions of their educational quality. In this study, it is evaluated through three dimensions: course content and guidance, DA, and challenges experienced (CEd).

Course Content and Guidance: Effective course content and teacher guidance are essential for student satisfaction and learning outcomes. Martin and Bolliger (2018) demonstrated that well-structured content, combined with timely instructor feedback, enhances SE. Similarly, Karsen et al. (2021) found that clarity in course materials and comprehensive guidance significantly improve comprehension and satisfaction in online learning environments. Therefore, a robust framework for course content and guidance is crucial for fostering a positive online learning experience, ultimately leading to better academic outcomes.

DA: The method of delivering content and assessing student learning is vital. Martin et al. (2023) emphasized that aligning course delivery with assessment is essential for meeting student expectations. Synchronous platforms facilitate real-time interaction, enhancing material understanding. However, Fidas et al. (2023) caution that assessment practices must adapt to online contexts to ensure fairness, as maintaining academic integrity presents unique challenges. Thus, effective DA practices are necessary to support a constructive online learning environment.

CEd: The abrupt transition to online learning due to the pandemic introduced several challenges, including technical issues, resource access, and increased workloads (Adnan, 2020). These obstacles can diminish students' online CEs and negatively impact motivation and engagement (Salarvand et al., 2023). Addressing these barriers is essential for improving the effectiveness of online education, highlighting the need for ongoing support and resources.

Online classroom environment

The online classroom environment encompasses the social, emotional, and instructional elements that create a supportive learning atmosphere. This study examines it through three dimensions: professorial concern, AR, and structure.

Professorial Concern: Teacher care and concern for students' well-being significantly affect learning outcomes. Vermeulen and Volman (2024) indicated that teacher presence in online environments fosters a positive atmosphere conducive to engagement. Rogers et al. (2021) further highlighted those students who perceive their instructors as supportive are engaged actively in discussions and activities. Thus, professorial concern is a crucial component of a positive online learning environment.

AR: Maintaining AR is crucial for encouraging high levels of critical thinking and performance. Vrieling-Teunter et al. (2022) underscored the importance of challenging curricula in motivating students. Balancing rigor without overwhelming students is essential, as highlighted by Abid et al. (2021), who noted that excessive difficulty can lead to disengagement. Therefore, AR must be carefully managed to enhance SE without inducing stress.

Structure: A well-structured online environment provides clear guidelines and expectations, which are essential for student success. Yılmaz and Yılmaz (2023) showed that structured courses with defined objectives enhance student satisfaction and performance. A clear structure helps alleviate student anxieties, allowing them to focus more on learning (Hawes & Arya, 2023). Consequently, a strong structural framework is necessary for maximizing the effectiveness of online education.

SE

SE in online learning reflects the levels of interest, motivation, and participation exhibited by students. It is a critical predictor of academic success and can be analyzed through three dimensions: affective, behavioral, and cognitive engagement.

Affective Engagement: Affective engagement pertains to students' emotional responses during their learning experience. Positive emotions, such as enjoyment and interest, bolster commitment to learning (Venn et al., 2020). In online settings, the quality of interactions significantly influences affective engagement, as well as the overall classroom environment. A sense of belonging within the virtual classroom enhances this dimension (Seifert & Bar-Tal, 2023). Thus, fostering positive emotional experiences is vital for increasing SE.

Behavioral Engagement: Behavioral engagement encompasses active participation in learning activities, such as attending classes and completing assignments. Labrović et al. (2023) indicated that behaviorally engaged students persist and achieve better academic outcomes. Interactive tools and collaborative projects in online settings can significantly

enhance behavioral engagement (Taşkın & Kılıç, 2022). Therefore, promoting active participation is essential for improving overall student performance.

Cognitive Engagement: Cognitive engagement refers to the mental effort invested in learning, including critical thinking and problem-solving skills. Zare et al. (2024) noted that cognitive engagement increases when tasks are perceived as meaningful and challenging. Inquiry-based activities and interactive content have been shown to deepen cognitive engagement and enhance understanding (Nguyen et al., 2024). Consequently, strategies that promote cognitive engagement are crucial for student success in online learning environments.

In summary, the selection of online CE, environment, and SE as dependent variables is grounded in their critical role in determining the quality of online learning, particularly within the framework of Self-Determination Theory. Each variable influences how students perceive and interact with synchronous online learning platforms. By examining specific dimensions, such as course content, professorial concern, and cognitive engagement, this study aims to contribute to a deeper understanding of the factors affecting student success in online education.

Materials and methods/methodology

Research design

This study employed a cross-sectional and quantitative research design to examine the relationships between students' online CLEs, environment, and engagement using an SEM. A cross-sectional design was chosen because the study gathered data from a sample of respondents at a specific point in time, aligning with the objective of students' perceptions and behaviors during the post-pandemic period of online learning. This approach allowed the research to capture the current state of students' experiences and attitudes without the need for longitudinal tracking, making it ideal for understanding the snapshot of their online learning environment. Maier et al. (2023) have demonstrated that cross-sectional designs are suitable for exploring relationships among variables at a single point in time using SEM techniques.

Additionally, the study is quantitative, as it sought to quantify and analyze relationships among the key variables: CE, environment, and engagement. The use of SEM, a statistical technique that requires numerical data, reinforces the suitability of this approach. Byrne (2013) has shown that SEM is effective in modeling complex relationships between variables, making it a popular choice for studies that examine interrelated factors. This research design aligns with previous SEM studies that employ quantitative measures to explore these relationships. The use of survey questionnaires, adapted from related studies, was a practical method for collecting large-scale quantitative data efficiently, while

interviews provided additional insights. The combination of these methods allowed for a comprehensive analysis that supports the study's goals of understanding and predicting SE through quantifiable variables.

Respondents of the study

The study involved a total of 342 students from grades 8 to 12, enrolled in selected private international schools during the 2022-2023 academic years. This sample size was determined to ensure statistical power, allowing for meaningful analysis of relationships among the variables of interest. To ensure the sample was representative and relevant to the study's objectives, the following criteria were established. Only students actively enrolled in grades 8 to 12 were eligible to participate, ensuring that respondents had adequate experience with online learning. Participants were required to have 1 to 2 years of experience with online learning, specifically using platforms within Google Suite (such as Google Meet, Google Drive, Gmail, and Google Classroom). This criterion was crucial for assessing their perceptions based on substantial exposure to online education. Students were engaged in online learning for approximately 4 to 6 hours daily. This timeframe was chosen to capture a typical online learning experience and its associated challenges. Only schools that had implemented learning management systems and conducted pure online classes during the pandemic were included in the study. This ensured that participants had a similar educational context. A random sampling technique was employed to select participants from the eligible student population. This method enhances the validity of the findings by reducing selection bias and allowing for the generalization of the results to a broader population of high school students in similar educational settings.

The chosen sample of grades 8 to 12 students was appropriate for this study due to several reasons. These grade levels represent a critical transitional phase in students' educational journeys, where they increasingly engage with more complex subjects and learning environments. This period is also characterized by heightened reliance on technology, particularly in the context of online learning, making their experiences particularly relevant for understanding engagement and learning outcomes. Table 1 provides the sample characteristics and the rationale for including each grade level in the study. For instance, younger students in grade 8 have different levels of familiarity with online platforms compared to seniors in grade 12, leading to distinct patterns of engagement and learning experiences. This approach not only enhances the validity of the findings but also contributes to a more nuanced understanding of the impact of online learning across various developmental stages.

Table 1 Sample analysis

Grade Level	Number of Students	Key Characteristics	Rationale for Inclusion
Grade 8	68	Transitioning from middle school; initial exposure to high school curriculum.	Represents early adolescent learning behaviors; helps identify foundational learning experiences and challenges.
Grade 9	70	The first year of high school; increased academic expectations.	Essential for understanding adjustment to higher AR and social dynamics.
Grade 10	68	Introduction to standardized testing; developing independence in learning.	Important for exploring how students engage with assessments and manage their studies.
Grade 11	68	Preparing for college and career paths; emphasis on subject specialization.	Provides insights into academic pressure and its impact on motivation and engagement.
Grade 12	68	Final year; focusing on transitions to post-secondary education or workforce.	Critical for examining readiness and the impact of cumulative educational experiences on future aspirations.
Total	342		

Data gathering instrument

The data gathering instrument is central to this study, as it captures the key variables of CLE, environment, and engagement. Each measurement instrument was carefully designed, adapted, validated, and tested for reliability to ensure the accuracy of the results.

Construction

The research employed a self-constructed questionnaire designed based on the literature and established tools in related studies. The questionnaire used in this study was structured into four distinct sections, totaling 20 questions (refer to Table A1). It was designed to systematically collect data relevant to the study's objectives. The questionnaire comprised four parts. (1) Profile of the Respondents: This section gathered basic demographic information, such as grade level, online learning experience, and familiarity with online platforms like Google Suite. (2) CLE: This part was adapted from the National Assessment Course Evaluation of the Technical Education and Skills Development Authority (TESDA). The TESDA questionnaire is widely recognized for assessing learning experiences in online courses, ensuring the relevance of the questions to online education. (3) Classroom Environment: This section was based on the University Study Hall Nature Dimensions, developed by Lackney (1994). These dimensions were chosen because they measure various aspects of the classroom environment that can affect SE, particularly in an online setting. (4) Students' Engagement: This portion was adapted from the SE in Schools

Questionnaire by Hart et al. (2011). The questionnaire has been widely used to assess engagement and was selected due to its applicability to online learning contexts.

Before administering the final version of the questionnaire, a pilot survey was conducted to test the instrument's reliability and identify any potential issues with question clarity or relevance. The pilot survey involved 30 students from the same population (grade 8 to 12 students). The pilot data were used to revise the instrument and refine any ambiguous questions. To ensure the reliability of the instrument, Cronbach's Alpha was calculated for each section of the questionnaire. A score of 0.90 was achieved, which indicates a high level of internal consistency across the items. According to Byrne (2013), a Cronbach's Alpha score above 0.7 is considered acceptable, while a score above 0.9 reflects excellent reliability.

Validity of the instrument

The validity of the instrument was ensured through both face and content validation. The initial draft of the questionnaire was reviewed by experts, including the researcher's adviser, dean, and field experts with experience in educational research and online learning. Their feedback helped to ensure that the questions were appropriate, clear, and aligned with the objectives of the study. To further ensure content validity, the questionnaire was compared with established instruments used in similar studies. The experts ensured that the questions covered the necessary dimensions of the CLE, environment, and engagement and that they were suitable for the context of online learning in international schools. Revisions were made based on the pilot survey results and expert recommendations. Ambiguous questions were rephrased, and the wording was adjusted to ensure that respondents could easily understand and accurately answer the questions. The final version of the questionnaire was approved by the research committee and deemed ready for data collection.

Validity of questionnaire

The validity of the 1994 University Study Hall Nature Dimensions questionnaire in contemporary settings is supported by its focus on core aspects of the learning environment physical, social, and psychological that remains relevant today. Despite being developed over two decades ago, these dimensions are crucial for understanding student interactions in online education, especially in light of recent shifts to digital platforms. The instrument's adaptability allows it to capture contemporary issues, such as accessibility and engagement, aligning with current educational theories. Additionally, pilot testing and expert feedback have validated its applicability in modern contexts. By using this established tool, the study ensures a robust framework for analyzing student experiences and engagement in today's online learning landscape, thus reinforcing its relevance and effectiveness.

Data collection process

A rigorous and systematic data collection process was followed to ensure the accuracy and reliability of the data collected. The researcher employed several steps to manage the data gathering effectively while maintaining ethical standards. Before commencing the study, the researcher submitted a formal letter of requisition signed by the researcher's mentor. This letter was forwarded to the principals of the selected international schools for their approval. After receiving approval from the schools, the study was reviewed by their Research Ethics and Review Committee. The Ethics Review Certificate was issued, signifying approval to conduct the research. This certificate affirmed that the study complied with ethical standards, particularly regarding the treatment of minors as research participants. Informed consent forms were distributed to both students and their guardians, given the participants' minor status (Grades 8 to 12). These consent forms provided a detailed explanation of the study's purpose, procedures, and expected duration. Participants were informed of their rights, including the right to withdraw from the study at any time without any consequences. The consent form also emphasized the confidentiality of their responses and their protection throughout the research process. Only students who returned the signed consent forms from their guardians were allowed to participate in the survey. In addition, privacy consent was obtained to ensure that personal data collected during the study remained confidential and used solely for research purposes. The final questionnaire, after passing reliability and validity tests, was distributed to 342 students from selected international schools. Depending on the schools' logistical preferences, the questionnaires were administered either in person or through an online platform, ensuring that all respondents completed the survey in a standardized manner. Students were instructed to complete the questionnaire independently and without any influence to preserve the integrity of their responses. The questionnaires covered the four main sections: profile of respondents, CLE, classroom environment, and SE. The online surveys were administered using a Google Forms link sent through email or shared via the schools' Learning Management System (LMS), while the paper-based surveys were distributed during designated class periods.

Upon collecting all the responses, the data were directly inputted into Google Sheets for digital storage and initial analysis. The researcher took special care to ensure that no alterations or modifications were made to the original responses during the data entry process. A manual data cleaning process was conducted to address any missing or inconsistent data, as well as to eliminate incomplete or duplicated responses. This process involved cross-checking responses for clarity and consistency, ensuring that all responses fell within the expected range based on the Likert scale used in the questionnaire. After the data were cleaned, the final dataset was submitted to a professional statistician for further statistical treatment. Descriptive statistics, such as frequency and percentage distributions,

were used to summarize the respondents' demographic data. To evaluate the relationships between variables, t-tests, and Pearson Product Moment Correlation Coefficient were used, providing insights into significant differences and relationships between CLE, environment, and engagement. To further validate the relationships among the study variables and test the conceptual model, Multiple Regression Analysis was employed. The data analysis process was conducted using IBM SPSS v.29, ensuring high levels of accuracy and consistency.

Ethical considerations

In adherence to the APA Ethics Code, the researchers implemented various ethical safeguards throughout the study. Participants were ensured that they fully understood the informed consent process, which outlined the study's purpose, methodology, and the estimated time commitment for completing the questionnaires. They were informed of their right to refuse participation or withdraw at any time, with a clear explanation of the implications of such decisions. The confidentiality of participants was paramount; no identifying details would be disclosed without explicit consent. To protect participants from any potential harm, the researcher took all necessary precautions. Data were collected through Google Sheets, ensuring no alterations were made to the original responses. After initial tabulation and data cleaning, the finalized data were sent to a statistician for analysis. Throughout the study, the research ensured that all data handling adhered to ethical standards, safeguarding participants' rights and privacy.

Data analysis

The final stage of data analysis involved using the AMOS Graphical Approach Version 23 for SEM to develop a structural model identifying the most significant predictors of SE, considering the CLE and environment. SEM allowed the research to model complex interrelationships between variables, offering a comprehensive understanding of factors influencing SE in online learning. Before analysis, the dataset was cleaned by checking for missing values, and Maximum Likelihood Estimation (MLE) was employed to compute regression coefficients, factor loadings, and covariances. Model fit was assessed using indices and the results were compared against acceptable thresholds. The final report accurately presented outcomes without misrepresentation, ensuring confidentiality by securely storing data and anonymizing participant identities through informed consent agreements. Direct and indirect effects of the variables were interpreted to provide a detailed understanding of the structural relationships in the model.

Results and discussion

Evaluating students' online learning experience, classroom environment, and engagement

Table 2 summarizes the indicators related to CLE, the online classroom environment, and SE, highlighting weighted means for each variable. Students' CLE was measured through course content and guidance, DA, and challenges experienced. From these variables, the researcher found out that course content was aligned with the learning objectives, adequate guidance was provided, and the learning objectives of the course were defined. The students find the language of instruction easy to understand as well as the course elements including the content, multimedia, and interactive activities helped them to learn. In terms of assessment, the students find their online assessments to be relevant. However, students have experienced challenges in their online classes in terms of time management and web connectivity. They also had difficulty concentrating due to other household chores during and after online classes. The students rated the course content and guidance higher than the other two. Though the CE had the lowest weighted mean, the researcher still finds this positive in the sense that the majority of these challenges were only experienced sometimes by the students and not too big of a hindrance for them to learn.

The classroom environment is measured in terms of white-collar care, educational diligence, and framework. Based on these variables, the students find their online learning environment positive where teachers respect their views, give them the freedom to ask questions, appreciate their ideas in class, create opportunities for them to contribute to the

Table 2 Summary of CLE, Online Classroom Environment, and SE indicators

Indicators	Weighted Mean	Verbal Interpretation	Rank
CLE			
Course Content and Guidance	3.36	Agree	1
DA	3.35	Agree	2
CEd	2.34	Agree	3
Composite Mean	*3.35*	*Agree*	
Online Classroom Environment			
Professorial Concern	3.46	Agree	1
AR	3.11	Agree	3
Structure (S)	3.39	Agree	2
Composite Mean	*3.32*	*Agree*	
Students' Engagement			
Affective Domain	2.72	Often	3
Behavioral Domain	3.20	Often	2
Cognitive Domain	3.28	Often	1
Composite Mean	*3.07*	*Often*	

Note: 3.50 – 4.00 = Strongly Agree; 2.50 – 3.49 = Agree; 1.50 – 2.49 = Disagree; 1.00 – 1.49 = Strongly Disagree

learning process, and are willing to assist them outside class hours. Meanwhile, AR is being practiced by allowing the students to give creative solutions during exams, developing independent learning, and having flexible projects using the school's learning management system. Finally, the structure of the learning environment is seen in terms of making the students aware of what they need to learn, finishing and accomplishing a certain amount of work done in class, planning class activities carefully, and creating content that is well arranged and logically presented. Among the three classroom environment criteria, professorial concern got the highest weighted mean from the students followed by structure and AR respectively. The results implied that the students see their teachers as the main factor in creating a good classroom environment online. Further, it is also important to note that even with all the resources available online, the teacher's role in the learning process can never be replaced.

Classroom learning engagement was measured based on three domains, affective, behavioral, and cognitive. Based on the affective engagement, it was found out that the students seem to care about their grades even if the class is online, they are also proud of their work and outputs as they are mostly self-motivated to do them. Meanwhile, for behavioral engagement, the three indicators with the highest weighted mean include showing respect to their teachers, paying attention to the things that they need to remember, and having good attendance in class. This implies that the students often exhibit positive behavior in class. Their good attendance can be attributed to the flexibility and convenience of attending online classes. On the other hand, getting involved in class activities, forming new questions in mind, and actively participating in class ranks the lowest among the behavioral engagement criteria. This implies that even though they attend their classes regularly, this does not ensure that the students are also diligently engaged in study arguments. With this, there is a need for the teachers to make sure that the student's attendance in class also translates to active participation by giving them activities that are engaging and collaborative. Finally, the students were seen often engaged cognitively as indicated by the following: (1) if they commit mistakes, they try to figure out where they were wrong; (2) when researching, they use different sources of information and synthesize them; and (3) when confused, they review their lessons that they do not understand. These results implied that the students are proactive, resourceful, and committed to their online learning. This is a good indication that online classes maximize the potential of the students same as how they do in face-to-face classes. The students were cognitively engaged more than behavioral and affective as seen in its highest weighted mean of 3.28. This implied that since there is more independent work to be done during online classes, there are more opportunities for the students to think critically and cognitively on their own. Not far behind is the behavioral domain followed by the affective engagement being in the last rank. From the result, the teachers should create activities that can elicit enthusiasm,

interest, happiness, and excitement in their online classes to improve their affective engagement.

SEM correlation

Using SEM, this section explores the interconnected relationships between classroom engagement, CE, and classroom environment. SEM is a robust statistical technique that allows for the simultaneous analysis of multiple variables, providing a comprehensive understanding of how these elements influence each other. By modeling these relationships, this study aims to uncover how factors such as professorial concern, AR, and classroom structure affect students' engagement and experiences. Understanding these dynamics can help educators create more effective and supportive learning environments, ultimately enhancing student outcomes.

Figure 1 shows that all three dimensions of classroom environment are good predictors of the respondents' classroom engagement. This means that any change in any dimension would have a causal effect on the student's classroom engagement. This implies that in designing the curriculum for the hybrid model, the classroom environment should be considered as this has a direct effect on the way the students are engaged in class.

Table 3 summarizes various fit indices used to evaluate the adequacy of a statistical model, typically in the context of SEM. Each index has a corresponding value, threshold, interpretation, and additional comments, providing a comprehensive assessment of model

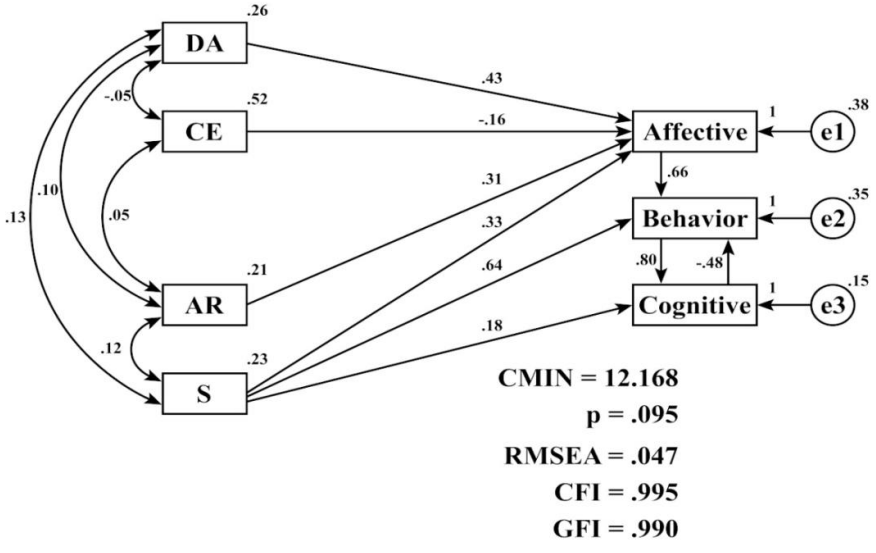

Fig. 1 SEM

Table 3 Fit Indices for model evaluation

Fit Index	Value	Threshold	Interpretation	Comments
CMIN/df	2.43	< 3 (Good), < 5 (Acceptable)	Indicates good model fit	Lower values indicate better model fit
RMSEA	0.047	< 0.08	Indicates acceptable fit	Close to an acceptable range
CFI	0.995	> 0.90	Indicates good fit	Excellent fit
GFI	0.990	> 0.90	Indicates good fit	Excellent fit
TLI	0.993	> 0.90	Indicates good fit	Excellent fit
NFI	0.990	> 0.90	Indicates good fit	Excellent fit
SRMR	0.035	< 0.08	Indicates good fit	Excellent fit

fit. CMIN/df (Chi-square statistic per degree of freedom): With a value of 2.43, which is below the commonly accepted threshold of 3, this indicates a good model fit. A chi-square statistic assesses how well the observed data align with the model; a lower value suggests that the model is an acceptable representation of the data. RMSEA (Root Mean Square Error of Approximation): At 0.047, this value is below the acceptable threshold of 0.08, suggesting an acceptable fit. The RMSEA is a widely used index that considers model complexity, with values closer to 0 indicating a better fit. CFI (Comparative Fit Index): With a value of 0.995, exceeding the threshold of 0.90, this indicates an excellent fit. The CFI compares the fit of a target model to that of a baseline model, with higher values reflecting a better fit. GFI (Goodness of Fit Index): A GFI value of 0.990, also above the threshold of 0.90, indicates excellent fit. The GFI assesses the proportion of variance accounted for by the model, with values close to 1 indicating a good model fit.

TLI (Tucker-Lewis Index): This index has a value of 0.993, surpassing the threshold of 0.90, indicating excellent fit. The TLI penalizes model complexity, rewarding parsimony while reflecting how well the model fits the data. NFI (Normed Fit Index): At 0.990, this value is well above the 0.90 threshold, suggesting excellent fit. The NFI compares the fit of the proposed model to a null model, providing insight into the model's performance relative to a baseline. SRMR (Standardized Root Mean Square Residual): The SRMR value of 0.035 is below the threshold of 0.08, indicating a good fit. This index measures the average discrepancy between observed and predicted correlations, with lower values suggesting a better fit. The fit indices presented in the table collectively indicate that the model demonstrates excellent fit to the data, suggesting that it accurately captures the underlying relationships being studied. Each index complements the others, providing a well-rounded evaluation of the model's adequacy.

Individual correlations: relationship between CLE, environment and engagement

Relationship between CLE and classroom environment

Table 4 presents the correlation between various aspects of the classroom environment and student learning experiences. The entries are categorized into three main areas: Course Content and Guidance, DA, and CEd. Each category examines the relationship through three dimensions: White-collar Care, Educational Diligence, and Framework.

For Course Content and Guidance, the R-values for White-collar Care, Educational Diligence, and Framework are .566, .354, and .514, respectively, with corresponding p-values of 0.005, 0.008, and 0.002. All three dimensions are highly significant, indicating a strong correlation between these factors and the effectiveness of course content and guidance.

In the DA category, Professorial Concern, AR, and Structure have R-values of .602, .404, and .561, with p-values of 0.001, 0.009, and 0.004. These results also show a highly significant correlation, emphasizing the importance of these factors in effective DA methods.

For the CEd category, Professorial Concern and AR have R-values of -.235 and 0.097, with p-values of 0.003 and 0.007, respectively, indicating a highly significant relationship. However, Structure, with an R-value of -0.059 and a p-value of 0.015, is not significant, suggesting that the structural aspects of the classroom environment do not significantly affect the CEd by students.

In summary, the table shows that Professorial Concern, AR, and Structure are critical components of the classroom environment that significantly influence students' learning experiences, except for the structure in the context of CE, where the correlation is not significant.

Table 4 Relationship between CLE and Classroom Environment

Course Content and Guidance	R-value	p-value	Interpretation
Professorial Concern	.566**	0.005	Highly Significant
AR	.354**	0.008	Highly Significant
S	.514**	0.002	Highly Significant
DA			
Professorial Concern	.602**	0.001	Highly Significant
AR	.404**	0.009	Highly Significant
S	.561**	0.004	Highly Significant
CEd			
Professorial Concern	-.235**	0.003	Highly Significant
AR	.097	0.007	Highly Significant
S	-.059	0.015	Not Significant

Note: **p<0.01

Parallel results were seen in the study of Khatimah (2021) which stated that the educational nature of the study hall can impact the students' educational results. It was perceived that a better study hall nature makes learners perceive more pleasant and encouraged to carry out education pursuit. It was proven that a constructive study hall nature is connected to encouraging learning in all situations.

Relationship between CLE and students' engagement

Table 5 shows that all dimensions of students' learning experience are significantly related to SEs from their p-value which is less than 0.01. This implies that the better the CLE, the more that the students are engaged. From the positive R-values, we can infer that the clearer the course content and guidance and the better the DA, the more engaged the students are in the lesson. On the other hand, the negative R-values under the CEd imply that if the students are having difficulty in class, the less that they became engaged in class. This means that their classroom engagement is inversely affected by the challenges that they encounter attending their online class. As a result, the teacher should make sure that the students are well-guided to lessen the difficulties that they encounter to encourage them to participate and engage in class. Parental support at home also helps lessen the burden and the challenges that the students experience in class.

The results of the study are parallel to the studies of Greller et al. (2017) which stated that regularity and persistence in learning activities are related to the learners' engagement and successful performance.

Parallel results were seen in the research of Rajabalee et al. (2020), which revealed that students' engagement levels in the online course indicate whether the students will do well in an independent activity if they show and exhibit a positive attitude such as giving decent effort in their respective activity.

Table 5 Relationship between CLE and Students' Engagement

Course Content and Guidance	R-value	p-value	Interpretation
Affective Domain	.482**	0.003	Highly Significant
Behavioral Domain	.460**	0.005	Highly Significant
Cognitive Domain	.502**	0.002	Highly Significant
DA			
Affective Domain	.506**	0.001	Highly Significant
Behavioral Domain	.489**	0.004	Highly Significant
Cognitive Domain	.538**	0.0005	Highly Significant
CEd			
Affective Domain	-.201**	0.006	Highly Significant
Behavioral Domain	-.215**	0.007	Highly Significant
Cognitive Domain	-.212**	0.008	Highly Significant

Note: **p<0.01

Relationship between classroom environment and students' engagement

Table 6 illustrates the connection between various aspects of the classroom nature and student engagement across three domains: Affective, Behavioral, and Cognitive. The table is divided into three main components of the classroom nature: White-collar Care, Educational Diligence, and Framework. Each component is correlated with SE in the affective (emotional response), behavioral (actions and participation), and cognitive (mental effort and strategy) domains.

For Professorial Concern, the R-values are .403, .478, and .510 for the Affective, Behavioral, and Cognitive domains, respectively, with all p-values lower than 0.01, indicating extremely crucially constructive correlations. This means that higher levels of Professorial Concern from educators are strongly associated with increased SE across all domains.

Similarly, AR shows R-values of .377, .407, and .463 for the Affective, Behavioral, and Cognitive domains, respectively, with highly significant p-values, suggesting that challenging academic environments positively influence SE.

Lastly, the Structure component presents R-values of .432, .522, and .593 for the Affective, Behavioral, and Cognitive domains, respectively, again with highly significant p-values. This indicates that well-structured classroom environments are strongly linked to higher levels of SE in emotional, participatory, and cognitive aspects.

Overall, the table underscores the importance of Professorial Concern, AR, and structured environments in fostering robust SE in various domains.

This is related to the study of Khatimah (2021) which stated that the learning environment influences the learning process and student behavior directly and indirectly. During the learning process when the students are presented with an environment of calm and supportive, then they can concentrate and absorb the lesson well. Providing a conducive learning environment is critical to the success of building students' behavioral abilities.

Table 6 Relationship between Classroom Environment and Students' Engagement

Professorial Concern	R-value	p-value	Interpretation
Affective Domain	.403**	0.004	Highly Significant
Behavioral Domain	.478**	0.002	Highly Significant
Cognitive Domain	.510**	0.001	Highly Significant
AR			
Affective Domain	.377**	0.006	Highly Significant
Behavioral Domain	.407**	0.003	Highly Significant
Cognitive Domain	.463**	0.002	Highly Significant
S			
Affective Domain	.432**	0.005	Highly Significant
Behavioral Domain	.522**	0.001	Highly Significant
Cognitive Domain	.593**	0.0005	Highly Significant

Note: **p<0.01

SEM results

The previous section presents the relationship between classroom environment, CE, and classroom engagement. It was found that the relationships are significant and that prompted to development of an SEM. Here, classroom engagement is considered as the dependent variable while classroom environment and CE are the independent variables.

Tables 7 and 8 present the regression weights, standard regression weights, and the fit indices for the model above. These confirmed the goodness of fit of the derived model.

The model confirms that DA is significant to affective engagement with $\beta = .43$; $p < .001$. This means that with a unit increase in DA, the affective engagement will increase by .43. Similarly, results showed that challenges experienced is also significant, however negative, to affective engagement. This is confirmed by $\beta = -.16$; $p < .001$ meaning that with a unit increase of challenges experienced, the affective engagement will decrease by .16.

SEM enables research to assess the direct and indirect effects of multiple variables simultaneously, providing a holistic view of the interactions at play in an educational

Table 7 Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	p
Affective	←	DA	.433	.081	5.363	***
Affective	←	CEd	-.161	.049	-3.318	***
Affective	←	AR	.315	.094	3.361	***
Affective	←	S	.332	.093	3.588	***
Behavior	←	S	.638	.123	5.198	***
Cognitive	←	S	.180	.066	2.732	.006
Behavior	←	Affective	.657	.087	7.521	***
Cognitive	←	Behavior	.796	.065	12.242	***
Behavior	←	Cognitive	-.479	.193	-2.478	.013

Table 8 Standardized Regression Weights: (Group number 1 - Default model)

			Estimates
Affective	←	DA	.290
Affective	←	CEd	-.151
Affective	←	AR	.187
Affective	←	S	.208
Behavior	←	S	.462
Cognitive	←	S	.136
Behavior	←	Affective	.760
Cognitive	←	Behavior	.832
Behavior	←	Cognitive	-.458

setting. In this model, regression weights indicate the strength and direction of the relationships between variables. A positive regression weight suggests that an increase in one variable leads to an increase in the other, while a negative weight indicates an inverse relationship. The regression weight for classroom environment on classroom engagement is significant, indicating that improvements in the classroom environment are associated with higher levels of SE. This implies that factors such as professorial concern, AR, and classroom structure directly influence students' ability to engage cognitively, behaviorally, and affectively. Furthermore, the significance of these weights is evaluated through p-values, where a p-value less than 0.05 indicates statistical significance.

The SEM results reveal that the classroom environment significantly influences cognitive, behavioral, and affective engagement, each of which plays a crucial role in hybrid learning environments. Cognitive engagement involves students' mental investment in learning, such as critical thinking and problem-solving. The SEM analysis shows that classroom structure, including clear goals and organized content, has a strong impact on cognitive engagement. This implies that hybrid courses should be well-organized, with clear learning objectives and activities that promote deeper understanding. Educators can enhance cognitive engagement by incorporating problem-based learning, discussion forums, and interactive quizzes that encourage active participation. Behavioral engagement refers to students' participation and involvement in learning activities. The SEM results highlight that professorial concern teachers' attentiveness and support significantly affect behavioral engagement. In hybrid environments, teachers should maintain regular communication through online platforms, offer prompt feedback, and engage students in group tasks. This active involvement from the teacher fosters a sense of connection and keeps students engaged in their studies. Affective engagement involves the emotional responses students have toward learning, such as enjoyment or frustration. The SEM findings show that AR, or the level of challenge in the coursework, positively influences affective engagement. To maintain this, hybrid courses should be intellectually stimulating yet enjoyable. Teachers can use multimedia content, real-world applications, and gamified learning to make the material more engaging. In summary, creating a well-structured hybrid curriculum with active teacher engagement and appropriate AR is essential for enhancing all three types of engagement. These strategies help ensure that students remain cognitively, behaviorally, and emotionally invested in their learning, leading to improved outcomes in hybrid educational environments.

Table 9 presents a qualitative examination of student experiences about classroom engagement, CE, and classroom environment, offering valuable insights that complement the quantitative findings of the study. The first theme, Classroom Engagement, highlights that students demonstrated varying levels of involvement depending on the nature of instruction and the degree of support provided by their teachers. For instance, students

Table 9 Analysis of interview data

Theme	Description	Supporting Quotes	Connection to Quantitative Findings
Classroom Engagement	Students expressed varying levels of engagement based on the type of instruction and teacher support.	"In classes where the teacher engages us, I feel more involved and eager to learn."	Aligns with SEM results indicating that classroom environment impacts engagement levels.
CE	Feedback highlighted the diversity of experiences among students, influenced by their study hours and platform usage.	"Those who study longer hours often feel fatigued, which affects their participation."	This supports the finding that longer online hours correlate with increased challenges faced.
Professorial Concern	Many students noted that teachers who were proactive in reaching out made them feel more supported and engaged.	"My teacher checks in with us regularly, which helps me stay motivated."	Correlates with the SEM results showing that professorial concern is a significant predictor of engagement.
Technical Support	Students emphasized the need for improved technical support, especially for those using various platforms.	"Some of us struggle with technology, and it can be frustrating."	Highlights the necessity for teachers to enhance their technical skills, as suggested by the SEM findings.
AR	The level of academic challenge was mentioned as a double-edged sword, motivating some while overwhelming others.	"I enjoy challenging work, but sometimes it feels like too much."	Reflects the mixed responses in quantitative data regarding AR and engagement levels.
Classroom Environment	Students discussed the physical and emotional atmosphere of the virtual classroom as essential for their engagement.	"A positive atmosphere makes me want to participate more."	This aligns with SEM findings that suggest the classroom environment significantly affects SE.

noted that classes where teachers actively engaged them fostered a greater sense of involvement and eagerness to learn. This observation aligns with the SEM results, which indicate that the classroom environment significantly influences engagement levels. The theme of CE underscores the diverse challenges students face, particularly concerning the number of hours spent studying and the platforms used. Many students reported that extended online learning hours often led to fatigue, negatively impacting their participation. This finding echoes the quantitative data, which revealed a correlation between longer online study hours and increased CE by students.

Professorial Concern emerged as a critical factor, with students emphasizing the importance of proactive teacher support. Those whose teachers regularly checked in felt more motivated and engaged, supporting the SEM results that identified professorial concern as a significant predictor of engagement. Additionally, the theme of Technical Support surfaced, with students expressing a need for enhanced technical assistance, particularly for those navigating different learning platforms. This highlights the necessity

for teachers to improve their technical skills, reinforcing insights from the SEM analysis. The theme of AR revealed a nuanced perspective, where students appreciated challenging work but sometimes felt overwhelmed. This reflects the mixed responses found in the quantitative data regarding AR and its relationship with engagement levels. Lastly, the theme of Classroom Environment illustrated that both the physical and emotional atmosphere of the virtual classroom played a vital role in SE, echoing SEM findings that underscore the classroom environment's significant impact on engagement. Overall, the qualitative insights derived from the interviews enrich the understanding of how these interconnected variables influence student experiences and engagement in hybrid learning environments.

Significant difference in the students' when grouped according to profile variables

Difference in the Students' Responses on CEd when Grouped According to the Demographics

It was observed that there was an important distinction in CE when gathered together based on the learning hours after the computed p-value of 0.020 was lower than the 0.05 alpha quantity. This means that the opinions differ crucially on the challenges that they experienced based on the length of time that they studied online. According to Bonferroni's test directed it was established that participants with an average of 4 to 6 hours of using virtual platforms experienced more problems. This implies that the longer a student stays in the virtual environment, the more problems that they encounter significantly. Thus, there is a need to limit and balance the students' time between their online and offline learning. The rest of the variables, on the other hand, show that there is no significant difference in the student's experiences regardless of their years in a virtual environment, platform usage, and the delivery of instructions.

Based on the results, the researcher can imply that since not all students experienced the same problems and challenges, students' responses vary dramatically from each other. This is parallel to the results of the study of Urkude and Devasena (2023), which revealed that teachers and students faced different obstacles in their online classes such as those which are related to the home setting, institution support, and personal obstacles such as having a pessimistic attitude toward online learning.

Difference in the responses to classroom environment when grouped according to profile

It was found that the respondents' responses varied significantly on professorial concern when grouped according to the platform used in virtual learning according to usage as

shown by the p-value of 0.046 which was lower than the 0.05 alpha level. This implies that the teachers' guidance to students on the usage of the online platform plays a huge role in their online learning. According to Bonferroni's test, it was established that those who use LMS have a better assessment of the professorial concerns of their teachers. This can be attributed to the technical skills that the teacher has to be able to guide and teach the students the fundamentals of using the different online platforms needed for learning. It is an important finding as this emphasizes the need for teachers to improve their skills in navigating the different online platforms to make sure that they can better guide the students on its usage. The less the teacher knows, the less that they can contribute and help while the more the teacher knows, the more that they can help.

Since the students are forced to do online classes during the last two years of the pandemic, the skills, and technicalities in navigating such platforms would be challenging for the students, thus their need varies differently in such a way that the guidance of their teachers must suit such need to sustain their learning remotely online. The significant difference may also be attributed to the type of teachers that the students have since it was mentioned in different research that junior teachers are more technically savvy than senior ones.

This is related to the study of Svihus (2024) which revealed that teachers who have a positive perception of online learning are more actively engaged in creating multimedia teaching aids which then eventually improve their technology and technical skills. On the other hand, the study by Rahayu and Wirza (2020) showed that aged faculty members looked at issues in generating subject engagement through e-learning systems.

The rest of the variables show that there is no significant difference in the respondents' responses on the way they see their classroom environment regardless of their years of online learning, average learning hours per day in the virtual classroom, and preferred delivery of instruction. This means that the students have almost the same expectations of their online classroom environment.

Difference in the students' responses to classroom engagement when grouped according to profile variables

It was found that the responses vary significantly on the affective engagement when grouped according to preferred delivery of instructions as shown by the p-value of 0.036 which is lower than the 0.05 level of significance. This means that the opinions differ statistically and according to the pair-wise comparison, it was established out that those who preferred pure online were more engaged effectively. Since effective engagement implies spiritual reply connected to work expenditure, the substantial the learner's absorption quality, pleasure, constructive behavior, the constructive benefit detained, inquisitive, and a familiarity sensation (and the lower than the apprehension, sorrow, and

weariness) that they feel in their online class, the greater the affective engagement that the respondents show.

Since affective engagement deals with student's emotional response to learning, the study of Xie et al. (2019) is parallel to the result of the study stating that positive emotions are correlated with higher achievement and self-regulation. It also relates to how students complete a certain task, in which in this study such task has something to do with the delivery of instruction by the teacher. If the students view the task as useful and enjoyable, then they are likely to feel positive emotions toward them.

In conclusion, in designing the hybrid curriculum, if the teacher wants to increase the students' engagement, then should give importance to maintaining a good classroom environment. However, for the teacher to do that, he should make sure that the students gain a meaningful experience in this mode of learning as this can create a better classroom environment which will then help maximize students' engagement and participation in class. If such is achieved, the students would have a good learning experience in the hybrid setup.

The findings of this study contribute to the growing body of literature on classroom engagement, experience, and environment, particularly within hybrid learning contexts. The significant difference in challenges faced by students based on their online learning hours aligns with previous research that emphasizes the detrimental effects of prolonged screen time. Mao et al. (2022) showed that extended engagement in online learning can lead to fatigue and decreased motivation, underscoring the necessity for balanced learning approaches. Furthermore, the study reveals that professorial concern significantly influences SE, corroborating findings from Kahu and Nelson (2017). Their research emphasizes that supportive teacher-student relationships foster a sense of belonging and enhance students' emotional and cognitive engagement. The present findings extend this concept by highlighting that students using Learning Management Systems reported higher levels of perceived support, suggesting that effective platform utilization can mediate the relationship between teacher concern and SE. In terms of classroom environment, the results indicate that all dimensions of classroom environment significantly impact SE. This aligns with the work of Zepke (2024), who posited that a positive learning environment is pivotal for fostering SE and success. The present study builds upon this by demonstrating that the specific characteristics of the classroom environment such as structure and AR are critical predictors of SE in hybrid settings. Moreover, the emotional aspect of engagement is supported by the findings of Fredricks et al. (2004), who assert that affective engagement is closely tied to students' emotional responses to learning tasks. The present results indicate that students who find the hybrid learning experience enjoyable and meaningful exhibit higher affective engagement levels, reinforcing the importance of creating engaging and relevant learning experiences. This study not only highlights the nuanced relationships

between classroom engagement, experience, and environment but also provides actionable insights for educators aiming to enhance student outcomes in hybrid learning contexts.

Educators should balance online and offline learning time to mitigate fatigue and enhance motivation. Professional development in LMS usage is essential for effective teaching. Building supportive teacher-student relationships fosters engagement. Designing meaningful, enjoyable learning experiences boosts affective engagement. Implementing feedback mechanisms can identify challenges and improve instructional practices. Research should conduct further studies on hybrid learning dynamics to understand the long-term effects of instructional strategies on SE and performance.

This study is subject to several limitations. First, the sample size may not fully represent the broader student population, limiting the generalizability of the findings. Second, the reliance on self-reported data can introduce biases, as students may overestimate their engagement or downplay challenges. Third, the study focuses primarily on a specific demographic group, which may not account for diverse learning needs and experiences. Lastly, the research is limited to a single context (hybrid learning during the pandemic), potentially affecting the applicability of the results in different educational settings. Future studies should address these limitations by incorporating diverse populations and methodologies.

Future research should explore the long-term effects of hybrid learning on diverse student populations to enhance generalizability. Investigating the experiences of students from varying socio-economic backgrounds, learning styles, and levels of technological proficiency would provide deeper insights into engagement and challenges. Additionally, longitudinal studies could assess the sustained impact of virtual learning environments on student outcomes over time. Finally, examining the effectiveness of specific instructional strategies and technologies used in hybrid settings could yield actionable recommendations for educators aiming to improve SE and success.

Conclusion

The majority of the respondents had less than three years of virtual experience which only started during the pandemic; were exposed to different virtual platforms specifically on Google Suite; were learning online for four to six hours every day and would choose face-to-face as the delivery of instruction. The majority of the respondents agree that their learning experience in their online classes is positive in terms of course content and guidance DA. Despite this, they still experienced different challenges in terms of time management, connectivity issues, and concentration. In terms of classroom environment, the majority of the respondents agree that their teachers show concern for their well-being as students by respecting and appreciating their ideas and opinions and letting them ask questions and clarifications if there are any. Further, they also agree that their online class

has maintained a good sense of AR and structure. In terms of classroom engagement, the majority of the students show a higher level of cognitive engagement than affective and behavioral. There is no significant difference in the students' learning experience, environment, and engagement when gathered together based on the profile constructs. There is an important connection between and among the students' experience, environment, and engagement. The Structural Equation Model (SEM) shows that in terms of CE, DA, and challenges experienced are good predictors of affective engagement. In terms of classroom environment, AR and structure are good predictors of academic, behavioral, and cognitive engagements.

Appendix

Table A1 Sample questionnaire of the participants

Instructions:
Thank you for participating in this survey! Your responses will help us understand students' online learning experiences, environments, and engagement levels. Please read each question carefully and answer honestly. Your answers are confidential and will only be used for research purposes.
Part 1: Profile of the Respondents
1. What is your grade level? a) Grade 8 b) Grade 9 c) Grade 10 d) Grade 11 e) Grade 12
2. How many years of online learning experience do you have? a) Less than 1 year b) 1 year c) 1-2 years d) More than 2 years
3. Which online platforms do you frequently use for your classes? (Select all that apply) a) Google Meet b) Google Classroom c) Zoom d) Microsoft Teams e) Other (please specify): _____
4. How many hours per day do you spend in online classes? a) Less than 2 hours b) 2-4 hours c) 4-6 hours d) More than 6 hours
5. How comfortable are you with using online learning tools? a) Very comfortable b) Comfortable c) Neutral d) Uncomfortable e) Very uncomfortable

Likert Scale Instructions:	
For the following statements, please indicate your level of agreement using the scale provided:	
1 = Strongly Disagree	
2 = Disagree	
3 = Neutral	
4 = Agree	
5 = Strongly Agree	
Part 2: CLE	
1.	The online materials provided are clear and easy to understand.
2.	I receive adequate feedback on my assignments and participation.
3.	The pace of online classes is suitable for my learning needs.
4.	I feel comfortable asking questions during online classes.
5.	The use of multimedia (videos, slideshows) enhances my understanding of the topics.
Part 3: Classroom Environment	
6.	The online classroom atmosphere is welcoming and inclusive.
7.	I feel a sense of belonging in my online classroom.
8.	Technical issues do not hinder my learning experience.
9.	I can easily access the resources needed for my studies.
10.	Peer interactions in the online environment are positive and supportive.
Part 4: Students' Engagement	
11.	I actively participate in discussions during online classes.
12.	I often find myself looking for additional resources related to my studies.
13.	I feel motivated to complete my online assignments on time.
14.	I engage with my classmates outside of formal class time.
15.	I believe that my contributions are valued in the online learning environment.
Thank You For Your Responses!	

Abbreviations

AR: Academic Rigor; CE: Classroom Experience; CEd: Challenges Experienced; CFI: Comparative Fit Index; CLE: Classroom Learning Experience; CMIN/df (Chi-Square Statistic per Degree of Freedom); DA: Course Delivery and Assessment; GFI: Goodness of Fit Index; LMS: Learning Management System; MLE: Maximum Likelihood Estimation; NFI: Normed Fit Index; RMSEA: Root Mean Square Error of Approximation; SE: Student Engagement; SEM: Structural Equation Modeling; SRMR: Standardized Root Mean Square Residual; TLI: Tucker-Lewis Index.

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Author's contributions

The author is responsible for the whole manuscript. The author read and approved the final manuscript.

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Availability of data and materials

Underlying Data:

All underlying data can be seen at:

https://figshare.com/articles/dataset/CLASSROOM_LEARNING_EXPERIENCE_ENVIRONMENT_AND_ENGAGEMENT/25585968

Declarations

Competing interests
Not applicable.

Ethical approval
This study was approved by the Lyceum of the Philippines University – Batangas ethical clearance committee after due consultation and review.

An Ethics and Review Certificate was also given by the Ethics Review Committee of the schools from which the data was collected from. An informed consent form and data privacy form was also read and was attached in the questionnaire for the collection of data to proceed.

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