

BEHAVIORAL, EMOTIONAL, AND COGNITIVE ENGAGEMENT IN HYBRID LEARNING ENVIRONMENTS

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Abstract

Hybrid learning environments have become increasingly prominent in higher education following the digital transformation accelerated by the COVID-19 pandemic. These environments combine face-to-face instruction with online learning platforms, creating flexible and interactive educational experiences. Student engagement remains a critical determinant of learning success in such environments. This study examines behavioral, emotional, and cognitive engagement among university students participating in hybrid learning environments. A quantitative research design was adopted, and data were collected from 600 undergraduate and postgraduate students enrolled in hybrid courses. Descriptive statistics were used to analyze engagement levels across the three dimensions. The findings reveal that hybrid learning environments significantly enhance student participation, motivation, and intellectual involvement in learning activities. Behavioral engagement is reflected through increased participation in classroom and online discussions, while emotional engagement is strengthened through improved interaction and sense of belonging. Cognitive engagement is enhanced through active learning strategies and technology-supported instructional activities. The study concludes that well-designed hybrid learning environments promote multidimensional student engagement and contribute to improved learning outcomes in higher education.

Keywords: Hybrid Learning, Student Engagement, Behavioral Engagement, Emotional Engagement, Cognitive Engagement, Higher Education.

Introduction

The integration of digital technologies into higher education has significantly transformed teaching and learning practices. In recent years, universities around the world have increasingly adopted hybrid learning environments that combine traditional classroom instruction with online learning activities. Hybrid learning represents a flexible and innovative instructional model that leverages the advantages of both face-to-face interaction and digital learning technologies.

Student engagement plays a crucial role in determining the effectiveness of learning environments. Engaged students demonstrate higher levels of academic participation, motivation, and intellectual effort, which ultimately lead to improved academic performance and satisfaction. Educational researchers widely recognize engagement as a multidimensional construct consisting of behavioral engagement, emotional engagement, and cognitive engagement.

Behavioral engagement refers to students' active participation in learning activities such as attending lectures, contributing to discussions, completing assignments, and collaborating with peers. Emotional engagement reflects students' feelings toward the learning process, including interest, motivation, enjoyment, and sense of belonging. Cognitive engagement involves the depth of intellectual effort students invest in understanding complex concepts, solving problems, and applying knowledge.

Hybrid learning environments offer unique opportunities to enhance these dimensions of engagement. Online platforms provide flexibility, multimedia resources, and opportunities for asynchronous participation, while face-to-face sessions facilitate social interaction, immediate feedback, and collaborative learning experiences. When effectively designed, hybrid learning environments can create dynamic learning experiences that promote deeper engagement.

Despite the increasing adoption of hybrid learning models, there remains a need for empirical research

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examining how these environments influence different dimensions of student engagement. Understanding engagement patterns in hybrid learning contexts is particularly important for improving instructional design and maximizing learning outcomes. Therefore, the present study aims to examine behavioral, emotional, and cognitive engagement among students participating in hybrid learning environments in higher education.

Literature Survey

Academic inquiry into the Third Battle of Panipat Bond et al. (2020) conducted a large-scale systematic review of student engagement in digital learning environments, including fully online and blended formats, making it one of the most comprehensive syntheses in the field. By analyzing over 200 empirical studies across different higher education contexts, the authors sought to identify common patterns in how digital pedagogies influence behavioral, emotional, and cognitive engagement. Their review moved beyond measuring simple participation metrics and instead focused on how instructional design shapes meaningful learning involvement. The findings indicated that behavioral engagement was consistently higher in courses where digital tools were used to structure regular participation. Features such as scheduled discussion forums, low-stakes quizzes, interactive polling, and collaborative tasks encouraged students to remain active throughout the course. Rather than sporadic interaction, students engaged in ongoing cycles of preparation, participation, and feedback. This sustained involvement helped students stay connected to course activities across time and modalities.

Emotional engagement was strongly linked to opportunities for peer interaction and supportive communication. Students reported feeling more motivated and committed when they could exchange ideas, receive encouragement, and experience a sense of presence within digital communities. Courses that incorporated group projects, peer review, and instructor feedback fostered a positive learning climate that strengthened students' emotional attachment to the learning process. In blended contexts, this sense of belonging helped offset the potential social fragmentation that can arise when learners are physically separated.

Regarding cognitive engagement, the review showed that the deepest learning occurred in courses using interactive multimedia, simulations, and problem-based activities. These tools supported active exploration, analysis, and application of knowledge rather than passive information reception. Students were more likely to engage in higher-order thinking when digital tasks required them to solve authentic problems or reflect critically on their learning.

Bond et al. emphasized that technology itself does not guarantee engagement. Engagement emerges when digital tools are integrated into pedagogically meaningful activities that promote interaction, reflection, and feedback. They also highlighted the critical role of students' sense of belonging, noting that emotional connection is especially important in hybrid learning contexts where physical separation can reduce social cohesion. Their findings strongly support the idea that post-pandemic blended learning should prioritize community-building, interaction, and active learning as central design principles rather than relying solely on technological innovation.

Raes et al. (2020) examined synchronous hybrid learning environments, often referred to as HyFlex or blended synchronous classrooms, where some students attend physically while others participate online in real time. Their study is particularly significant because it addresses one of the most challenging instructional formats that emerged during and after the COVID-19 pandemic. Using a mixed-method design that included student surveys, classroom observations, and performance data, the researchers analyzed how technology-mediated interaction shapes engagement across physical and virtual participants.

The findings revealed that emotional engagement in hybrid settings is strongly dependent on students' opportunities for real-time interaction. Learners reported feeling more connected and motivated when instructors facilitated live discussions that included both in-person and remote students equally. Tools such as shared digital whiteboards, collaborative documents, and video breakout rooms fostered a sense of shared presence, reducing the psychological distance between groups. When these interactive opportunities were absent, remote learners reported feelings of exclusion and disconnection, which weakened their emotional investment in the course.

In terms of behavioral engagement, participation increased when instructors intentionally integrated remote students into classroom activities. Features such as live polling, chat-based questioning, and structured breakout groups ensured that all students had visible roles in learning tasks. However, when instructors defaulted to interacting primarily with students physically present in the room, online participants were more likely to withdraw from discussions and participate passively. This imbalance highlighted the need for equitable instructional attention across modalities.

Regarding cognitive engagement, the study found that students engaged more deeply when hybrid lessons included collaborative problem-solving and interactive tasks rather than lecture-heavy formats.

Active learning strategies helped maintain attention and intellectual effort among both in-person and remote learners. Raes et al. concluded that hybrid engagement is not automatic but requires deliberate pedagogical planning, technological fluency, and inclusive communication practices. Their work is especially relevant for post-pandemic higher education, where synchronous hybrid classrooms continue to shape flexible learning delivery.

Stöhr, Demazière, and Adawi (2020) investigated students' learning experiences during the rapid pandemic transition to online and blended environments, providing valuable insight into how engagement shifts under crisis conditions. Using a qualitative approach based on student interviews and reflective accounts, the researchers explored how learners adapted emotionally, behaviorally, and cognitively to remote and hybrid learning contexts.

The study revealed that while students appreciated the flexibility of digital learning—such as recorded lectures and self-paced study—they often struggled with emotional engagement due to feelings of isolation and reduced peer interaction. The absence of campus routines and face-to-face contact led many students to feel disconnected from their academic community. Motivation declined when learning became solitary and lacked opportunities for informal communication and support. However, the researchers found that engagement significantly improved when instructors incorporated interactive blended elements. Online discussion forums, collaborative group projects, and reflective activities created spaces for dialogue and peer support. These practices helped restore a sense of belonging and reduced emotional detachment. Students reported that regular communication from instructors, including check-ins and feedback, strengthened their commitment to learning and provided reassurance during uncertain times.

Behavioral engagement was influenced by course structure and accountability. Students were more consistent in their participation when deadlines, participation requirements, and learning activities were clearly outlined. Courses with minimal structure saw higher levels of procrastination and disengagement. In terms of cognitive engagement, students demonstrated deeper learning when online activities were meaningfully connected to assessments and classroom discussions. Reflective assignments and application-based tasks encouraged students to integrate knowledge rather than passively consume content. Stöhr et al. concluded that blended learning can effectively support engagement even during crises, but only when it includes structured interaction, emotional support, and clear instructional design. Their findings have informed post-pandemic strategies that emphasize flexibility alongside strong community-building

practices. The rapid evolution of digital pedagogy after the COVID-19 disruption has generated a new wave of empirical research examining how intentionally designed blended models influence student engagement in higher education.

Bozkurt and Sharma (2021) analyzed global higher education responses to pandemic disruptions and highlighted the transition from emergency remote teaching toward sustainable blended learning ecosystems. Their review emphasized that student engagement in post-pandemic learning depends on restoring social presence and structured interaction that were missing during crisis teaching. They found that students initially experienced emotional disengagement due to isolation and uncertainty, but engagement levels improved when institutions introduced collaborative online tasks, synchronous discussions, and interactive feedback systems. The authors argued that blended learning must prioritize human connection, flexibility, and digital inclusivity to support long-term engagement. They concluded that post-pandemic models are most effective when technology supports community building rather than merely content delivery.

Methodology

Research Design

The present study employed a quantitative descriptive research design to investigate the levels of student engagement within hybrid learning environments in higher education institutions. A quantitative approach was considered appropriate because the objective of the study was to measure and analyze observable patterns of student engagement across multiple dimensions using numerical data. This approach allows the researcher to examine relationships between variables and to generate statistically interpretable results that reflect students' learning experiences.

The descriptive research design focuses on systematically collecting data that describe the characteristics of a particular phenomenon without manipulating the research environment. In the context of this study, the descriptive design enabled the researcher to examine students' behavioral, emotional, and cognitive engagement within hybrid learning settings as they naturally occur in university courses. Rather than introducing experimental interventions, the study observes existing engagement patterns among students participating in hybrid learning environments.

Hybrid learning environments combine traditional face-to-face instruction with digital learning platforms and online educational resources. The descriptive design therefore provides an effective framework for understanding how students interact with both physical and virtual components of the learning process. By analyzing students' responses

to structured questionnaire items, the study aims to identify engagement trends and provide insights into how hybrid instructional models influence student participation, motivation, and intellectual involvement in learning activities.

Population and Sample

The population consisted of university students enrolled in hybrid learning courses across various academic disciplines. A purposive sampling technique was used to select participants who had experienced hybrid learning for at least one academic semester.

Sample Distribution

Category	Number of Students
Undergraduate students	380
Postgraduate students	220
Total Sample	600

Data Collection Instrument

Data were collected using a structured questionnaire consisting of 15 items designed to measure three dimensions of student engagement:

- Behavioral engagement
- Emotional engagement
- Cognitive engagement

A five-point Likert scale was used:

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

Data Analysis Techniques

After data collection, the responses obtained from the questionnaire were organized and analyzed using descriptive statistical methods. Descriptive statistics are widely used in educational research to summarize and interpret numerical data by identifying patterns, trends, and distributions within the dataset.

Two primary statistical techniques were applied in this study:

- Mean score analysis
- Participation frequency analysis

Mean score analysis was used to determine the average level of engagement across the three dimensions - behavioral, emotional, and cognitive engagement. Calculating the mean score for each dimension provided an overall indication of the extent to which students were engaged in hybrid learning environments. Higher mean values indicated stronger levels of engagement among students.

Participation frequency analysis was conducted to examine students' involvement in specific learning

activities such as online discussions, classroom participation, assignment completion, and collaborative projects. Frequency percentages helped identify how actively students participated in different components of hybrid learning environments.

These analytical techniques enabled the researcher to interpret the collected data systematically and to identify key engagement patterns among students. The results derived from these analyses provide valuable insights into how hybrid learning environments influence students' participation, motivation, and intellectual involvement in higher education settings.

Data Analysis

To evaluate student engagement in hybrid learning environments, mean scores were calculated for the three engagement dimensions: behavioral engagement, emotional engagement, and cognitive engagement. The analysis provides insight into how students participate in academic activities, how they feel about learning, and how deeply they engage intellectually with course content. Table 1 presents the mean engagement scores for each engagement dimension.

Table 1: Mean Scores of Student Engagement Dimensions

Engagement Dimension	Mean Score	Standard Deviation
Behavioral Engagement	4.08	0.61
Emotional Engagement	3.89	0.66
Cognitive Engagement	4.15	0.58

As shown in table 1, all three engagement dimensions recorded relatively high mean scores, indicating strong student engagement in hybrid learning environments. Cognitive engagement achieved the highest mean score of 4.15, suggesting that students actively invested effort in understanding course material and solving academic problems. Behavioral engagement recorded a mean score of 4.08, reflecting active participation in classroom discussions, online activities, and assignments. Emotional engagement had a mean score of 3.89, indicating that most students experienced positive feelings such as motivation and interest during hybrid learning. Overall, the findings demonstrate that hybrid learning environments support multidimensional student engagement.

To further examine engagement patterns, participation in specific learning activities within hybrid courses was analyzed. Participation indicators provide a clearer understanding of how students interact with both online and classroom

components of hybrid learning. Table 2 summarizes student participation across major learning activities.

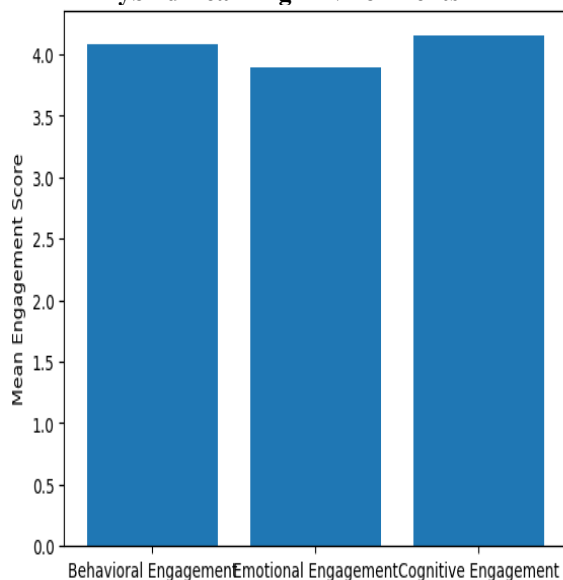
Table 2: Student Participation in Hybrid Learning Activities

Learning Activity	Participation Rate (%)
Online Discussion Forums	82
Classroom Discussions	79
Assignment Submission	88
Collaborative Projects	74

The results presented in table 2 indicate high levels of participation across various learning activities in hybrid courses. Assignment submission recorded the highest participation rate at 88%, suggesting strong academic commitment among students. Participation in online discussion forums reached 82%, highlighting the effectiveness of digital platforms in facilitating interaction. Classroom discussions also showed high engagement levels at 79%, demonstrating that students remain actively involved during face-to-face sessions. Collaborative projects recorded a participation rate of 74%, reflecting students' willingness to engage in teamwork and knowledge-sharing activities.

To provide a visual representation of engagement patterns in hybrid learning environments, a graphical comparison of the three engagement dimensions was conducted. Figure 1 illustrates the relative levels of behavioral, emotional, and cognitive engagement among students.

Figure 1: Student Engagement Dimensions in Hybrid Learning Environments



As illustrated in figure 1, cognitive engagement recorded the highest score among the three engagement dimensions. This suggests that hybrid learning environments encourage deeper intellectual involvement and critical thinking among students. Behavioral engagement also shows strong levels, indicating that students actively participate in learning activities across both online and face-to-face platforms. Emotional engagement, while slightly lower, remains relatively high, demonstrating that students maintain positive attitudes and motivation toward hybrid learning. The graphical representation reinforces the conclusion that hybrid learning environments support balanced and multidimensional engagement.

Results and Discussion

The findings of this study highlight the significant role of hybrid learning environments in promoting student engagement in higher education. Behavioral engagement was evident through high participation rates in online discussions, classroom interactions, and assignment submissions. The integration of digital platforms enabled students to remain actively involved in academic activities beyond classroom hours.

Emotional engagement was reflected in students' motivation and positive attitudes toward hybrid learning environments. The combination of face-to-face interaction and online communication helped create a sense of community among students, reducing feelings of isolation that are often associated with fully online learning.

Cognitive engagement demonstrated the strongest impact in hybrid learning environments. Students reported greater intellectual involvement when engaging with multimedia resources, online materials, and collaborative problem-solving activities. Hybrid learning allowed students to review content at their own pace and apply knowledge during classroom sessions. The results suggest that hybrid learning environments provide an effective instructional model that fosters multidimensional engagement among students.

Conclusion

Hybrid learning environments have become a central component of modern higher education. By integrating digital technologies with traditional classroom instruction, hybrid learning offers flexible and interactive educational experiences that support student engagement. This study examined behavioral, emotional, and cognitive engagement among university students participating in hybrid learning environments. The findings indicate that hybrid learning significantly enhances student participation, motivation, and intellectual involvement in academic activities.

Among the three engagement dimensions, cognitive engagement recorded the highest level, suggesting that hybrid learning promotes deeper understanding and critical thinking. Behavioral engagement was also strong, reflecting active participation in learning tasks, while emotional engagement indicated positive student attitudes toward hybrid learning. The results suggest that universities should continue developing well-structured hybrid learning environments supported by effective instructional design, digital resources, and interactive learning strategies. By fostering multidimensional student engagement, hybrid learning can contribute to improved academic performance and enhanced educational experiences in higher education.

Conflict of Interest

There is no conflict of interest between the authors in this manuscript.

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