Shared Metacognition and Its Relationship to Cognitive and Teaching Presence in the Blended Learning Environment among Bachelor's Students at the University of Jordan

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***Abstract*—Many factors influence student learning in a blended learning environment. To enhance the teaching–learning process and reduce the communication barriers imposed by screens and remote interaction, it is essential to understand the elements that affect engagement, particularly within collaborative groups. This descriptive correlational study examined the level of shared metacognition and its relationship with cognitive presence and teaching presence in the blended learning environment at the University of Jordan. A cluster-random sampling technique yielded a sample of 948 students drawn from all faculties and both genders. Validated instruments measured shared metacognition, cognitive presence, and teaching presence, and the data were analyzed using means, standard deviations, Pearson correlations, and multiple correlation analysis. Results showed high levels of shared metacognition, cognitive presence, and teaching presence. Statistically significant positive correlations were found between shared metacognition and cognitive presence (r = 0.692) and between shared metacognition and teaching presence (r = 0.593). Shared metacognition also accounted for a substantial proportion of variance in both forms of presence. These findings offer practical guidance for curriculum design in blended settings and help instructors address cognitive and metacognitive dimensions that enhance student motivation and engagement.**

***Keywords*—shared metacognition, teaching presence, cognitive presence, blended learning**

I. Introduction

During the COVID-19 pandemic, Jordan—like many other countries—was compelled to make an abrupt transition to distance learning in response to the emergency situation. This rapid shift had far-reaching implications: students reported declines in academic performance, heightened frustration, feelings of isolation, and diminished motivation to continue their education. Simultaneously, teachers faced substantial challenges, including inadequate technological preparedness, psychological strain, and limited training in remote instructional strategies. These issues imposed a significant burden on both students and educators, prompting ministries and educational institutions to acknowledge the limitations of fully remote learning models. In response, Jordan and various other countries began implementing blended learning frameworks across educational settings—not merely as a contingency plan, but as a strategic initiative to align with the global shift toward digital education. Blended learning facilitates student autonomy, fosters motivation, and encourages active participation—especially within collaborative group environments.

To enhance the quality of teaching and learning and mitigate the challenges of screen-mediated communication, it became critical to examine the blended learning environment and the factors that shape student success—particularly those related to cognitive, shared metacognitive, and instructional dynamics. Despite their pivotal role, these elements remain insufficiently addressed in the existing literature, especially within Arabic-language research contexts. The researchers identified a clear gap regarding the interplay between shared metacognition and the two key components of the Community of Inquiry framework: cognitive presence and teaching presence. This aligns with Garrison's [1] call for deeper investigation into shared metacognition to strengthen the foundation of communities of inquiry. Garrison emphasizes the importance of examining how these elements coalesce within blended learning settings to foster meaningful engagement and learning outcomes. Accordingly, the present study seeks to assess the level of shared metacognition among students at the University of Jordan. It also aims to explore the degree to which students experience cognitive and teaching presence, and to analyze the interrelationships among these three constructs within the context of blended learning at the university.

This research seeks to address the following questions:

1) What is the level of shared metacognition among students at the University of Jordan from their perspective?
2) What is the level of cognitive and teaching presence among students at the University of Jordan from their perspective?
3) Is there a statistically significant correlation (at the 0.05 significance level) between shared metacognition and both cognitive and teaching presence?

The significance of this study lies in its dual theoretical and practical contributions. On the theoretical front, it engages with current advancements in blended and distance learning by applying contemporary educational theories to investigate the complexities of technology-mediated instruction. The study extends the body of scientific knowledge by offering empirically supported insights into shared metacognition, cognitive presence, and teaching presence within blended

learning environments. It further contributes validated instruments for measuring these constructs, thereby enhancing future research capacity in this domain. Additionally, the research fills a critical gap in both local and international academic literature concerning blended learning, particularly in Arabic-language contexts.

From a practical standpoint, the study equips educators with evidence-based understanding of how students learn within blended learning environments, enabling them to craft instructional strategies and set pedagogical goals tailored to the specific demands of this modality. The findings support curriculum development efforts aimed at preparing learners for the future of education in technologically rich settings, particularly at the postgraduate level. Moreover, the results underscore the key competencies that both instructors and students must cultivate to optimize the effectiveness of blended and remote learning. By providing a robust theoretical foundation and comprehensive literature review, the study empowers educators to integrate cognitive, teaching, and metacognitive dimensions into their practice—thereby addressing common challenges in digital education. Ultimately, the study offers practical guidance for designing more dynamic, engaging, and motivating learning environments that foster meaningful student engagement and achievement.

Research Terms and Definitions:

Shared Metacognition: Defined as the metacognitive processes of individuals working as a cohesive social entity towards a unified goal, i.e., the collective objective of the task or activity [2]. It is assessed by students' scores in the cognitive presence domain of the research tool.

Cognitive Presence: refers to learners' ability to engage in reflective thinking and collaborative discussion as part of a critical inquiry process, enabling them to make sense of content and experiences [2]. In this study, it is assessed using participants' results on the cognitive presence scale of the instrument.

Teaching Presence: encompasses the instructional design and active guidance of both cognitive and social learning elements to support effective and meaningful educational experiences [2]. It is determined through learners' scores on the teaching presence section of the research questionnaire.

II. Theoretical Framework

Within the realm of collaborative learning, a substantial body of research has explored the complexities of group dynamics, with metacognition emerging as a pivotal area of focus. Fundamentally, metacognition refers to the awareness and deliberate regulation of one's cognitive processes [3]. Coined by John Flavell in the late 1970s, the term denotes "knowledge about cognitive phenomena", or more simply, "thinking about thinking" [4]. Martinez [5] further emphasizes that metacognition involves both the monitoring and control of mental activities.

Traditionally, metacognition has been closely associated with self-regulation, serving as a foundational mechanism for cognitive oversight and evaluation [2]. However, a critical challenge arises in incorporating collaborative or shared thinking into learning contexts, as classical models of metacognition typically prioritize individual cognition. Contemporary scholarship has increasingly acknowledged the value of social interaction and collaborative processes in deepening our understanding of metacognitive function [1].

This paradigm shift has led to a reconceptualization of metacognition—from an individually centered model to one that recognizes it as a socially embedded construct. Rather than viewing metacognition as an isolated internal process, this emerging perspective highlights its development through interaction between individuals and their sociocultural environments. In this context, cognitive engagement and group collaboration are essential for cultivating metacognitive awareness.

The concept of shared metacognition captures this evolution. It refers to the collective metacognitive processes enacted by individuals working together as a unified social group toward a shared objective [2]. This construct encompasses not only the individual's personal understanding of their own learning journey but also their ability to co-construct meaning with others, and to monitor and regulate both their own and others' cognitive contributions [1, 6].

Akyol and Garrison [7] delineate three core dimensions of metacognition: Knowledge of Cognition (KC), which pertains to an individual's self-awareness of their cognitive strengths and limitations; Monitoring of Cognition (MC), which involves ongoing assessment of one's thought processes during learning; and Regulation of Cognition (RC), which encompasses the strategic actions taken to guide and optimize learning. These dimensions are applicable to both individual and shared metacognitive regulation within collaborative learning environments, highlighting the dynamic interplay between personal insight and collective engagement [7].

The construct of shared metacognition suggests that both self-regulation and co-regulation involve two interrelated components: monitoring (awareness) and management (strategic action). The monitoring dimension entails cognitive awareness of one's learning process, encompassing the evaluation of expectations, the feasibility of content, the effectiveness of procedures, and the cognitive effort required. In contrast, the management dimension encompasses deliberate and reflective actions such as strategic planning, goal-setting, regulating the inquiry process, exploring ideas, and evaluating alternative hypotheses. This conceptual framework integrates both individual and collective dimensions of cognition and learning, with dialogue serving as the central mechanism through which shared understanding and strategic coordination are achieved [2].

The importance of shared metacognition becomes particularly pronounced in blended learning environments, which integrate traditional face-to-face instruction with online modalities—both synchronous and asynchronous. This significance is especially evident in collaborative group settings where learning is driven by the exchange of ideas and mutual dialogue among participants. Within such environments, learners are not only able to monitor and regulate their own cognitive processes but also engage in reciprocal interactions—listening to and reflecting on the perspectives of their peers—thus enhancing their metacognitive development.

From the standpoint of the Community of Inquiry (CoI) framework, which comprises cognitive, social, and teaching

presence, shared metacognition occupies a critical position at the intersection of cognitive and teaching presence. It forms the core of the educational experience and is essential for fostering meaningful cognitive engagement and collaborative inquiry [1]. Cognitive presence, as defined by Garrison *et al.* [8], refers to "the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical inquiry community." This cognitive presence is activated and measured through the Practical Inquiry (PI) Model, which outlines four progressive phases designed to assess the quality and depth of critical thinking and discourse within a community of inquiry [2].

The stages of cognitive presence are as follows:

1) Triggering Event: This initial phase of critical inquiry is marked by a triggering event that surfaces a specific problem rooted in prior experiences [8].
2) Exploration: During this stage, the focus shifts to comprehending the problem, gathering relevant information, and exploring various interpretations [7].
3) Integration: This phase involves synthesizing the acquired information and insights into a cohesive idea or concept [9].
4) Resolution: The final stage addresses the resolution of the problem, typically involving the application of an idea or hypothesis [8].

Teaching Presence is divided into three categories:

1) Design and Organization: Design involves pre-educational structural decisions, while organization pertains to adjustments made during the learning process to accommodate changes.
2) Facilitating Discourse: This category focuses on fostering discussions within a community of inquiry to support the construction of personal meaning and collaborative understanding.
3) Direct Instruction: This involves academic leadership, often characterized by specific guidance and is considered a primary responsibility of teaching, which can be notably deficient in online learning environments [2].

The evident connection between shared metacognition and both cognitive and teaching presence in blended learning environments—reflected in the positioning of shared metacognition at the intersection of these two presences [1]—underscores the importance of further exploring the dynamics among these variables. This relationship holds critical implications for both learners and instructors, as it influences engagement, collaboration, and academic success. Numerous studies support the significance of this interconnection. For instance, Harb and Krish [10] argue that blended learning inherently fosters a vibrant cognitive presence, while Vaughan and Wah [11] emphasize that teachers must actively employ digital technologies to design, facilitate, and guide constructive and collaborative learning environments. Such environments enable students to participate in the regulation of their learning processes, a function central to shared metacognition.

Further evidence from Sadaf *et al.* [12] reveals a positive correlation between shared metacognition and cognitive presence, and Ataş [13] underscores the vital role of CoI components and shared metacognition in online collaborative learning contexts. Additionally, Sadaf *et al.* [14] highlight that teaching presence significantly enhances both self-regulation and co-regulation, thereby improving the quality of case-based online learning. Similarly, Olesova and Sadaf [15] report that students perceived teaching presence as the most prominent and impactful element of the CoI framework, particularly in fostering critical thinking. From an educational and practical standpoint, a deep understanding of shared metacognition can inform the development of effective facilitation strategies within collaborative inquiry settings, leading to more meaningful and impactful learning experiences. Theoretically, shared metacognitive awareness provides a robust foundation for enriching the CoI framework, as it emphasizes the interconnectedness of participants and promotes insight and innovation through critical dialogue [1].

Given the growing emphasis Jordan—and many countries globally—place on blended learning as a foundational approach within educational institutions, it has become imperative to investigate this learning environment comprehensively. Understanding the key factors that influence student outcomes is essential to enhancing the quality and sustainability of the learning experience. Equally important is examining teacher-related factors to support the integration of modern instructional strategies and the adoption of innovative curricula that align with the rapid technological transformations of our time. In this context, the present study seeks to illuminate one of the most critical dimensions of student learning in blended settings: the interrelationship among shared metacognition, cognitive presence, and teaching presence. By addressing a gap in Arabic-language literature, this research aims to examine the levels of these constructs and their interconnections among undergraduate students at the University of Jordan, with the goal of offering insights to improve and advance blended learning practices.

III. Literature Review

A. Shared Metacognition and Presence

Research on shared metacognition and its relationship to presence in educational contexts has been the focus of numerous studies, each offering valuable insights into how these constructs can be effectively integrated to enhance learning environments. Vaughan and Wah [11], for example, investigated how to design, facilitate, and guide educational technology courses for pre-service teachers with an emphasis on fostering shared metacognitive skills through the use of digital technologies. Utilizing both the Shared Metacognition (SM) and Community of Inquiry (CoI) questionnaires, their study involved 72 undergraduate students at Mount Royal University in Calgary, Alberta. The findings emphasized that a comprehensive understanding of metacognition in teacher education requires moving beyond purely individualistic approaches. Instead, it should be conceptualized as a dynamic interaction between self-regulation and co-regulation, forming an integrated and collaborative learning strategy. Their research highlighted the critical role of digital technologies not merely as instructional aids, but as foundational tools for cultivating a constructive, collaborative learning environment in which students actively engage in shared metacognition.

Building on this line of inquiry, Ataş [13] conducted a study aimed at identifying and analyzing the levels of Community of Inquiry (CoI) elements and Shared Metacognition (SM) among students engaged in online collaborative learning. By developing a detailed coding framework to evaluate collaborative discussion posts and translating the SM questionnaire into Turkish, Ataş collected data from 68 students enrolled in a vocational school of health services in Turkey. The study affirmed the CoI model as a powerful theoretical framework, effectively delineating cognitive, social, and teaching presence as well as shared metacognitive processes. The results underscored that key components such as planning, directing, monitoring, evaluating, and reflecting are indispensable for the development of shared metacognition in online collaborative settings. This research illuminated the intricate interplay between these elements, further establishing their central role in fostering deeper, more effective learning through collaborative inquiry.

Sadaf *et al.* [12] adopted a correlational research approach to examine the relationship between students' perceived metacognition and their sense of online presence within the Community of Inquiry (CoI) framework, focusing specifically on a Case-Based Instruction (CBI) course. Drawing on data from 47 graduate students in the southeastern United States and utilizing both the CoI and Online Shared Metacognition questionnaires, the study revealed that among the three forms of presence—cognitive, social, and teaching—cognitive presence was perceived as the most prominent and consistent. It was also found to significantly influence students' metacognitive engagement in the online learning environment. Notably, the study identified a strong correlation between the two dimensions of metacognition—self-regulation and shared regulation—with shared regulation exhibiting a stronger association with all three types of online presence. Of particular interest, social presence demonstrated the strongest correlation with both self- and shared regulation, followed closely by cognitive presence.

In a subsequent study, Sadaf *et al.* [14] explored the influence of teaching presence on shared metacognition in a case-based online instructional setting. This study, involving 113 graduate students enrolled in an instructional design course, employed the CoI and Shared Metacognition (SM) questionnaires to collect data. The findings highlighted direct instruction as a key component in promoting shared metacognition, especially in fostering both self-regulation and co-regulation among learners. The research underscores the centrality of teaching presence—particularly through purposeful instructional guidance—in encouraging active student engagement and enhancing the effectiveness of case-based online learning.

Finally, Olesova and Sadaf [15] examined students' perceptions of shared metacognition and online presence within CoI-based online training programs. Using a sample of 40 students and employing both the CoI and SM questionnaires, their findings showed that teaching presence was rated as the most influential in shaping learning outcomes, while social presence was considered the least impactful among the three presences. Additionally, participants reported higher levels of individual metacognition compared to shared metacognition. Elements such as course readings, structured discussions, and application-oriented tasks were identified as the most influential in supporting critical thinking development. Teacher feedback, in particular, was recognized as the most effective strategy for cultivating critical thinking skills, reaffirming the importance of active, responsive, and well-structured instructional practices in online education.

B. Shared Metacognition

Backer *et al.* [16] conducted a study to examine the nature of students' individual contributions to shared metacognition and their influence on collaborative learning dynamics, with particular attention to how these contributions enhance or impede educational outcomes. The study, carried out in an authentic university setting, involved 60 first-year educational science students, all of whom held professional bachelor's degrees. The findings revealed a strong positive correlation between contributions to shared metacognition that actively transformed and enriched collaborative interactions and students' immediate comprehension of course content. In contrast, contributions that merely confirmed prior ideas or disrupted ongoing interaction showed no comparable benefit. These results underscore the importance of active, constructive engagement in shared metacognitive processes as a catalyst for deeper learning.

In a related study, Çoruk and Seferoğlu [17] explored the effects of an online project-based infographic design process on learners' self-regulation and shared metacognition. The study, which involved 34 vocational school students during the second semester of the 2021–2022 academic year in Turkey, demonstrated a significant enhancement in students' interactive self-regulation skills—particularly within the domains of student-content engagement, student-teacher interaction, and peer collaboration—with statistically significant improvements recorded. Moreover, students exhibited marked gains in shared metacognitive abilities, further reinforced by the effective integration of teacher feedback. Participants also reported notable development in their design, teamwork, and research competencies, highlighting the effectiveness of the project-based learning model in cultivating both cognitive and collaborative capacities essential for academic success.

C. Cognitive and Teaching Presence

Harb and Krish [10] investigated the role of cognitive presence in a blended learning environment, specifically examining university students' attitudes toward employing this approach in language learning. Their quantitative study surveyed 100 students enrolled in an English language skills course at Al-Balqa Applied University in Jordan, using a self-report questionnaire to gather data. The results revealed that blended learning significantly enhanced cognitive presence, fostering an active and engaging context for language acquisition. Moreover, students expressed favorable attitudes toward the cognitive presence enabled by the blended learning model, highlighting its effectiveness in enriching the language learning experience and promoting deeper learner engagement.

Al-Muhaya [18] conducted a study to examine the impact of implementing the Community of Inquiry (CoI) framework in a blended learning course on the development of students'

critical thinking skills. Employing a quasi-experimental design, the study utilized three groups—two experimental and one control—with the experimental groups receiving training based on the CoI framework. The two experimental groups comprised 24 and 25 randomly selected students, respectively, while the control group consisted of 25 students. Analysis of the students' electronic contributions on the learning management system revealed statistically significant differences across the three core dimensions of the CoI framework—social presence, teaching presence, and cognitive presence—with the second experimental group outperforming the others. This group also demonstrated markedly higher levels of critical thinking skills, underscoring the effectiveness of structured CoI-based instruction in enhancing critical engagement within blended learning environments.

Similarly, Simpson-Spence [19] examined the influence of teaching presence on the online learning experiences of students who had previously encountered academic failure. The study sampled 137 self-selected undergraduate students from a Canadian university who had struggled in asynchronous online courses. Utilizing the Community of Inquiry (CoI) teaching presence instrument, Simpson-Spence identified a clear link between teaching presence and academic failure in online settings. The findings highlight the critical necessity of embedding a robust teaching presence in the design and delivery of online courses to reduce student failure rates and enhance overall learning outcomes.

Building on this focus, Wang *et al.* [20] surveyed both teachers' and students' perceptions of teaching presence in online classes at a Chinese university, involving 1,041 students and 18 instructors. Their analysis uncovered a significant disconnect between teachers' and students' views, particularly regarding the facilitation of discourse. Students valued discourse facilitation more highly than direct instruction, a perspective not equally shared by the teachers. This perceptual gap poses a challenge for educators striving to engage students effectively in virtual learning environments. The study suggests that instructors may need to recalibrate and emphasize specific aspects of teaching presence to better meet students' expectations and improve their educational experience.

In a related investigation, Silva *et al.* [21] explored whether learners' perceptions of non-designed instructors' (NDI) teaching presence could predict cognitive presence and whether the use of distance learning media moderated this relationship. The study employed the CoI framework questionnaire with 125 master's students from a private religious university in the western United States during summer and fall semesters. Multiple regression analysis demonstrated that perceptions of teaching presence significantly predicted cognitive presence. However, the use of educational media resources did not moderate this effect, indicating that teaching presence exerts a direct and substantial influence on cognitive presence regardless of the technological media employed.

Al-Salti and Abu Awwad [22] conducted a descriptive study to examine the effectiveness of the Community of Inquiry (CoI) framework and emotional presence within synchronous online learning among undergraduate students at the University of Jordan. The sample comprised 940 students, and data were collected via a questionnaire assessing the key study variables. The findings demonstrated a moderate to high level of effectiveness for both the CoI framework and emotional presence. Additionally, the study identified a statistically significant gender effect favoring female students across cognitive, teaching, and emotional presence dimensions. Faculty affiliation also showed a significant impact, with students from humanities faculties reporting higher levels of social, cognitive, teaching, and emotional presence. Moreover, the research revealed a positive correlation between social and teaching presence and students' overall satisfaction with their learning experience.

Xue *et al.* [23] carried out a correlational study investigating the interrelationships among the three components of the CoI framework, the association between CoI and learner satisfaction, and the mediating roles of academic emotions and self-regulation. Utilizing questionnaires to assess all variables, the study sampled 461 undergraduate students engaged in online learning in China. The results indicated that teaching presence significantly and positively predicted both social and cognitive presence. Furthermore, both positive and negative academic emotions mediated the relationships between teaching presence, social presence, and satisfaction, while self-regulation mediated the link between teaching presence, cognitive presence, and satisfaction.

A thorough review of existing literature reveals a robust and significant relationship between shared metacognition, cognitive presence, and teaching presence within the Community of Inquiry (CoI) framework. This framework, which intricately integrates cognitive and teaching presence in online learning environments, has proven essential for deepening our understanding of shared metacognition. Notably, teaching presence consistently emerges as the most influential element, playing a critical role in guiding students to effectively regulate their learning processes. Previous research [11–15] collectively affirm that the CoI framework provides a strong theoretical foundation for investigating shared metacognition, clearly delineating its core components. The CoI dimensions—cognitive, social, and teaching presence—exhibit strong associations with shared regulation, highlighting the central role of direct instruction in cultivating shared metacognitive skills, as underscored by Refs. [14, 15].

Further inquiry into shared metacognition emphasizes its positive impact on students' comprehension of learning content, especially when it actively enhances collaborative learning dynamics. This finding is supported by Refs. [16, 17], who demonstrated that shared metacognitive skills significantly improve within project-based learning contexts, thereby underscoring the value of interactive and collaborative learning models.

Regarding cognitive and teaching presence, the literature consistently highlights that positive student attitudes toward cognitive presence are fundamental in blended learning settings, fostering a robust cognitive presence. Furthermore, embedding teaching presence into course design is imperative for successful online learning outcomes. However, a notable divergence exists between students' and instructors' perceptions of teaching presence, particularly concerning discourse facilitation. Students tend to regard

teaching presence—especially in terms of facilitating dialogue—as more critical than teachers do, often perceiving it as less effective than instructors assume. This perceptual gap is significant because students' views of teaching presence strongly predict their cognitive presence, as evidenced in studies [10, 19–21].

The current study aligns closely with prior research in the domains of shared metacognition, cognitive presence, and teaching presence, employing a correlational research design and targeting university students as its population. It utilizes measurement instruments and methodological strategies consistent with those applied in earlier studies. Moreover, this research builds upon established findings by interpreting its results through the lens of prior work that consistently demonstrates positive associations between shared metacognition and key components of the Community of Inquiry (CoI) framework—specifically cognitive and teaching presence—which have been shown to enhance critical thinking, learning satisfaction, and self-regulation [18, 22, 23].

Nevertheless, this study distinguishes itself in several critical respects. It extends beyond the scope of previous investigations by pursuing distinct objectives and integrating variables that have not been collectively examined before. Notably, while earlier research has addressed these constructs either individually or in limited combinations, this study represents the first in the Arabic context to comprehensively explore the interrelationships among shared metacognition, cognitive presence, and teaching presence within a blended learning environment. This holistic approach provides a deeper, more integrated understanding of how these dimensions interact to shape student learning outcomes in technology-enhanced educational settings.

IV. Research Methodology

The present study adopts a quantitative descriptive and correlational research design to investigate the level of shared metacognition and its relationship with cognitive and teaching presence within blended learning environments among students at the University of Jordan. The use of the quantitative descriptive method is well-justified, as it enables a systematic assessment of students' perceptions and experiences in a real educational setting. Moreover, the correlational approach is particularly appropriate for this study's aims, as it facilitates the exploration of interrelationships among key variables—shared metacognition, cognitive presence, and teaching presence—without manipulating the natural learning environment, thereby preserving the authenticity of the data collected.

A. Research Population and Sample

The study population consisted of undergraduate students at the University of Jordan who were enrolled in courses delivered using the blended learning approach during the first semester of the academic year 2023/2024. The total population included 49,000 students, distributed across scientific, health, and humanities faculties. A cluster random sampling method was used, whereby faculties were grouped into three categories: scientific, humanities, and health sciences. Random course sections were then selected from each group, provided that the selected students were enrolled in blended learning courses. The final sample consisted of 948 students, distributed across all faculties and both genders: 654 females and 294 males. Faculty distribution included 430 students from humanities faculties, 153 from scientific faculties, and 365 from health-related faculties. Table 1 presents the distribution of students across humanities, science, and medical faculties.

Table 1. Distribution of students across humanities, science, and medical faculties

Items	Frequency	Percent (%)
Male	294	31.0
Female	654	69.0
Total	948	100.0
Humanities	430	45.4
Scientific	153	16.1
Health	365	38.5
Total	948	100.0

B. Research Instruments

To accomplish the research objectives, two primary instruments were utilized: The Shared Metacognition Scale and the Cognitive and Teaching Presence Scale. Below is an in-depth description of each:

1) Shared metacognition scale

The Shared Metacognition Scale was developed by Garrison and Akyol [24] and consists of 26 items distributed across two dimensions of regulation: self-regulation (13 items) and co-regulation (13 items). Items 1–6 reflect self-regulation monitoring strategies, while items 7–13 address self-regulation management strategies. Items 14–19 reflect co-regulation monitoring strategies, and items 20–26 address co-regulation management strategies.

In the current study, the scale was translated into Arabic, then back-translated into English to ensure the accuracy of the translation. The items were rewritten in Arabic with adjustments to some phrases and wording to better suit the Arab educational context and to align with the objectives of the study. To ensure content validity, the scale in its preliminary form was reviewed by a panel of four expert reviewers in educational and psychological sciences from faculty members at Jordanian universities. Their feedback was considered, and the necessary modifications were made accordingly. The final version of the scale remained composed of 26 items (13 for self-regulation and 13 for co-regulation), formatted using a five-point Likert scale.

To assess the reliability of the scale, Cronbach's alpha was calculated for internal consistency, yielding a value of 0.915 for the self-regulation dimension and 0.905 for the co-regulation dimension. In addition, the corrected split-half reliability using the Spearman-Brown coefficient was 0.873 for self-regulation and 0.808 for co-regulation.

2) Cognitive and teaching presence scale

The Arabic version of the Cognitive, Teaching, Social, and Emotional Presence Scale, developed in the study by Al-Salti and Abu Awwad [22], was used. The cognitive presence section included 12 items, while the teaching presence section included 13 items. The Cronbach's alpha coefficient for internal consistency was 0.894 for cognitive presence and 0.955 for teaching presence.

To verify the face validity of the scale, it was presented in

its initial form to a panel of four expert reviewers specializing in educational and psychological sciences from faculty members at Jordanian universities. Their feedback was considered, and modifications were made accordingly. The final version of the scale consisted of 25 items measuring cognitive and teaching presence, organized using a five-point Likert scale.

C. Research Variables

The research includes the following variables:

- Shared Metacognition.
- Cognitive Presence.
- Teaching Presence.

Demographic Variables:

1) Student Gender (Male, Female):

The sample included 948 students, of whom 654 were female and 294 were male.

2) Type of College (Scientific, Humanities, Health):

The sample was distributed across all scientific, humanities, and health colleges. The number of students in scientific colleges was 153, in humanities colleges 430, and in health colleges 345.

D. Research Procedures

To achieve the research's objectives, the following procedures were followed:

- Identifying the research problem, questions, and variables.
- Reviewing the theoretical literature and previous studies related to the research topic.
- Selecting the appropriate instruments and scales for the research's objectives.
- Translating and validating the Shared Metacognition Scale and the Cognitive and Teaching Presence Scale.
- Conducting the research by posting an electronic link to the questionnaires on the e-learning platform for all scientific, humanities, and medical disciplines that teach courses using the blended learning method during the first semester of the 2023/2024 academic year.
- The responses, totaling 948, were subjected to statistical analysis using SPSS.
- The results were presented and organized in statistical tables according to the research's questions and variables.
- The current research's results were discussed in light of previous studies and the theoretical framework related to the research's objectives, and recommendations were made based on the research's findings.

E. Statistical Analysis

- To answer the first research question, means and standard deviations were calculated for the total scores and subdimensions of the Shared Metacognition Scale and its items.
- To answer the second research question, means and standard deviations were also calculated for the scores on the Cognitive and Teaching Presence Scale, including its items and sub-dimensions.
- To answer the third research question, Pearson correlation coefficients were calculated between the dimensions of the Shared Metacognition Scale and both cognitive and teaching presence. Based on these results, multiple regression analysis was conducted to predict shared metacognition based on the presence variables.

A. Research Limitations

1) The research was conducted at the University of Jordan in Amman.
2) The research was applied in the first semester of the 2023/2024 academic year.
3) The research population includes students from scientific, health, and humanities faculties at the University of Jordan.

F. Ethical considerations

The participants were selected through a random sampling method, and written informed consent was secured from all individuals before data collection began. To ensure confidentiality, no identifying information is disclosed, and the anonymity of all participants is strictly maintained.

V. Research Findings

To answer the first research question: "What is the level of shared metacognition among students at the University of Jordan?" Means and standard deviations were calculated for the scores on the Shared Metacognition Scale, including its items and sub-dimensions. Table 2 presents these results.

Table 2. Means and standard deviations of the scores on the shared metacognition scale, its items, and its sub-dimensions

Shared Metacognition	Mean	Std. Deviation
I am aware of my effort.	4.48	0.632
I am aware of my thinking.	4.52	0.610
I know my level of motivation.	4.33	0.706
I question my thoughts.	4.29	0.775
I make judgments about the difficulty of the problem.	4.15	0.794
I am aware of the current knowledge I have.	4.33	0.692
I assess my understanding.	4.27	0.725
I change my strategy when needed.	4.29	0.735
I am aware of my level of learning.	4.39	0.685
I seek new strategies when needed.	4.37	0.701
I apply strategies.	4.17	0.771
I assess how I deal with the problem.	4.21	0.790
I assess my strategies.	4.25	0.755
I care about others' ideas.	4.14	0.876
I listen to others' feedback.	4.17	0.851
I consider others' opinions.	4.09	0.878
I reflect on others' feedback.	3.83	1.035
I monitor others' strategies.	3.78	1.036
I observe how others act.	3.96	0.954
I seek confirmation of my understanding from others.	3.99	0.917
I request information from others.	3.90	0.910
I respond to others' contributions.	4.07	0.812
I challenge others' strategies.	3.65	1.029
I challenge others' viewpoints.	3.61	1.078
I help others learn.	4.28	0.743
I monitor others' learning.	3.70	1.033
Self-Regulation	**4.3105**	**0.50859**
Shared Regulation	**3.9361**	**0.64285**

It is observed from Table 2 that the mean score for self-regulation as a whole was 4.3105, which is considered high. The item-wise scores for self-regulation ranged between 4.15 and 4.52. It is also observed that the mean score for co-regulation as a whole was 3.9361, also considered high, with item-wise scores ranging between 3.61 and 4.28.

To answer the second research question: "What is the level of both cognitive and teaching presence among students at

the University of Jordan?" Means and standard deviations were calculated for the scores on the Cognitive and Teaching Presence Scale, including its items and sub-dimensions. Table 3 presents these results.

Table 3. Means and standard deviations of the scores on the cognitive and teaching presence scale, its items, and its sub-dimensions

Presence	Mean	Std. Deviation
The issues raised during lectures increase my interest.	4.34	0.782
Course activities stimulate my cognitive curiosity.	4.26	0.905
I have the cognitive motivation to ask questions related to the course content.	4.14	0.900
I use a variety of information sources.	4.14	0.889
The brainstorming strategy and search for relevant information help me.	4.15	0.866
Online discussions are valuable in helping me appreciate knowledge.	4.02	0.941
The integration of new information helps me answer questions raised in the course.	4.17	0.812
Learning activities help me build explanations or find solutions related to the course material.	4.16	0.821
Reflecting on course content and discussions helps me understand the key concepts.	4.18	0.802
I can test the knowledge learned in the course.	4.16	0.833
I develop ideas about course issues that are applicable.	4.07	0.893
I can apply the knowledge acquired in the course.	4.16	0.830
The faculty member explains important topics.	4.29	0.766
The faculty member clarifies the main objectives and outcomes.	4.31	0.731
The faculty member gives clear instructions on how to proceed.	4.25	0.794
The faculty member informs us in advance about deadlines and learning activities.	4.25	0.778
The faculty member helps us identify areas of agreement and disagreement.	4.21	0.787
The faculty member guides us toward understanding course topics.	4.24	0.733
The faculty member helps students engage with the course content.	4.25	0.754
The faculty member helps keep students engaged in the learning task.	4.06	0.836
The faculty member encourages us to explore new concepts in the course.	4.22	0.766
The faculty member's teaching practices enhance the sense of learning.	4.20	0.785
The faculty member focuses on discussing issues that aid learning.	4.21	0.783
The faculty member provides feedback that helps me understand my strengths.	4.15	0.825
The faculty member provides timely feedback to students.	4.15	0.817
Cognitive Presence	**4.1632**	**0.64246**
Teaching Presence	**4.2150**	**0.64206**

It is observed from Table 3 that the mean score for cognitive presence as a whole was 4.1632, which is considered high. The item-wise scores for cognitive presence ranged between 4.02 and 4.34. Additionally, the mean score for teaching presence as a whole was 4.2150, also considered high, with item-wise scores ranging between 4.06 and 4.31.

To answer the third research question: "Is there a statistically significant correlational relationship at the 0.05 level between the dimensions of shared metacognition and both cognitive and teaching presence?" Pearson correlation coefficients were calculated between the scores on the dimensions of the Shared Metacognition Scale and both cognitive and teaching presence. Table 4, and Figs. 1 and 2 present these results.

It is observed from Table 4, Figs. 1 and 2 that the Pearson correlation coefficient between students' ratings of the dimensions of shared metacognition was 0.475 between self-regulation and co-regulation. The students' ratings also showed a correlation of 0.616 between self-regulation and cognitive presence, and 0.569 between co-regulation and cognitive presence. Subsequently, the proportion of variance explained by each domain of shared metacognition in cognitive presence was calculated. Table 5 presents these results.

Table 4. Pearson correlation coefficients between students' ratings of the degree of each domain of shared metacognition and both cognitive and teaching presence

Correlations	A	Shared Regulation	Cognitive Presence	Teaching Presence
Self-Regulation	1	0.475**	0.616**	0.561**
		0.000	0.000	0.000
	948	948	948	948
Shared Regulation	0.475**	1	0.569**	0.434**
	0.000		0.000	0.000
	948	948	948	948
Cognitive Presence	0.616**	0.569**	1	0.742**
	0.000	0.000		0.000
	948	948	948	948
Teaching Presence	0.561**	0.434**	0.742**	1
	0.000	0.000	0.000	
	948	948	948	948

**: *p*-value: 0.000; Sample Size (*n*): 948

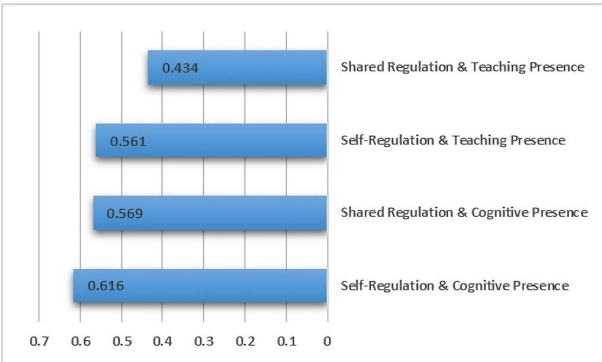

Fig. 1. The correlation coefficients between shared metacognition dimensions and the presence components.

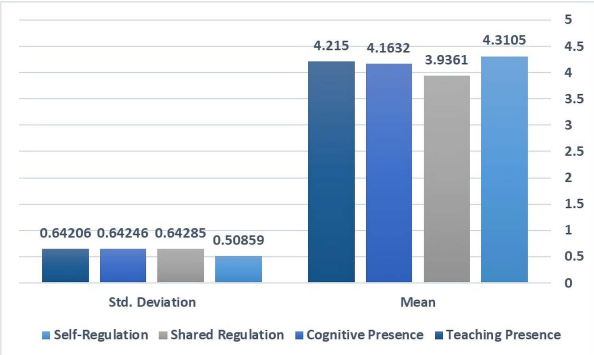

Fig. 2. The descriptive statistics of key learning dimension.

Table 5. Multiple correlation coefficients and the proportion of variance explained by shared metacognition domains in cognitive presence

Model	R	R^2
1	0.692a	0.478

It is observed from Table 5 that the multiple correlation coefficient between the domains of shared metacognition and cognitive presence was 0.692, and the explained variance was 0.478. The predictive coefficients for cognitive presence based on shared metacognitive skills were extracted, as shown in Table 6.

Table 6. Prediction coefficients for cognitive presence based on shared metacognition skills

Model	Unstandardized Coefficients	Standardized Coefficients	t
	B	Std. Error	Beta
1 (Constant)	**0.328**	0.134	
Self-Regulation	0.564	0.034	0.446
Shared Regulation	0.357	0.027	0.357

The proportion of variance explained by each domain of shared metacognition in teaching presence was also calculated. Table 7 presents these results.

Table 7. Multiple correlation coefficient and the proportion of variance explained by shared metacognition domains in teaching presence

Model	R	R^2
1	0.593a	0.351

It is observed from Table 6 that the multiple correlation coefficient between the domains of shared metacognition and cognitive presence was 0.593, and the explained variance was 0.351. The predictive coefficients for teaching presence based on shared metacognitive skills were extracted, as shown in Table 8.

Table 8. Prediction coefficients for teaching presence based on shared metacognition skills

Model	Unstandardized Coefficients	Standardized Coefficients	t	
	B	Std. Error	Beta	Sig.
1 (Constant)	0.870	0.149		5.839
Self-Regulation	0.578	0.038	0.458	15.386
Shared Regulation	0.216	0.030	0.217	7.270

Overall, the results indicated a correlational relationship between the domains of shared metacognition (self-regulation and co-regulation) and cognitive presence, with a correlation coefficient of 0.692, explaining 47.8% of the variance, which represents a strong relationship. There was also a correlational relationship between the domains of shared metacognition and teaching presence, with a correlation coefficient of 0.593, explaining 35.1% of the variance, which also represents a strong relationship.

VI. Discussion

The level of shared metacognition among students at the University of Jordan from their perspective

To address the first research question concerning the level of shared metacognition among students at the University of Jordan, both self-regulation and co-regulation were found to be notably high, with self-regulation scoring 4.3105 and co-regulation 3.9361. These results demonstrate that students excel in both individual and collaborative regulatory functions, exhibiting keen awareness and monitoring of their own cognitive processes alongside a sophisticated capacity to observe, analyze, and regulate the thinking of others. This dual ability enables them to effectively manage their personal learning strategies while also coordinating group strategies, thus exerting control over both individual and collective inquiry processes. Such integration of self- and co-regulation fosters a seamless fusion of personal and shared dimensions of thinking and learning, ultimately enhancing comprehension and academic achievement.

The findings further indicate that students are actively engaged, cooperative, and invested in their learning processes. Essential elements such as collaborative thinking, interaction with peers and the learning environment, knowledge exchange, and cooperation collectively underpin the development of shared metacognition [2]. Moreover, the energizing role of shared metacognition in collaborative learning is strongly and positively correlated with students' immediate grasp of learning material, as confirmed by Backer *et al.* [16].

This study's insights on shared metacognition hold particular significance for blended learning contexts, where the integration of self- and co-regulation guides students toward more effective shared metacognitive engagement. Through sustained dialogue within cooperative groups, students are able to identify and address their weaknesses, reinforce their strengths, and collaboratively construct both individual and collective understanding. This dynamic process enhances task performance and academic outcomes. Openness to diverse perspectives and strategies via ongoing discussion broadens cognitive horizons, facilitates the correction of misconceptions, strengthens accurate knowledge, and fosters deeper integration within the group, all of which contribute to the successful completion of shared objectives.

The present findings align with those of research [16, 17], who also reported high levels of shared metacognition in collaborative learning, positively associated with students' understanding of content and the significant development of shared metacognitive skills. Nevertheless, this study distinguishes itself through its unique objectives, incorporation of additional variables, and the specific measurement tools employed.

The level of cognitive and teaching presence among students at the University of Jordan from their perspective

To address the findings related to the second research question concerning the levels of cognitive and teaching presence among students at the University of Jordan, it is essential to first emphasize the interconnectedness of the three presences—cognitive, teaching, and social—within the Community of Inquiry (CoI) framework [9]. This interrelationship was corroborated by Xue *et al.* [23], who identified a positive correlation among these presences. Moreover, the collective influence of cognitive, teaching, and social presence on enhancing online learning has been substantiated by Al-Salti and Abu Awwad [22].

In the current study, cognitive presence received a notably high mean score of 4.1632, signaling that students at the University of Jordan demonstrate robust critical thinking capabilities. Cognitive presence is intrinsically and positively linked to critical thinking, as evidenced in the work of Al-Muhaya [18]. Critical thinking encompasses evaluation, judgment, and reasoning—key components that underpin enhanced cognitive processing [2]. Additionally, critical thinking is context-sensitive, adapting to exceptional circumstances and generalizability, which aligns with its conceptualization within a comprehensive model of critical thinking and scientific inquiry [9].

Furthermore, it appears that students have adeptly acclimated to blended learning environments introduced over recent years and have honed their skills in navigating online educational platforms. Their ability to engage in shared

dialogues and discussions facilitates the construction of both individual and collective meaning, thereby contributing significantly to the elevated levels of cognitive presence observed. The process of meaning-making necessitates sustained communication, as cognitive presence is fundamentally grounded in dialogue and discourse to advance through the stages of the Practical Inquiry Model:

Triggering Event: the critical juncture that sparks inquiry and initiates cognitive engagement [8].

Exploration: the phase focused on comprehending the problem's nature and seeking pertinent information, characterized by a dynamic interplay between individual reflection and shared dialogue [7].

Integration: the consolidation of acquired knowledge into a coherent and structured understanding, facilitated by critical dialogue and reflective discourse [2].

Resolution: the application of ideas or hypotheses to address the problem, which often leads to new questions, thus perpetuating ongoing cycles of inquiry and fostering continuous learning [2, 9].

The significance of this finding lies in emphasizing the critical role of dialogue within cooperative learning groups, where interaction and discourse significantly enhance students' ability to comprehend and internalize the true nature of the problem. This collaborative engagement fosters the optimal resolution of issues through the integration, critical evaluation, and synthesis of ideas—adopting robust concepts while discarding weaker ones. Consequently, this cultivates a strong cognitive presence that sharpens critical thinking skills and leads to improved learning outcomes.

Regarding teaching presence, which also scored highly at 4.2150 in this study, it reflects the proficiency and effectiveness of instructors and faculty at the University of Jordan in executing instructional design and facilitation functions. Teaching presence, in both capacities, serves as a pivotal mechanism for supporting and amplifying cognitive presence to realize meaningful learning outcomes [9]. It harmonizes the elements of the Community of Inquiry into a cohesive and functional framework aligned with educational goals, while simultaneously fostering and valuing active student engagement to ensure successful learning experiences.

Moreover, teaching presence is closely linked to learning success and failure. Simpson-Spence [19] reported a significant correlation between diminished teaching presence and increased failure rates in online learning environments. Additionally, Silva *et al.* [21] demonstrated that teaching presence is a strong predictor of cognitive presence among students. Therefore, instructors must cultivate and sustain dynamic, collaborative learning environments, as they wield the greatest influence in shaping both the educational atmosphere and learning outcomes. Effective design, direction, facilitation, and leadership of the learning experience in blended settings are essential to motivate students and guide their cognitive development toward meaningful, educationally valuable achievements [2].

The importance of this finding also underscores the necessity for educators to continuously refine their skills and enhance their teaching competencies within technology-driven educational contexts. It highlights the pivotal role of collaborative group learning based on sustained dialogue in blended learning environments—particularly when instructors demonstrate the capability to manage and lead such groups efficiently, thereby enabling students to attain superior academic performance and deeper learning.

With respect to cognitive and teaching presence, the results of this study align with the findings of studies [10, 19–21], all of which identified positive trends in cognitive presence and underscored the critical role of robust teaching presence in ensuring online learning success and predicting students' cognitive engagement. However, the current study distinguishes itself through its unique objectives and the inclusion of additional variables not addressed in these prior works.

The correlation between shared metacognition, cognitive presence, and teaching presence among students at the University of Jordan

Regarding the third research question, which examines the existence of a statistically significant correlation at the 0.05 level between the dimensions of shared metacognition and both cognitive and teaching presence, it is important to recognize from the outset that blended learning inherently fosters a dynamic cognitive presence, as evidenced by Harb and Krish [10]. Moreover, when instructors leverage digital technologies to design, facilitate, and guide a constructive, collaborative learning environment, students become adept at regulating their own learning processes—a fundamental aspect of shared metacognition, as demonstrated in [11].

Furthermore, students consistently rate teaching presence as the most prominent component within online learning environments, according to Olesova and Sadaf [15]. Accordingly, the elevated ratings of cognitive and teaching presence observed in this study substantially contribute to the enhancement of shared metacognition. As Garrison [1] articulated, shared metacognition resides at the nexus of cognitive and teaching presence and constitutes the core of the learning experience. Thus, higher levels of cognitive and teaching presence directly correlate with an increased degree of shared metacognition, indicating a strong positive relationship.

The significance of this finding lies in underscoring the pivotal role cognitive and teaching presence play in the emergence and quality of shared metacognition, particularly given that shared metacognition is indispensable for both cognitive presence and effective collaborative inquiry. Strong teaching presence is especially crucial in fostering cognitive presence, as effective design and management of the learning experience elevate students' cognitive engagement. This underscores the imperative for educational institutions to invest in enhancing instructors' competencies through targeted training programs aimed at cultivating leadership skills for managing collaborative learning groups in blended and online education. Demonstrating robust teaching presence, in turn, amplifies students' cognitive presence. When both presences are firmly established, a high level of shared metacognition naturally emerges, thereby facilitating superior academic achievement and student success.

Concerning the correlation between shared metacognition, cognitive presence, and teaching presence, the results of this study align with those reported in studies [11–15]. These

studies collectively affirm that the implementation of the Community of Inquiry (CoI) framework in online learning environments promotes the development of shared metacognition, particularly through the mechanism of teaching presence, which empowers students to regulate their learning. The CoI framework identifies the core components of shared metacognition, revealing strong correlations between both cognitive and teaching presence and co-regulation. Additionally, students perceive a strong teaching presence as a key indicator of shared metacognition even in traditional face-to-face education settings. Nevertheless, this study distinguishes itself from prior research in terms of its specific objectives, the inclusion of additional variables, and the instruments employed.

This study is subject to several limitations that should be considered when interpreting the findings. First, there is a noticeable gap in the Arabic academic literature concerning the constructs of shared metacognition, cognitive presence, and teaching presence in blended learning environments. While a few relevant foreign studies exist, the lack of localized research may limit the contextual depth and cultural relevance of the available theoretical framework. Second, the study was geographically limited to one public university—the University of Jordan in Amman—due to logistical constraints and the wide distribution of other public universities across the country. As such, the results may not fully capture the diversity of student experiences in other institutional or regional contexts. These limitations underscore the need for further research across a broader range of universities and educational settings to strengthen the generalizability and applicability of the findings.

VII. Conclusion

This study identified high levels of shared metacognition, cognitive presence, and teaching presence among undergraduate students at the University of Jordan within a blended learning context. A strong positive correlation was found between shared metacognition—including both self-regulation and co-regulation—and cognitive presence (r = 0.692), explaining 47.8% of its variance. Likewise, a significant correlation was found with teaching presence (r = 0.593), explaining 35.1% of its variance. These findings underscore the critical role of cognitive and teaching presence in enhancing students' shared metacognitive skills. Cognitive presence supports students in engaging with ideas critically and meaningfully, while teaching presence facilitates structured guidance and interaction. Together, these elements foster environments that encourage collaborative inquiry and reflective learning—hallmarks of shared metacognition. By validating these relationships within the Community of Inquiry framework, the study adds new insights, particularly within the Arabic-speaking educational context. It highlights the importance of empowering educators to design and facilitate collaborative learning experiences that actively support metacognitive development and academic achievement in blended environments.

VIII. Recommendations

Based on the findings of this research, the following recommendations are proposed:

1) Recommendations for Instructors and Faculty Members: Instructors are encouraged to design learning environments that integrate digital tools to support dialogue, interaction, and the development of shared metacognition. Emphasizing collaborative instructional design enhances both cognitive and teaching presence, which are key to student engagement. Moreover, it is vital for faculty members to enhance their competencies in blended learning through targeted professional development workshops. These should focus on strategies for facilitating group collaboration and promoting self- and co-regulation. Maintaining a strong teaching presence by offering timely feedback, engaging consistently with learners, and providing clear academic guidance is essential to sustaining student motivation and participation.
2) Recommendations for Students: Students should be encouraged to develop shared metacognitive skills by engaging in regular reflection, monitoring their thought processes, and actively contributing to group discussions. Structured collaborative activities can support this development and help students critically engage with their peers' perspectives. Active participation in cooperative learning groups that involve dialogue, role exchange, and joint problem-solving fosters deeper understanding. Additionally, maintaining open and constructive peer dialogue is essential for reinforcing accurate concepts, addressing misconceptions, and enhancing group cohesion.
3) Recommendations for Educational Institutions: Educational institutions should adopt the Community of Inquiry (CoI) framework as a foundational model for course design in blended and online environments. This approach emphasizes the integration of cognitive, teaching, and social presence to create meaningful and effective learning experiences. Institutions are also encouraged to establish academic support units that offer services such as peer coaching and mentoring to help students develop metacognitive and collaborative skills. To ensure continuous improvement, institutions should implement regular assessments to evaluate the effectiveness of their blended learning environments and adjust curricula based on students' feedback and performance data.
4) Recommendations for Researchers: Future research should broaden the scope of inquiry into shared metacognition by exploring its dynamics in diverse educational settings, including schools, vocational programs, and private universities. Understanding how sociocultural contexts influence the interplay between teaching presence, cognitive presence, and metacognitive processes is also crucial. Researchers are encouraged to employ mixed-methods approaches that combine quantitative and qualitative data to capture the complexity and depth of collaborative learning and metacognitive development. This would provide richer insights and more actionable recommendations for improving educational practice.

Conflict of Interest

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Amal Sameeh Al-Salti contributed to the conceptualization and design of the study, supervised the research process, and participated in writing and editing the manuscript. Ferial Abu Awwad was involved in conceptualizing the study, conducting data analysis, and validating the methodology and findings. Hani Ayyoub led the data collection and preparation, designed and distributed the questionnaire, coordinated among co-authors, and contributed to writing, editing, and validating the manuscript. Amani Al-Serhan participated in writing, editing, and validating the final manuscript. All authors read and approved the final version of the manuscript.

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Generative AI or AI-assisted technologies were not used in any way to write or complete essential authoring tasks in this manuscript. Its use was restricted to particular grammatical edits and revised word and sentence structure.

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