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EXPLORING REFLECTIVE PRACTICES IN BLENDED LEARNING: A DEEP DIVE INTO EDUCATORS' IN-ACTION AND ON-ACTION PERSPECTIVES IN INTERDISCIPLINARY COURSES

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ABSTRACT

Aim/Purpose	This study aims to explore the reflective practices of educators in blended learning environments, specifically in interdisciplinary courses, and to understand how these practices impact student engagement and learning outcomes.
Background	Blended learning, combining online and face-to-face instruction, has become increasingly important for enhancing student engagement and learning outcomes. Reflection is a critical practice for instructors and educators, enabling them to continuously improve their teaching strategies and adapt to the dynamic needs of students. Reflective practices, particularly reflection-in-action and reflection-on-action, are essential for developing effective and responsive educational environments.
Methodology	A mixed-methods design was employed, incorporating qualitative reflections from course coordinators and instructors, and quantitative data from an online learning platform (Forum). Participants included coordinators and instructors from a federal university in the UAE involved in interdisciplinary General Education courses.

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Contribution	The study highlights the potential of reflective practices to significantly enhance the effectiveness of blended learning, suggesting that ongoing professional development and support for educators are essential. Additionally, the findings highlight the unique challenges and opportunities within the UAE context, calling for context-specific strategies to optimize blended learning.
Findings	The findings highlight the importance of instructors' reflective practices, particularly reflection-in-action and reflection-on-action, in developing flexible and adaptive lesson plans that enhance student engagement. Key challenges identified include the need for clearer instructional materials, better integration of interdisciplinary content, and comprehensive faculty training. Data from the online platform revealed significant variations in student engagement metrics, such as breakout room participation, chat activity, and assignment completion.
Recommendations for Practitioners	Educators should design lesson plans that incorporate real-life scenarios, active learning strategies, and reflection to enhance students' engagement in blended learning environments.
Recommendations for Researchers	Future research should investigate reflective practices in various educational settings, explore the effects of adaptive teaching strategies on student engagement across disciplines, and incorporate student perspectives to gain a deeper understanding of their impact on learning.
Impact on Society	The study emphasizes how reflective, adaptive teaching strategies can improve engagement and critical thinking, contributing to more inclusive and sustainable education systems aligned with global goals.
Future Research	Longitudinal research should explore the long-term effects of reflective teaching on student outcomes. In addition, investigating faculty development programs will help enhance the effectiveness of reflective practices in education.
Keywords	blended learning; reflective practices, students' engagement, interdisciplinary courses

INTRODUCTION

In the field of education, the implementation of blended learning has gained significant attention as educators seek to enhance student engagement and learning outcomes through a combination of online and face-to-face instruction (Foley & Curtin, 2022; Ramalingam et al., 2021). Blended learning, defined as a pedagogical approach that merges synchronous and asynchronous methods, provides flexible, engaging, and personalized educational experiences (Pham et al., 2023). This approach combines the advantages of both in-person and digital learning to create flexible, engaging, and personalized educational experiences. Its importance lies in the potential to boost student engagement, enhance learning outcomes, accommodate various students' needs, and increase their access to resources (Vu et al., 2021) through effective instructors' presence and reflective practices. This study is particularly significant in addressing the goals outlined in the United Arab Emirates (UAE) National Agenda 2021, which aims to develop a first-rate education system that prepares students for future challenges by integrating advanced technologies into learning. Furthermore, the research aligns with Sustainable Development Goal 4 (SDG 4), which seeks to ensure inclusive and quality education for all and promote lifelong learning opportunities (UAE National Committee on Sustainable Development Goals, 2017).

However, while the benefits of blended learning are widely recognized, there is a lack of empirical research investigating educators' reflective practices in shaping effective lesson design, instructional

decisions, and student engagement strategies. Specifically, current teaching practices in blended learning often lack how educators continuously adapt their methods during (reflection-in-action) and after (reflection-on-action) instructional delivery (An et al., 2019; Rodríguez-Triana et al., 2017). While these reflective practices have been studied in traditional learning contexts, there is insufficient empirical research on how they are specifically applied within blended learning environments. This research aims to bridge this gap by exploring how educators navigate and adjust their instructional methods through reflection, particularly in interdisciplinary blended courses, where the complexity of integrating multiple disciplines may further complicate effective teaching strategies.

Moreover, educators frequently face challenges in designing learning activities that are both interactive and cognitively stimulating across physical and virtual platforms. Reflection plays an essential role in helping educators assess the structure, flow, and inclusivity of their lesson plans, enabling them to align their practices more closely with learner needs and educational policy priorities (Storie, 2021; Warburton, 2017).

Schön's (1983) concepts of reflection-in-action and reflection-on-action provide a framework for understanding how educators adjust and refine their teaching strategies in real-time and retrospectively. This study investigates these reflective practices (reflection-in-action and reflection-on-action) in the context of interdisciplinary blended learning courses in the General Education (Gen-Ed program), focusing on their alignment with the Community of Inquiry (CoI) framework (social, cognitive, and teaching presences) to enhance student engagement (emotional, cognitive, and behavioral). By engaging in reflective practices, educators can strengthen the three presences within their blended learning environments and enhance student engagement (Samuel, 2023).

This study explores educators' reflective practices in blended learning interdisciplinary courses within the UAE context. The aim is to gain insights into how educators reflect on their teaching practices and make adjustments to improve student learning experiences. The following research questions were formulated to guide this study:

(1) What insights and challenges emerge from educators' reflection-in-action and reflection-on-action regarding the structure, components, and implementation of lesson plans in blended learning interdisciplinary courses?
(2) How do students' engagements align with educators' reflective practices in blended learning environments?
(3) What opportunities arise from reflective practices to enhance student engagement in blended learning environments?

Framework of the Study

Blended learning environments challenge traditional instructional practices and demand that educators evolve pedagogically while engaging in continuous reflection (Garone et al., 2022; van der Stap et al., 2024). Implementing effective blended learning requires educators to reflect on and improve their practices to meet students' diverse needs (Devi et al., 2021; Ramalingam et al., 2021; Vu et al., 2021). This is especially critical in interdisciplinary settings where instructors must navigate content integration across fields, requiring reflective strategies that are adaptive and context-sensitive (Rashid, 2024).

Although reflective practices are known to enhance instruction, barriers such as limited time, lack of immediate student feedback, and technology fatigue often inhibit real-time reflection in digital settings (Aithal & Aithal, 2023; Owen & Dunham, 2015). Therefore, educators need targeted professional development to support reflection-in-action and reflection-on-action in blended learning environments (Koh et al., 2019; Terry et al., 2018). Faculty development programs that integrate blended instructional design, digital pedagogy, and interdisciplinary collaboration have been found to foster deeper reflective capacities and improve student engagement outcomes (Lee et al., 2016; van der Stap et al., 2024).

Integrating reflective practice within the COI framework aims to improve student engagement by promoting critical thinking, collaborative learning, and effective teaching strategies (Ramalingam et al., 2021; Villanueva et al., 2024). As shown in Figure 1, the developed framework illustrates how reflective practices (reflection-in-action and reflection-on-action) are central to enhancing the blended learning environment. Instructors' actions, facilitated by the CoI framework, encompass social, cognitive, and teaching presence through carefully designed and implemented teaching practices. These practices, in turn, directly impact students' emotional, cognitive, and behavioral engagements, representing their active participation and investment in their learning. The ongoing process of reflection-in-action and reflection-on-action helps educators refine their approaches, thus continuously enhancing the teaching and learning environment (see Figure 1).

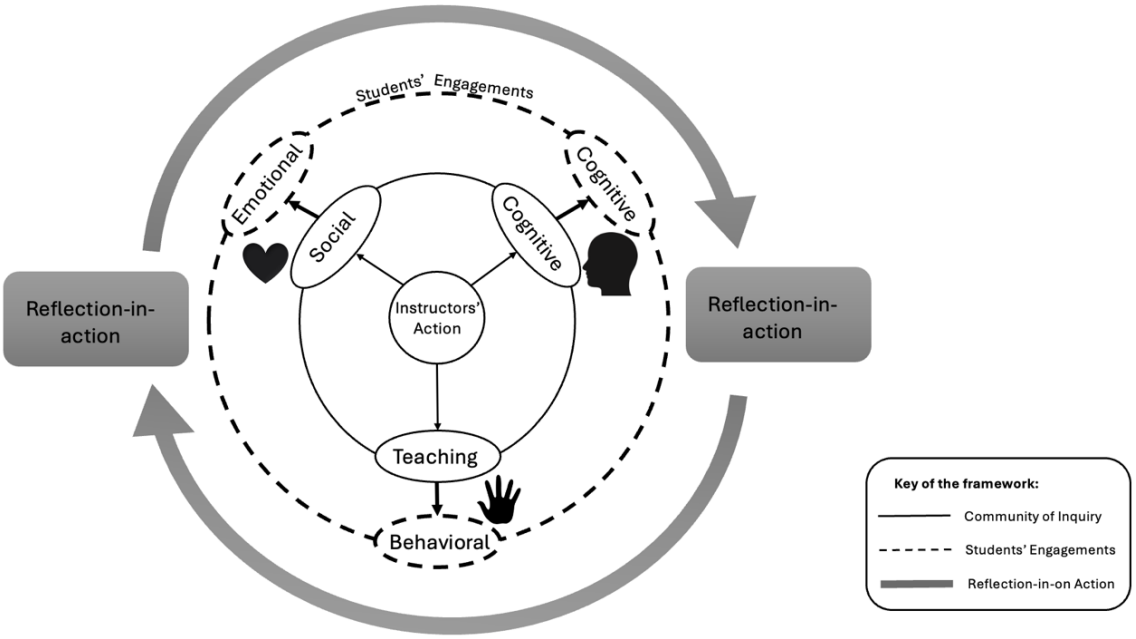

Figure 1. Integrated framework for enhancing student engagement in blended learning environments

The COI framework, developed by Garrison et al. (2000), is a theoretical model focusing on the interplay of cognitive, social, and teaching presences in online learning environments. It emphasizes student-student and student-teacher interactions in online learning environments. However, the CoI framework has been critiqued for its limited applicability to interdisciplinary blended learning (Archer, 2010). Accordingly, the Academic Communities of Engagement (ACE) framework complements the CoI model by highlighting the role of reflective practices, relationships, and personal communities in both online and blended learning settings (Borup et al., 2020). The study's framework can provide a lens to analyze educators' reflective practices in blended learning environments and their impact on student engagement (Zhang & Zhu, 2023). By applying the CoI framework to blended learning environments, educators can use reflection-in-action and reflection-on-action to enhance student engagement in several ways. Together, CoI and ACE offer a cohesive theoretical basis for examining how educators can reflectively enhance presence and engagement.

Social presence and emotional engagement

Social presence involves creating meaningful interactions that encourage sharing explanatory ideas and probing questions in an active learning environment (Castellanos-Reyes, 2020). This leads to the student's emotional engagement, which involves the emotional energy directed toward learning, such as excitement, interest, and motivation (An et al., 2019; ElSayary et al., 2022).

Facilitating social presence is achieved by fostering a supportive and collaborative learning community where educators can create opportunities for students to engage in reflective discussions, share their experiences and insights, and provide feedback to their peers (Wang, 2019). Using emotional expression emphasizes the importance of expressing emotions and social-emotional features of communication to build strong relationships within an online community (Borup et al., 2020). Open communication, an essential component of social presence, involves the shared and mutual exchange of information among learners in a respectful manner (Meda & ElSayary, 2021). Effective communication through discussion boards, announcements, and emails is crucial to prevent feelings of isolation and disconnection (Symeonides & Childs, 2015). Rational discourse and open dialogue require a sense of community that evolves over time and can occur while students interact within the educational context (Çakıroğlu, 2019). Collaboration helps students co-construct knowledge or create products that cannot be achieved individually, bridging both affective and cognitive domains (Borup et al., 2020). This aspect is crucial because it fosters cognitive presence, indirectly enhancing the learning community's critical thinking processes (Ay & Dağhan, 2023).

Cognitive presence and cognitive engagement

Creating cognitive presence involves designing triggering events, including attention, focus, questioning, critical thinking, problem-solving, and deep learning by incorporating reflective activities and prompts that require students to analyze and evaluate their learning experiences (Agusta & Noorhapizah, 2020; Nazamud-din et al., 2020; Prince et al., 2020). For example, educators can design reflective polls and challenging activities encouraging students to reflect on their learning processes, identify growth areas, and set improvement goals, which leads to cognitive engagement (Allen et al., 2021; Gu et al., 2022). Exploration and application of new ideas entail searching for information, knowledge, and alternatives to better understand the situation or problem as students delve into the issue to develop potential solutions (Lau et al., 2019). Students' cognitive engagement is also enhanced when they integrate ideas across disciplines using the new knowledge and skills acquired to combine thoughts and derive meaning from their exploration (Borup et al., 2020).

Teaching presence and behavioral engagement

Developing a teaching presence involves providing guidance, feedback, and student support. Educators can use reflective practices to assess students' understanding, provide timely and constructive feedback, and adapt their instructional strategies accordingly (Caskurlu et al., 2020). By reflecting on their teaching practices, educators can identify areas where students may be disengaged or struggling and make necessary adjustments to improve student behavioral engagement (Allen et al., 2021). In addition, instructors can support behavioral engagement by monitoring attendance, sending reminders about due dates, and providing assistance to students who struggle to submit assignments on time (Meda & ElSayary, 2021). Other important indicators of teaching presence that lead to behavioral engagement are the design and organization of the curriculum, method, and assessment (Castellanos-Reyes, 2020); facilitating discourse (Li et al., 2021); direct instruction (Meda & ElSayary, 2021); and constructive feedback (Borup et al., 2020).

Challenges in fostering emotional, cognitive, and behavioral engagements often stem from a lack of teacher support (Borup et al., 2020). Limited interaction with online peers and instructors, who may not be regularly present to initiate and monitor interactions, poses significant challenges (Oviatt et al., 2018). However, these challenges can be overcome by linking the three presences, social, cognitive, and teaching, with student emotional, cognitive, and behavioral engagements through reflection-in-action and reflection-on-action (Prince et al., 2020). By reflecting-in-action, teachers can make real-time adjustments to their teaching strategies, enhancing social presence and promoting a sense of belonging and motivation among students (Villanueva et al., 2024). Reflection-on-action allows educators to retrospectively evaluate and refine their approaches, improving cognitive presence by designing activities that challenge students intellectually and encourage critical thinking (Ramalingam et al., 2021).

Student perspectives are crucial in evaluating reflective teaching methods. However, the literature suggests a gap in integrating student voices into the evaluation of teaching presence and its impact on engagement (Papanikolaou et al., 2017). Therefore, this study also considers how students perceive and respond to instructors' reflective practices in blended settings. Challenges in fostering engagement stem from inadequate training, insufficient time for reflection, and a lack of collaborative planning across disciplines. Reflective practices are thus essential tools for professional growth, particularly when integrated into faculty development communities and interdisciplinary teams (Rashid, 2024; Terry et al., 2018).

Research gap

Despite the growing adoption of blended learning and reflective teaching practices, several critical gaps remain. First, while frameworks such as CoI and ACE guide engagement strategies, there is a lack of empirical research exploring how interdisciplinary instructors adapt reflective strategies to navigate the complexities of cross-disciplinary integration in blended courses (Rashid, 2024). Second, existing studies primarily focus on the instructor's role, with limited attention to how students perceive reflective teaching practices and how these perceptions influence their engagement (Papanikolaou et al., 2017).

Furthermore, challenges such as insufficient professional development, limited time for reflection, and a lack of collaborative planning structures hinder educators' ability to engage in sustained reflective practice (Garone et al., 2022; Terry et al., 2018). These limitations reveal the need for faculty support models that are contextually responsive and grounded in interdisciplinary and blended pedagogical demands. This study addresses these gaps by proposing an integrated framework that examines educators' reflective practices through the dual lens of CoI and ACE while also incorporating student engagement perspectives.

Context of the study

The College of Interdisciplinary Studies at a federal higher education institution in the UAE has implemented a model to develop students' competencies. This model features a blended learning approach that combines online course delivery with weekly in-person lab sessions, ensuring flexibility and continuity in education. By incorporating practical skills into the curriculum, the model enhances students' skills, preparing them for future jobs. It is supported by student-centered, adaptable teaching methods such as case studies and project-based learning.

A significant aspect of this model is the flipped classroom strategy, where lecture content is delivered online for pre-class study and class time is dedicated to interactive, hands-on activities. This approach shifts the focus from passive listening to active participation, fostering deeper engagement with the material. The college also emphasizes active learning techniques, including group work, peer teaching, and in-class debates, to create a dynamic learning environment and develop essential skills like teamwork, leadership, and communication.

Advanced educational technologies are integrated into the learning process, supporting interactive learning experiences and providing access to a wealth of digital resources. The online platform "Forum" monitors and tracks students' active participation. In addition, continuous assessment and timely feedback are used to monitor student progress and encourage a proactive approach to learning, with formative assessments such as classroom polls, reflection questions, and peer reviews.

METHODOLOGY

This study employed a single, intrinsic case study design (Creswell, 2015). An intrinsic case study is appropriate because it focuses on gaining a deep understanding of the phenomenon rather than generalizing findings. This approach lends itself to understanding a phenomenon in depth, in its real-life occurrence, and from multifaceted perspectives (Crowe et al., 2011). The rationale of this method is the triangulation approach (Campbell & Fiske, 1959), with special emphasis on using an intrinsic case

study that involves qualitative inquiry to deepen our understanding of the phenomenon and to allow respondents to reflect on their application of the COI freely. An interpretive paradigm is therefore followed as it matches the qualitative nature of the study. Qualitative data were sourced from (a) course coordinators' reflections on three hybrid GenEd courses at a federal university in the UAE, (b) reflections of eight instructors teaching the three courses for at least one term period, and (c) empirical engagement data extracted from the online platform "Forum" used to deliver the online sessions of the courses representing the three-dimensional nature of COI to capture students' engagement along the three dimensions based on the framework of the study. The Forum analytic data included behavioral logs, emotional indicators (e.g., reactions and breakouts), and cognitive task performance (e.g., polls, assessments, reflections).

Three Gen-Ed courses were selected based on the following criteria: (1) they represent interdisciplinary learning outcomes typical of the Gen-Ed curriculum, (2) they are consistently offered in a blended format across academic terms, and (3) each course involves teaching by diverse faculty backgrounds in education, business, and humanities, allowing for varied reflective insights aligned with the CoI framework. The Gen-Ed courses chosen for this study were:

- IDS204 – Deriving Insights from Evidence
- IDS102 – Applied Creative and Critical Thinking
- IAH244 – Ethical System

PARTICIPANTS

The sample of participants chosen for this study is a convenient (volunteer-based) sample. Convenience sampling was used due to institutional access constraints and the availability of coordinators and instructors actively teaching in the relevant term. All participants were contacted in advance, and formal permissions were obtained prior to data collection, following ethical protocol ZU23_075_F. Although purposive sampling was considered, volunteer-based convenience sampling was more practical, given scheduling, workload variations, and institutional timelines. It also enabled access to participants who had recent experience reflecting on blended teaching. First, course coordinators (n1=3) for the three hybrid Gen-Ed courses were selected for this study. The three Gen-Ed courses were chosen given their similarity in being delivered to students within the Gen-Ed phase of their bachelor's degree. Second, instructors (n2=8) teaching the courses (3 for IAH-244, 3 for IDS-204, and 2 for IDS-102) volunteered to reflect on their teaching practices and perceptions using semi-structured interviews. Two participants were seconded from the College of Humanities and Social Sciences (CHSS), while the others were from the College of Interdisciplinary Studies (CIS). The courses taught or coordinated, qualifications, specializations, and colleges of participants are presented in Table 1.

Table 1. Demographic information of participants

Participants	Course	Qualification	Specialization	College
Coordinator 1	IAH-244	Associate Professor	Educational Management, Leadership, and Policy	CIS
Coordinator 2	IDS-102	Assistant Professor	Inclusive Education	CIS
Coordinator 3	IDS-204	Assistant Professor	Business	CIS
Instructor 1	IDS-204	Associate Professor	Business	CIS
Instructors 2 & 3	IAH-244	Assistant Professors	Language Study Educational Management	Secondments from CHSS
Instructor 4	IDS-102	Assistant Professor	Media and Communication	CIS
Instructor 5	IDS-204	Assistant Professor	Business Management	CIS
Instructor 6	IDS-204	Senior instructor	Health Sciences	CIS
Instructors 7 & 8	IAH-244 IDS-102	Instructors	Education Teaching and Learning	CIS

Finally, secondary data were sourced from the "Forum" platform from the three courses to form 27 sections from IAH-244, 12 from IDS-102, and 15 from IDS-204, with a total of 54 sections, which particularly displays student engagement metrics.

INSTRUMENTS

Three tools were used in this study: field notes reflection, semi-structured interviews, and document analysis. For the field notes, a template where coordinators wrote their reflections guided by the COI framework (Garrison et al., 2000) was used to include: (1) social presence (5 indicators – students' engagement, meaningful interactions, relationships with students, emotional expression, and open communication channels); (2) cognitive presence (5 indicators – triggering event, association with new ideas, connecting ideas across disciplines, application of new ideas, and students' reflection); and (3) teaching presence (4 indicators – design and organization, facilitating discourse, direct instruction, and feedback for assessments). This tool was validated by the study of Garrison et al. (2000), who highlighted that students acquire meaningful online learning experiences when exposed to the three categories of COI.

The semi-structured interviews were conducted with eight instructors by the end of the semester using open-ended reflective questions adapted from Schön's (1983) reflective questions and aligned to the COI framework (Garrison et al., 2000) to narrow the lens and understand instructors' perceptions of their teaching practices. The interviews were conducted online using the Zoom video conferencing platform, and each interview lasted 60 minutes. There were six open-ended reflective questions for each category (social, cognitive, and teaching presence) to form 18 questions. The interview questions were sent to two educational experts to determine the face validity and clarity. The experts compared the questions to the purpose of the study and commended them (see the Appendix).

The document analysis is used with the online platform for teaching "Forum" to include an analysis of 54 sections in the three Gen-Ed courses. All sections were coded to be anonymous while analyzing data. The analysis included percentages, mean, and median indicators of students' engagement. The items selected from the forum were the outcomes of students' engagements (emotional, cognitive, and behavioral engagements) as a result of the social, cognitive, and teaching presences. For emotional engagement, breakouts, chats, hand raises, and reactions were observed and interpreted. For cognitive engagements, the number of polls, including pre-assessment, reflection, and open-ended questions about applications, was gathered. Regarding behavioral engagements, the talk time for instructors and students, attendance, and assignment feedback were observed. The results were then validated by comparing them with another report from the Gen-Ed department's Chair, who confirmed the results analyzed.

PROCEDURE

Ethical approval was obtained from the University's research ethics committee, no. ZU23_075_F. All participants were informed of their voluntary participation rights and may withdraw from the interview at any point (for instructors) or refrain from sharing their reflections (for coordinators).

To address the first research question of the study, field note reflection was completed by educators, and semi-structured interviews were conducted and recorded with each instructor. Reflection-in-action using field notes was done during the semester, while teaching and learning took place. Coordinators wrote the reflection on a weekly basis after their weekly meeting with their instructors. Reflection-on-action using semi-structured interviews was analyzed and categorized according to the study framework, as reflected in the Results section.

The forum secondary data analysis was used to answer the second and third questions of the study. The data from 54 sections were analyzed using descriptive statistics (frequency, mean, and median) to confirm or disconfirm instructors' reflections about students' engagements.

RESULTS

COORDINATORS' REFLECTION

Social presence

Table 2 combines insights from coordinators on students' engagement, emotional expression, and communication channels. It highlights the varying levels of engagement based on student characteristics and the importance of effective communication and real-life scenarios in fostering student participation.

Table 2. Insights from coordinators on social presence

Themes	Coordinators	Common insights
Students' Engagement	*Coordinator 1:* Structured LPs limit spontaneous participation. Interest in topics is crucial. *Coordinator 2:* Labs enhance interaction. Real-life scenarios boost engagement; afternoon classes show less. *Coordinator 3:* Non-native English speakers struggle more. Faculty encouragement increases participation.	Engagement varies by student characteristics and interests; structured lesson plans may limit spontaneity.
Meaningful Interactions (Active Learning)	*Coordinator 1:* Active learning is not accurately reflected by engagement percentages alone. Motivation and interest are crucial. Engagement levels differ between classes. *Coordinator 2:* Higher active learning in strong student groups and supportive environments. Labs and real-life scenarios boost engagement. Afternoon classes are lower in active learning. *Coordinator 3:* Active engagement requires preparation. Structured LPs limit engagement strategies. Timing and workload affect engagement.	Active learning driven by motivation, interest, and adaptable pedagogical approaches.
Relationship with Students	*Coordinator 1:* Building relationships more important than forcing participation. Understanding learning methodologies fosters better relationships. *Coordinator 2:* Face-to-face classes strengthen relationships. Frequent interactions in hybrid models build rapport. Adding personal experiences and humor improves relationships. *Coordinator 3:* Online LPs limit personal connections. Face-to-face sessions and office hours improve rapport. Students' cultural considerations influence satisfaction.	Building strong relationships and understanding learning styles are key for effective engagement.
Emotional Expression (Signals & Emojis)	*Coordinator 1:* Emojis and signals are unreliable indicators of engagement. Reactions and chat usage emphasized but need updating. *Coordinator 2:* Use of emojis and signals increases with comfort. Positive reactions encourage participation. Checks and Xs effective for quick feedback. *Coordinator 3:* Use of emojis influenced by instructor behavior. Not consistent indicators of engagement.	Emojis and signals are not consistently reliable for engagement; chat features need improvement.

Themes	Coordinators	Common insights
Open Communication Channel	*Coordinator 1:* Meaningful communication through announcements, office hours, and emails promotes motivation. Restructuring lab sessions can enhance relationships. *Coordinator 2:* Numerous announcements often missed. WhatsApp groups facilitate better communication. Office hours underutilized. *Coordinator 3:* Restructuring lab sessions necessary. Students use office hours more for concerns, but do not proactively seek them out.	Effective communication channels and structured lab sessions enhance student-instructor relationships.

Cognitive presence

Table 3 summarizes observations on triggering events, association, integration, and application of new ideas. It emphasizes the significance of engaging and relatable content, clear prep and reflection activities, and the need for interdisciplinary integration to enhance cognitive engagement.

Table 3. Insights from coordinators on cognitive presence

Themes	Coordinators	Common insights
Triggering Event	*Coordinator 1:* Engaging events like the Trolley problem spark curiosity and participation. *Coordinator 2:* Problem-centric nature triggers curiosity. Relatable topics enhance engagement. *Coordinator 3:* More games and engaging activities could enhance curiosity and reflection.	Engaging and relatable events trigger curiosity and participation.
Association	*Coordinator 1:* Prep polls should directly link to pre-class work. Clear questions encourage critical thinking. *Coordinator 2:* Reflection polls connect new ideas with previous ones. Synthesis sessions integrate concepts. *Coordinator 3:* Pre-polls and reflection activities link readings to discussions. Reliance on AI tools poses challenges.	Clear and direct prep polls link new ideas with previous knowledge, fostering critical thinking.
Integration	*Coordinator 1:* Efforts needed for explicit interdisciplinary integration. Avoiding repetition maintains interest. *Coordinator 2:* Course discussions aid integration. Real-life activities enhance retention and application. *Coordinator 3:* Focus on skills applicable across disciplines. Relevance to various fields can enhance integration.	Explicit interdisciplinary integration and avoiding repetition are crucial for maintaining interest.

Themes	Coordinators	Common insights
Application of New Ideas	*Coordinator 1:* Understanding activity purposes is crucial. Clear language and relevant examples aid practical application. *Coordinator 2:* Assignments for real-world problems encourage higher-order thinking. Updating scenarios keeps them relevant. *Coordinator 3:* Assignments aligned with outcomes and real-world applications. Regular updates needed to prevent cheating.	Clear and relevant assignments aligned with learning outcomes enhance the practical application of ideas.
Students' Reflection on Activities & Wrap-up	*Coordinator 1:* Reflection polls after activities gauge understanding. Periodic reflection consolidates learning. *Coordinator 2:* Wrap-ups and take-home messages are effective reflective practices. *Coordinator 3:* Structured LPs offer multiple reflection opportunities, though flipped model challenges preparedness.	Structured opportunities for reflection, such as polls and wrap-ups, consolidate learning and gauge understanding.

Teaching presence

Table 4 presents insights on design and organization, facilitating discourse, direct instruction, and assessment feedback. It highlights the importance of culturally appropriate assessments, guided discussions, clear rubrics, personal insights, and flexible assessment strategies for effective teaching and learning.

Table 4. Insights from coordination or teaching presence

Themes	Coordinators	Common insights
Design and Organization	*Coordinator 1:* Assessments should focus on cultural appropriateness and alignment with student levels. *Coordinator 2:* Polls are direct and easy for grading. Some activities need more context and repetition for understanding. *Coordinator 3:* Curriculum interesting but STEM-focused. Regular updates of assessments needed to prevent cheating.	Culturally appropriate assessments aligned with student levels are crucial.
Facilitating Discourse	*Coordinator 1:* Discussions can take various forms, including probing follow-up questions and peer commentary. Strategies like calling on quiet students to share breakout room answers can enhance engagement. *Coordinator 2:* Guided questions and focus questions are helpful for instructors but limited by time constraints. Providing more support in answer keys, especially for logical reasoning units, can enhance discussions. *Coordinator 3:* The structured online environment offers limited tools for facilitating discourse. Faculty can choose strategies like debates and role-playing to engage students. Unprepared students, however, pose challenges to effective discourse.	Variety of discussion strategies enhances engagement; clear and consistent grading rubrics ensure fairness.

Themes	Coordinators	Common insights
Direct Instruction	*Coordinator 1:* Understanding the distinction between data and information is crucial for students to apply their learning. Questioning techniques guide students in acquiring knowledge and applying ethical theories. Course objectives need alignment with student levels and cultural contexts. *Coordinator 2:* Direct instruction is minimal, with instructors acting as facilitators. Sharing personal insights and giving feedback are essential, but cultural differences and topic relevance can impact student engagement. Examples like Emirati astronaut Al Neyadi inspire students by connecting course content to local contexts. *Coordinator 3:* Faculty provide limited direct instruction due to the structured environment. Personal insights and examples help students relate to the course content. Synthesis techniques and comprehensive assignments aid in the retention of key concepts.	Distinction between data and information, and questioning techniques are crucial. Course objectives should align with student levels and contexts.
Instructor Feedback on Assignments	*Coordinator 1:* Instructors, particularly adjuncts and secondments, need more guidance on providing effective feedback. Clear communication of grading criteria helps reduce confusion among students. *Coordinator 2:* Flexibility in adapting activities to meet students' needs is limited, posing challenges for weaker sections. In-person sessions provide opportunities for reinforcing concepts and addressing student concerns. Streamlining assessment guidelines can reduce confusion. *Coordinator 3:* Standardized training for new faculty on grading and feedback is necessary. Flexibility in assessments can improve student progress, but standardized activities and instructions may limit adaptability.	Clear communication of grading criteria and standardized training for faculty enhances assessment effectiveness.

INSTRUCTOR REFLECTIONS ANALYSIS

The following analysis explores instructors' reflections on their teaching practices within blended learning environments. The reflections are categorized under social, cognitive, and teaching presences, providing insights into engagement, active learning, and instructional design.

Social presence

Students' Engagement

Student engagement varied significantly across different courses and teaching methods. Instructor 1 noted:

> "*The flipped classroom model fostered consistent engagement through pre-class preparation, reinforced by tools like Perusall.*"

However, Instructor 2 found that students often felt isolated online, with better engagement in face-to-face sessions. Instructor 3 highlighted the importance of pre-class work for maintaining active engagement, whereas Instructor 4 observed that prepared students often took the initiative in breakout groups. Instructor 5 reported:

> "*Engagement improved over time due to familiarity with the course structure and peer support.*"

Instructors 6 and 8 remarked that while students engaged with each other, their connection to the course material was sometimes superficial. Instructor 7 observed that balanced gender distribution in classes enhanced engagement and emphasized the effectiveness of discussions.

Meaningful Interactions (Active Learning)

Active learning was primarily fostered through breakout rooms and discussions. Instructor 1 emphasized:

> "*Active learning allows students to tailor their approach to pre-class materials.*"

Instructor 2 noted that breakout sessions required more instructor guidance, while discussions and debates were particularly engaging. Instructor 3 found breakout rooms effective for peer teaching. Instructors 4 and 5 highlighted peer-to-peer steps and practice testing as effective strategies. Instructor 6 mentioned:

> "*Better facilitation was needed to prevent task splitting in breakouts.*"

Instructor 7 noted the effectiveness of post-breakout discussions and prep polls, though time constraints were challenging. Instructor 8 stressed the importance of structured breakout sessions and pre-class preparation for active learning.

Relationship with Students

Building strong relationships with students was universally regarded as crucial. Instructor 1 used informal interactions and personalized engagement to foster a sense of community. Instructor 2 emphasized ice-breaking activities and individual meetings with quieter students. Instructor 3 built rapport through personal anecdotes and humor and encouraged students to share freely in lab sessions. Instructor 4 noted:

> "*A sense of community was established by the end of the semester, with students helping peers in breakout sessions.*"

Instructor 5 used nonverbal cues like emoticons to create a positive environment. Instructor 6 found lab sessions great for building rapport but highlighted challenges with repetitive group dynamics. Instructor 7 used humor and common interests to connect with students, while Instructor 8 pointed out the benefits of lab sessions for socializing and connecting outside the formal class structure.

Emotional Expression (Signals & Emojis)

The use of emojis and signals as indicators of engagement varied. Instructors 1 and 3 found reflection polls and emojis useful for gauging student sentiment. Instructor 2 noted:

> "*Initiating emoji use encouraged students.*"

Instructor 4 observed increased emoji use over the semester, contributing to a sense of community. Instructor 5 actively used and encouraged emoticons to create a positive environment. Instructors 7 and 8 faced challenges with consistent student use of emojis and engagement through these means.

Open Communication Channel

Communication was facilitated through various channels, including office hours, emails, and announcements. Instructor 1 emphasized:

> "*Providing safe spaces and multiple feedback channels is crucial."*

Instructor 2 found peer feedback particularly effective. Instructors 4 and 6 noted the need for regular verbal and written feedback. Instructor 7 used direct and peer feedback methods to encourage participation. Instructor 8 stressed the importance of follow-up questions and peer commentary for maintaining open communication.

Cognitive Presence

Triggering Event

Real-life scenarios and problems were commonly used to trigger deeper inquiry and higher-order thinking. Instructor 1 found:

> "*Scenarios helped students apply theories practically.*"

Instructor 2 noted:

> "*Engaging scenarios like capital punishment and the trolley problem were effective.*"

Instructor 3 observed that real-life applications helped students develop higher-order thinking. Instructors 4 and 5 highlighted controversial and real-world topics to spark curiosity. Instructor 6 mentioned that unfamiliar scenarios could detract from understanding. Instructor 7 suggested better communication of real-life problem relevance. Instructor 8 highlighted, "*Connecting content to cultural norms and broader societal issues is important.*"

Association

Connecting new ideas with previous ones was facilitated through structured pre-class work and reflection activities. Instructors 1 and 3 found prep polls and reflection activities effective in linking pre-class readings to class discussions. Instructor 2 emphasized the importance of well-structured scenarios and learning skills over content. Instructor 4 noted that students generally integrated new ideas but needed time to adapt. Instructor 5 observed:

> "*Discussions helped students apply advanced concepts and skills."*

Instructor 6 used visuals and the scientific method to help students connect concepts. Instructors 7 and 8 found that pre-class work and discussions were essential for understanding and applying new ideas.

Integration

Interdisciplinary integration was a key aspect of these courses. Instructors 1 and 3 emphasized the need for explicit interdisciplinary integration and avoiding repetition. Instructor 2 noted that structured scenarios helped students focus on skills over content. Instructors 4 and 5 highlighted the importance of connecting class activities to various disciplines. Instructors 6 and 7 pointed out that some students struggled with the interdisciplinary nature of the content due to language barriers and complex readings. Instructor 8 suggested restructuring lab sessions to help students focus on integrating concepts more effectively.

Application of New Ideas

The application of new concepts to real-world problems was facilitated through assignments and projects. Instructors 1 and 5 emphasized the importance of understanding the purpose of activities and providing clear language and relevant examples. Instructor 2 suggested:

> "*Creating projects instead of paper assignments for practicality.*"

Instructors 3 and 4 highlighted the value of real-world problem scenarios in assignments. Instructor 6 noted that students often did not see the relevance of activities to their studies. Instructors 7 and 8 pointed out that students sometimes focused more on grades than on genuinely applying new concepts, suggesting the need for explicit connections between assignments and real-world applications.

Students' Reflection on Activities & Wrap-up

Reflective activities and wrap-ups were seen as crucial for consolidating learning. Instructors 1 and 3 used reflection polls and periodic pauses for reflection to gauge understanding. Instructors 4 and 5 found that wrap-ups and take-home messages were effective reflective practices. Instructor 6 sug-

gested using exit tickets and quizzes for quick checks on understanding. Instructors 7 and 8 emphasized the importance of reflection activities for helping students connect their learning throughout the course.

Teaching Presence

Design and Organization

Effective course design was essential for facilitating learning. Instructors 1 and 3 found the structured lesson plans (LPs) and supplementary materials helpful. Instructor 2 noted:

> "*More comprehensive instructor notes are needed.*"

Instructors 4 and 5 emphasized the logical sequence of activities and the importance of linking learning outcomes to activities. Instructor 6 suggested redesigning the course to make it more interesting and relevant to students. Instructor 7 pointed out challenges with the level of language in readings and the need for clearer definitions of scientific concepts. Instructor 8 suggested adding background information and detailed notes to enhance the instructor's understanding.

Facilitating Discourse

Various strategies were used to facilitate discourse among students. Instructors 1 and 3 used probing questions and peer commentary to enhance engagement. Instructors 2 and 4 emphasized the importance of guided questions and focus questions. Instructor 5 used open-ended questions, reflections, breakouts, and summaries to encourage balanced participation. Instructors 6 and 8 highlighted the need for explicit facilitation of discussions to ensure clarity and relevance. Instructor 7 suggested simplifying questions and gradually building up complexity.

Direct Instruction

Direct instruction was effective in clarifying complex topics. Instructors 1 and 3 used structured approaches and questioning techniques to guide students. Instructors 2 and 4 found direct instruction and complex concepts essential for first-year students. Instructors 5 and 6 provided concrete examples and explanations during lab sessions. Instructors 7 and 8 used direct instruction to clarify challenging concepts and enhance understanding.

Instructor Feedback on Assignments

Assessments informed teaching and learning processes through feedback and reflection. Instructors 1 and 3 emphasized the need for clear communication of grading criteria and effective feedback. Instructor 2 suggested flexibility in adapting activities to meet student needs. Instructors 4 and 5 used ongoing constructive feedback to guide student learning. Instructor 6 highlighted the importance of linking assessments to the scientific method for context. Instructors 7 and 8 provided detailed feedback on assignments and used classwork assessments for immediate feedback and clarification of concepts.

"Forum" Metrics Analysis

The total number of online classes was 26 sessions conducted, with two sessions weekly (1 hour 20 minutes each). Each session included indicators for the social, cognitive, and behavioral engagements. For social engagement, the lessons were designed to include 1-2 breakouts, chats, hand raises, and reactions to facilitate students' communication and interactions throughout the session. The cognitive engagement was supported by pre-classwork, 2-3 reflective polls, and real-life scenarios (observed through video contributions on the forum) where students could apply what they had learned and connect ideas across disciplines. Additionally, assignments served as cognitive engagement indicators, allowing students to solve real-life problems. For behavioral engagement, indicators included instructors' and students' talk time percentage, number of absences (late students were marked absent on the forum), and the average of feedback received on four assignments per course. To ensure

meaningful learning, instructors assessed one indicator using a 5-point rubric and provided feedback for each session and constructive feedback on each learning outcome for each assignment.

Social Presence & Emotional Engagement

The social engagement metrics from the online platform "Forum" showed varying levels of student participation. In collaborative work, the average class time spent in breakout rooms ranged from 21% to 24.2% (576-962.5 minutes). For open communication, the average number of chat messages per session ranged from 73 to 102, with a median of 3-4 messages per student. The hand-raising feature, indicating class interactions, showed an average range of 758-1020 instances, with a median of 24-53 per session. Emotional expression was tracked through reaction emojis, with an average range of 412-1400 instances and a median of 24-53 per student, as shown in Table 5.

Table 5. The Forum metrics of emotional engagement indicators

Course	Social							
	Engagement (breakouts)		Open communication (chat)		Interactions (hand raised)		Emotional expression (reactions)	
	min	Ave (%)	Msg.	Med./ stud	#	Med./ stud	#	Med./ stud
IAH 244	576	22%	102	3	823	33	1400	57
IDS 102	842.558	21%	101.3	4.04	758.4	24	412.58	16.12
IDS 204	962.5	24.22	73.33	2.9	1020.2	53	862.6	39.02

Cognitive Presence & Cognitive Engagement

The cognitive engagement metrics indicated strong involvement in reflective activities and the application of knowledge. The data showed an average of 18 to 20 reflective polls graded per course, with students receiving instructor feedback. The median number of graded activities ranged from 2 to 4 for pre-classwork and connecting new knowledge to previous concepts, with corresponding feedback provided. Grades for assignments solving real-life problems indicated that most students received A and B grades, reflecting high levels of cognitive engagement and constructive feedback on their work, as shown in Table 6.

Table 6. The Forum metrics of emotional engagement indicators

Course	Cognitive			
	Polls (reflection + triggering events)	Association (pre-class-work)	Video (integration & application)	Triggering events (real-life applications)
	Median	Median	Median	Grade (Count)
IAH 244	18	4	3	A (227), B (193), C (85), D (21), F (4), total (530)
IDS 102	19	3	3	A (53), B (75), C (67), D (26), F (8), total (229)
IDS 204	20	3	2	A (96), B (135), C (56), D (3), F (3), total (293)

Teaching Presence & Behavioral Engagement

Behavioral engagement metrics highlighted the importance of direct instruction and feedback. The instructors' talk time, indicating direct instruction and facilitating discourse, ranged from 58% to 67% of class talk time. The number of comments instructors gave on assignments averaged 3.2 to 7 per student, though the forum metrics did not specify the length or depth of feedback. Attendance metrics indicated that 43.2% to 54% of students were late or absent, highlighting a significant area for improvement in student punctuality and attendance, as shown in Table 7.

Table 7. The Forum metrics of emotional engagement indicators

Course	Behavioral			
	Direct instruction (talk time)	Attendance (absences)	Feedback	
	% (median/min)	% (no.)	Ave/ student	Ave for college
IAH 244	58% (17.6)	54% (326)	7	5
IDS 102	67% (22)	49% (382)	3.28	5.04
IDS 204	59.38 (18)	43.22% (359)	4.8	5.02

Analyzing the Forum metrics provides valuable insights into social, cognitive, and behavioral engagement levels in online classes. Reflective practices and real-life applications were crucial for enhancing cognitive engagement, while effective communication and flexible lesson plans significantly impacted social presence and emotional engagement. Teaching presence was reinforced through direct instruction and constructive feedback, which is essential for maintaining high levels of behavioral engagement. These findings highlight the importance of continuous reflection and adaptation in blended learning environments to improve student engagement and learning outcomes.

DISCUSSION

RQ1: WHAT INSIGHTS AND CHALLENGES EMERGE FROM EDUCATORS' REFLECTION-IN-ACTION AND REFLECTION-ON-ACTION REGARDING THE STRUCTURE, COMPONENTS, AND IMPLEMENTATION OF LESSON PLANS IN BLENDED LEARNING INTERDISCIPLINARY COURSES?

Reflection-in-action and reflection-on-action highlighted the importance of flexible and adaptive lesson plans in fostering social presence and emotional engagement, provided critical insights into cognitive presence and engagement, and emphasized the importance of teaching presence in promoting behavioral engagement.

Social Presence & Emotional Engagement

Educators noted that while structured lesson plans ensure consistency, they can limit spontaneous participation and meaningful interactions. This finding aligns with Ramalingam et al. (2021), emphasizing the need for adaptable approaches to accommodate diverse student characteristics and interests. It also aligns with the literature call for pedagogical flexibility in blended learning environments (Garone et al., 2022). Real-life scenarios were particularly effective in enhancing student participation and emotional engagement, making learning more relatable and engaging. This finding reinforces prior studies indicating that contextual and real-world applications of knowledge foster deeper emotional connections to the material (Borup et al., 2020; Gu et al., 2022). Forum data triangulated this insight by revealing that courses with more breakout interactions and structured discussion prompts

correlated with higher emoji reactions and chat participation, reflecting stronger emotional engagement (Villanueva et al., 2024). However, challenges in maintaining engagement during online components were noted, pointing to the need for improved communication tools and strategies (Oviatt et al., 2018; Wang, 2019).

Cognitive Presence & Cognitive Engagement

Educators emphasized the significance of engaging and relatable events to trigger curiosity and participation, such as the Trolley problem, which promotes higher-order thinking and critical analysis (Garrison et al., 2000). Clear and direct preparatory activities, such as prep polls and reflection exercises, were highlighted as crucial for linking new ideas with previous knowledge and fostering critical thinking, aligning with Agusta and Noorhapizah (2020). However, challenges were noted in integrating new ideas, particularly due to language barriers and complex readings, which were mentioned previously by Lau et al. (2019). The results reflect what the literature outlined as necessary for cognitive engagement: explicit reflection prompts, interdisciplinary integration, and deep learning cycles (Prince et al., 2020; Zhang & Zhu, 2023). Language-related barriers and content complexity, especially in interdisciplinary contexts, echoed concerns raised in the literature regarding accessibility and cognitive load in blended environments (Borup et al., 2020). Forum metrics confirmed these reflections, showing that student participation in reflection polls and application-based assignments was highest in sessions with real-life interdisciplinary tasks (Zhang & Zhu, 2023).

Teaching Presence & Behavioral Engagement

Educators noted that culturally appropriate assessments and clear communication of grading criteria were essential for maintaining student engagement and satisfaction, confirming Ramalingam et al. (2021) and ElSayary et al. (2022). Instructor reflections also pointed out limitations in feedback delivery, especially among newer or adjunct faculty, highlighting limitations identified by Borup et al. (2020). Forum metrics confirmed variability in feedback quantity and quality across sections, impacting students' assignment performance and behavioral indicators, which was also emphasized by Papanikolaou et al. (2017). It was also found that structured lesson plans and direct instruction provided clarity and guidance, especially for first-year students, confirming previous literature's emphasis on the same point (Li et al., 2021; Meda & ElSayary, 2021). It was pointed out that there is a need for more comprehensive instructor notes and clearer definitions of scientific concepts to enhance understanding. These results support the need for faculty training and collaborative planning, which the literature connects with improved teaching presence and learner outcomes (Terry et al., 2018; van der Stap et al., 2024).

RQ2: How do students' engagements align or contrast with educators' reflective practices, and what opportunities arise to enhance these engagements within blended learning environments?

The observed variations in student participation revealed the alignment between students' engagements and educators' reflective practices in terms of social, cognitive, and teaching presences and emotional, cognitive, and behavioral engagements.

Social Presence & Emotional Engagement

The data from the Forum metrics indicated that students' engagement in collaborative work and open communication was significantly influenced by the structure and flexibility of lesson plans. This finding is supported by the work of Castellanos-Reyes (2020), who emphasized the importance of adaptable teaching strategies in enhancing social presence and the literature's emphasis on social presence through meaningful dialogue (Borup et al., 2020). Forum indicators showed slightly lower emoji use and chat activity in sessions with highly structured LPs, reinforcing instructors' claims that spontaneity plays a role in emotional engagement (Villanueva et al., 2024). Additionally, educators noted that real-life scenarios and relatable topics were effective in promoting emotional engagement.

This approach aligns with the findings of Gu et al. (2022), who highlighted the role of contextual and real-world applications in fostering emotional connections to the material.

Cognitive Presence & Cognitive Engagement

Students' cognitive engagement was significantly enhanced through the use of reflective polls, pre-class work, and real-life problem scenarios. This finding is consistent with the work of Garrison et al. (2000), who emphasized the role of cognitive presence in promoting deep learning and critical thinking. However, challenges in interdisciplinary integration and language barriers were noted, suggesting a need for more explicit and structured approaches to connecting new ideas with previous knowledge. This observation aligns with the findings of Borup et al. (2020), who advocate for using clear and structured reflective activities to enhance cognitive engagement. Forum analytics confirmed alignment between engagement and cognitive reflection activities, particularly in integration-based sessions (Zhang & Zhu, 2023). These findings reflect the literature's claim that structured cognitive scaffolding enhances student reflection and motivation (Prince et al., 2020).

Teaching Presence & Behavioral Engagement

Students' behavioral engagement was significantly influenced by providing clear and detailed instructional materials, timely and constructive feedback, and culturally appropriate assessments. This finding is consistent with the work of Ramalingam et al. (2021), who emphasized the importance of teaching presence in promoting behavioral engagement. However, Forum data showed high absenteeism and inconsistent poll responses, which were underreported in educator reflections, suggesting potential self-reporting bias (Owen & Dunham, 2015). This supports the need for triangulating subjective reflections with learning analytics for a more accurate picture of student behavior (Papanikolaou et al., 2017). The challenges identified around attendance and timeliness echo the barriers to behavioral engagement discussed by Oviatt et al. (2018). Challenges in maintaining consistent attendance and punctuality were noted, suggesting a need for improved strategies to enhance student accountability and participation. This observation aligns with the findings of ElSayary et al. (2022), who highlighted the importance of effective teaching presence in maintaining student engagement and satisfaction.

RQ3: WHAT OPPORTUNITIES ARISE FROM REFLECTIVE PRACTICES TO ENHANCE STUDENT ENGAGEMENT IN BLENDED LEARNING ENVIRONMENTS?

This study revealed clear opportunities for enhancing emotional, cognitive, and behavioral engagement through deliberate, reflective practices, as supported in both local and global literature.

Social Presence & Emotional Engagement

Educators who engaged in structured weekly reflections adapted their teaching strategies based on real-time student feedback, improving both emotional and cognitive engagement. Reflection-in-action practices, such as modifying activities mid-lesson or soliciting instant student input, significantly improved emotional engagement (Villanueva et al., 2024). These approaches align with the literature's assertion that continuous adaptation fosters inclusion and motivation in hybrid classrooms (Borup et al., 2020; Wang, 2019). Additionally, opportunities for improvement included explicit interdisciplinary integration and structured scenarios to maintain interest and avoid repetition, which is essential for enhancing emotional engagement (Prince et al., 2020; Zhang & Zhu, 2023).

Cognitive Presence & Cognitive Engagement

Reflection-in-action led educators to reframe interdisciplinary content in response to student confusion or disengagement, enhancing meaning-making and retention (Zhang & Zhu, 2023). Reflection-on-action was used to revise interdisciplinary assessments, resulting in more meaningful learning outcomes and higher participation (Zhang & Zhu, 2023). This iterative adjustment supports Prince et al.

(2020) and Agusta and Noorhapizah (2020) on the use of reflective scaffolding for engagement. Several opportunities for improvement were raised, including using various discussion strategies and providing timely and constructive feedback, which are crucial for facilitating discourse and maintaining student engagement (Prince Machado et al., 2016). The need for standardized training for new faculty on grading and feedback was also emphasized to ensure consistency and clarity in assessments (Borup et al., 2020).

Teaching Presence & Behavioral Engagement

Weekly reflective practice, supported by structured faculty templates and shared feedback cycles, created opportunities to improve attendance, participation, and submission quality. Where instructors failed to reflect on attendance data, Forum analytics offered corrective insights, demonstrating the value of triangulation, as recommended by Papanikolaou et al. (2017). The literature consistently supports the importance of proactive teaching presence for behavioral engagement (Allen et al., 2021; Ramalingam et al., 2021). The study recommends institutionalizing peer reflection among faculty and integrating analytics-informed reflections into professional learning communities (Terry et al., 2018; van der Stap et al., 2024). This aligns with global research emphasizing reflective capacity-building for sustainable engagement gains in higher education.

IMPLICATIONS

This study offers several practical and theoretical implications for blended learning design, reflective teaching, and interdisciplinary instruction. First, flexible and adaptive lesson plans are paramount in fostering social presence and emotional engagement, particularly when instructors make real-time adjustments based on student responses, a practice rooted in reflection-in-action. Second, by triangulating educator reflections with Forum-based analytics, the study highlights that real-life scenarios and contextual applications not only spark interest but also enhance emotional and cognitive engagement. These findings align with the CoI framework's social and cognitive presences while reinforcing the practical relevance of the ACE model, which emphasizes connectedness and engagement across academic communities.

Third, the value of interdisciplinary connections is another key implication, as these connections enrich the learning experience and provide students with diverse perspectives. This approach can enhance cognitive engagement by encouraging students to synthesize information from various disciplines and apply it meaningfully. Fourth, effective teaching presence, characterized by clear feedback, structured scaffolding, and culturally appropriate assessment, emerged as a cornerstone of behavioral engagement. However, inconsistencies in feedback delivery reveal a gap in faculty readiness and underscore the value of standardized training programs and ongoing peer reflection. Finally, this study shows that embedding structured reflection cycles (reflection-in-action and on-action) into faculty practice offers a sustainable pathway for improving student engagement across emotional, cognitive, and behavioral domains. These insights apply to faculty developers, instructional designers, and policy leaders striving to build reflective, data-informed professional learning systems.

CONCLUSION

This study provides valuable insights into educators' reflective practices in blended learning environments, particularly within interdisciplinary courses. For RQ1, the findings show that flexible lesson planning, real-time adjustments, and contextual content directly improve social, cognitive, and behavioral dimensions of student engagement. For RQ2, it was evident that student engagement trends, captured through learning analytics, aligned with educators' reflections on their teaching practices. However, gaps between perceived and actual engagement highlighted the need for triangulation. For RQ3, this study identified clear opportunities to enhance engagement through reflective strategies such as modifying activities mid-lesson, revising assessments, and facilitating interdisciplinary integration. The study also highlights the importance of reflective practices in promoting critical thinking,

collaborative learning, and effective teaching strategies. These practices enable educators to make real-time adjustments and retrospective evaluations, ultimately enhancing student engagement and learning outcomes. This research advances the current literature by empirically linking reflection-in-action and reflection-on-action to student engagement within the CoI and ACE frameworks, thereby offering a dual-theoretical lens. It contributes to a growing body of global scholarship that advocates for analytics-informed, reflective pedagogy in higher education. Practically, the study offers a replicable model for institutions seeking to align teaching presence with measurable engagement outcomes. It also advocates for embedding reflection into faculty training, assessment design, and curriculum planning, helping institutions meet both national goals (UAE Vision 2021, 2009) and global mandates (SDG 4) for quality education.

LIMITATIONS AND RECOMMENDATIONS

Despite the valuable insights gained from this study, several limitations should be acknowledged and addressed in future research. Firstly, the study relied on self-reported data from educators, which may be subject to biases such as social desirability or recall bias. Future studies should triangulate these data with additional objective measures, such as direct observations, to provide a more comprehensive understanding of reflective practices and engagement.

Secondly, the sample size of coordinators and instructors was relatively small, which may affect the robustness of the findings. To address this limitation, future research should include a larger and more diverse sample of educators to strengthen the validity and reliability of the results.

Furthermore, the study primarily focused on educators' reflective practices, with limited direct student input. Future studies should incorporate more extensive student perspectives to provide a balanced and comprehensive view of the impact of reflective practices on student engagement and learning outcomes.

Future research should explore the impact of flexible and adaptive lesson plans on student engagement and learning outcomes in various educational settings to enhance the field. Longitudinal studies are needed to examine how real-time adjustments in teaching strategies can accommodate diverse student characteristics and interests over time.

Moreover, research should delve into the role of effective teaching presence in providing clear, detailed instructional materials, timely feedback, and culturally appropriate assessments. Investigating how these elements contribute to behavioral engagement and student success can provide valuable insights for educators and institutions. Future studies should also consider developing and evaluating comprehensive faculty training programs that enhance instructional practices and feedback mechanisms, ensuring that teaching presence effectively supports student engagement in blended learning environments.

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APPENDIX

SEMI-STRUCTURED INTERVIEW QUESTIONS FOR INSTRUCTORS

The questions used in the interviews are considered mirroring the coordinators' fieldnotes indicators:

A. Social presence

- Did students engage with the material and each other as anticipated?
- Which active learning strategies were most effective?
- How well did I establish a sense of community and connection among students?
- What opportunities can I create at this moment for students to share their feelings and reactions to the content?
- How am I facilitating an environment where feedback is readily exchanged between students and myself?
- What can I do in the future to encourage quieter students to participate more actively in the discussion?

B. Cognitive presence

- How did students connect and apply concepts?
- What did the discussions reveal about students' understanding of the course materials?
- How did students demonstrate reflective thinking throughout the course?

- How did real-life scenarios and problems lead to students' development of higher-order thinking skills?
- Were students able to effectively explore and integrate new ideas?
- How successfully did students apply new concepts with real-world problems?

C. Teaching presence

- Was the course design effective in facilitating the learning process?
- How well did I facilitate discourse among students? How did that contribute to their learning?
- Was my instruction clear and direct throughout the learning process?
- Was direct instruction effective in clarifying complex topics?
- How did in-class assessments inform my teaching and the students' learning process?
- How did assignments inform my teaching and the students' learning process?

AUTHORS

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