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Facilitating Students' Emotional Engagement in Synchronous Online Learning: A Systematic Literature Review

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Abstract

Learners' emotional engagement in synchronous online learning (SOL) is critical for improving learning persistence and performance. Nevertheless, there is currently a lack of comprehensive and systematic reviews of emotional engagement in SOL. This review synthesizes the strategies to promote emotional engagement in SOL found in published empirical studies. A total of 32 articles were systematically analyzed by following the grounded theory approach. The primary themes were grouped into four categories: (a) instructor actions (e.g., interacting informally before and after class, encouraging the expression of ideas), (b) learner behaviors (e.g., building rapport with peers, recognizing individual accountability), (c) environment characteristics (e.g., creating a supportive atmosphere, selecting communication modes), and (d) activity design (e.g., using breakout rooms, embedding diverse elements). These findings offer comprehensive understanding and guidance for promoting emotional engagement in SOL for instructors, researchers, and course developers.

Keywords: synchronous learning, emotional engagement, online learning, strategies, technology

Introduction

During the COVID-19 pandemic, numerous educational institutions experienced a swift transition in their approaches to learning and teaching. Specifically, online learning replaced a substantial portion of face-to-face instruction, employing online technologies to facilitate instructor-student interaction (Dahlstrom-Hakki et al., 2020). Synchronous and asynchronous online learning are two representative communication modes, characterized by the level of interactivity and immediacy of communication (Vlachopoulos & Makri, 2019). Compared to asynchronous learning, synchronous learning offers multiple ways of interacting, sharing, and collaborating in real-time through videoconferences, webcasts, and interactive learning models (Bailey et al., 2021). Synchronous online learning was swiftly adopted by course instructors during the COVID-19 pandemic. While technology bridges timing gaps in interactions, the sense of transactional distance associated with the student facing a screen could result in a less immersive learning atmosphere and lower emotional attachment (Chiu et al., 2023). Consequently, there could be low emotional engagement of students in synchronous online learning (SOL).

Piaget's theory of affective development in constructivism states emotional development runs parallel to cognitive development, influencing cognitive growth. This theory provides a foundational basis for enhancing students' emotional engagement. The increasing importance of emotional engagement to student persistence and performance in the online learning environment has been emphasized by several studies. For example, Özhan and Kocadere (2020) underscored the influence of emotional engagement on learning motivation. In another SOL course, Zhou et al. (2022) found that emotional engagement was the most essential type of engagement in predicting students' behavioral intentions. Furthermore, a growing body of evidence indicates that learners who lack emotional engagement are prone to disengagement both behaviorally and cognitively (Dubovi, 2022). The emotional engagement level of students has been regarded as a benchmark for the quality of SOL (Daher et al., 2021). However, enhancing emotional engagement is challenging in SOL environments, given their intricate spatial and temporal dynamics. In prior research, Murphy et al. (2020) found that students usually expressed negative emotional engagement like uncertainty, anxiety, and nervousness when transitioning to virtual classes. Similarly, Salta et al. (2022) found a lower level of emotional engagement among students in both synchronous and asynchronous online environments compared to the traditional learning setting.

The low emotional engagement of students in SOL was influenced by various factors, such as apathetic learning atmosphere, low personal pride, feelings of isolation (Apridayani & Waluyo, 2022), unfamiliarity with learning, and poor expectation management (Brown et al., 2023). Some empirical studies on SOL have endeavored to improve emotional engagement using diverse strategies. Furthermore, several scholars have conducted systematic literature reviews on the strategies to enhance student engagement in various contexts including massive open online courses (Wei et al., 2021), blended synchronous learning (Wang & Huang, 2023), and flipped learning in schools (Bond, 2020). Most of the reviews focus on the cognitive and behavioral engagement dimensions. This review differs from prior studies in that it focuses on the studies that specifically apply emotional engagement interventions. The purpose of this study was hence to identify the strategies applied in the empirical studies to promote students' emotional engagement in SOL environments.

Emotional Engagement

Engagement generally comprises behavioral, cognitive, and emotional dimensions (Fredricks et al., 2016). Specifically, emotional engagement, the focus of our study, refers to students' affective reactions such as their positive and negative responses to learning environments and activities (Martin & Borup, 2022). In traditional physical learning environments, behavioral, cognitive, and emotional engagement have been recognized as crucial factors influencing students' self-efficacy, academic achievement, and overall success (Bowden et al., 2021; Chen et al., 2020). In online learning environments, the absence of visual and body language cues and classroom atmosphere makes emotional engagement more critical (Aladsani, 2022).

Emotional engagement is commonly divided into two categories: positive emotional engagement such as enjoyment and pride, and negative emotional engagement such as boredom and anxiety (Lu et al., 2023), all of which have been demonstrated to have noteworthy associations with academic and psychological outcomes (Wang et al., 2015). Viewed from an internal process perspective, emotional engagement encompasses both the sense of emotional connectedness and emotional expression (Lim et al., 2020). Emotional connectedness is a psychological state in which learners experience a sense of emotional connection or belonging, reflecting a common personal experience in the community (Lacoste & Dekker, 2016). Besides, emotional engagement is established through individual's emotional expression via texts, picture, facial expressions, and gestures, through which people communicate their internal state to others (Caspi & Etgar, 2023).

To promote students' positive emotional connectedness and expression in SOL, researchers have investigated the influencing factors of emotional engagement and implemented experimental interventions. Specifically, strategies such as using various learning interactions, instant feedback, and interactive storytelling trailers, are proven to be effective in promoting emotional engagement in SOL (Daher et al., 2021; Hisey et al., 2022; Zainuddin et al., 2022). Besides, some scholars have explored the use of various strategies to increase student emotional engagement (Heilporn & Lakhal, 2021). Thus, it is imperative to systematically synthesize and summarize useful strategies for improving emotional engagement in SOL.

Methods

This review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, which were designed to enhance the reporting quality of systematic reviews (Moher et al., 2009). This version of the PRISMA statement, which includes a 27-item checklist for reporting in systematic reviews, was chosen because its recommendations have been widely endorsed and adopted by researchers (Page & Moher, 2017).

Literature Search

The literature search was conducted systematically from the following online databases: Scopus, Web of Science, Science Direct, EBSCOhost, Taylor and Francis, and Wiley Online Library in October 2023. The selection of these databases considered the multidisciplinary nature of the research topic. The words used

in the title, abstract, and keywords included ("synchronous" OR "simultaneous" OR "web conferenc*" OR "video conferenc*" OR "virtual classroom" OR "econferenc*" OR "virtual conferenc*" OR "webinar") AND ("emotional engagement" OR "affective engagement"). It is possible that other relevant articles, which may have used different terms or were included in alternative databases, were inadvertently overlooked. To address this issue, we further employed a snowball approach that screened the reference lists of the identified articles at the end of the search phase. The inclusion criteria were: (a) original research from peer-reviewed journals; (b) written in English; and (c) available in full text. We did not impose any restrictions on the publication timeframe. In total, the search produced 312 articles, which were included for further selection.

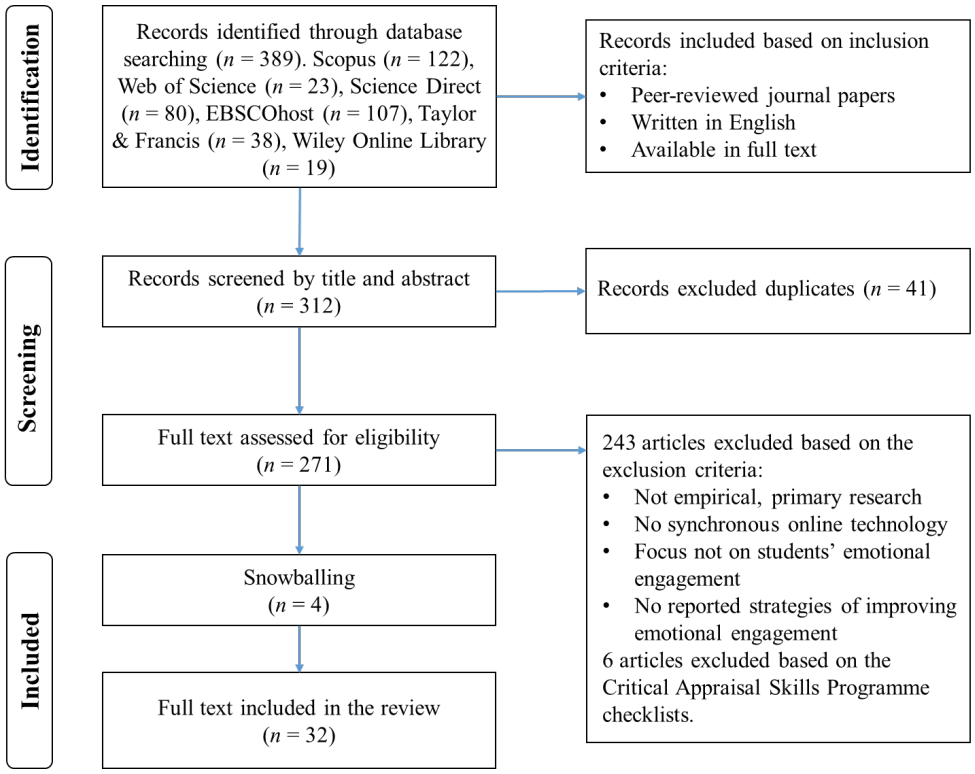
Selection

For each article, the title, abstract, and full text were reviewed. Upon initial examination, it was discovered that SOL could be categorized into three distinct subtypes based on communication modes: text-SOL supported by instant message service, voice-SOL supported by audio-conferencing systems, and video-SOL supported by videoconferencing systems. In this study, all three online learning modalities were included in the review to investigate strategies for enhancing emotional engagement in diverse SOL contexts.

Figure 1 depicts the literature selection process. By checking the titles, abstracts, and full texts, 41 articles were removed due to being duplicates; thus, 271 articles remained for further selection. In further reading of the remaining literature, 243 articles were filtered out due to the various reasons. For one, the studies that did not focus on students' emotional engagement were excluded. For another, the articles exploring students' emotional engagement but not reporting on strategies for improving emotional engagement were filtered out. After further assessing the quality of articles by following the Critical Appraisal Skills Programme (2018) checklist, six articles were excluded due to their poor quality. Finally, the selection resulted in 32 eligible articles for the systematic review.

Figure 1

Literature Selection Process



Data Collection and Coding

In this systematic review, the following data were extracted from each full paper: authorship, year of publication, participants, subjects, research methods, study length, synchronous techniques used, and proposed strategies. The proposed strategies were typically distributed across sentences or paragraphs. The basic unit of analysis was phrases that contained keywords such as *emotion*, *engagement*, and *strategies*. This process started with creating a table in Microsoft Excel. Each article was added as a new row in the table, with key data items included. For ease of management, the articles were sorted alphabetically by author name, and each article was assigned a unique code for identification (see Appendix). Then, each article was analyzed through thematic coding by the first author to discover effective strategies for improving students' emotional engagement in SOL and frequently discussed with the second author when uncertainty arose. The second author specialized in learning engagement in SOL, which enhanced the accuracy and validity of the coding. In the present study, the coding process followed the underlying paradigm of grounded theory and went through open, axial, and selective coding stages. The grounded theory employs a systematic procedure to summarize data features through hierarchical coding and systematically explores conceptual connections within codes, enabling the development of a theoretical framework that comprehensively explains the phenomenon as a whole.

During the open coding stage, the first author initially read all the articles to gain an overall understanding. Subsequently, codes were generated for the data items related to strategies, and data with similar codes

were organized into themes. To ensure reliability and reduce personal biases in coding, the second author randomly selected 25% of the articles and independently coded them. Following this, the two authors discussed the items and assigned provisional codes to the strategies aimed at enhancing emotional engagement. During the axial coding stage, the two authors frequently discussed and analyzed the above strategies and coded them in a higher level of categories. After discussions, the authors decided to classify the strategies into four main themes (i.e., instructor actions, student behaviors, environment characteristics, and activity design). The selective coding stage centered on the refining subthemes related to strategies and entailed a thorough review of the literature to uncover additional evidence.

Results

Overview of the Studies

Table 1 illustrates the educational contexts of the studies on emotional engagement in SOL. Most of the studies (n = 27, 84%) were conducted in higher education, primarily with undergraduate learners (n = 19) and graduate learners (n = 2). In contrast, a limited number of studies focused on K–12 learners (n = 5). Regarding research methods, a mixed-method approach incorporating both qualitative and quantitative findings was frequently employed (n = 23, 72%). Five studies focused solely on qualitative research, providing reports on how synchronous techniques were designed and implemented in online learning, as well as capturing the perception of learners or instructors through observations, interviews, and written reflections. Four studies were quantitative in nature, investigating learners' performance and perceptions in face-to-face and synchronous video-based learning contexts, that is, article E3, E9(learners' emotions), E21(group awareness), and E28 (learners' aggressive responses). The three most frequently cited articles were E29, E11, and E9. In 2024, the number of citations for each one according to Google Scholar was as follows: E29 (Yang, 2011) had 203; E11 (Gregory & Masters, 2012) had 142; and E9 (D'Errico et al., 2016) had 134. Among them, Yang (2011) developed a system that supported learners and teachers to communicate synchronously in e-meetings, and documented intensive and reciprocal engagement among students.

Table 1

Educational Context and Research Methods of the Eligible Studies

Category	Studies, *n*	Citations
Educational context		
Higher education		
Graduate	2	E7, E13
Undergraduate	19	E2, E3, E9, E10, E11, E12, E15, E17, E18, E19, E20, E21, E22, E24, E25, E27, E29, E30, E31
Not identified	6	E1, E4, E5, E8, F14, E16

K–12	5	E6, E22, E26, E28, E32
Research method		
Qualitative	5	E1, E4, E5, E6, E22
Mixed method	23	E2, E7, E8, E10, E11, E12, E13, E14, E15, E16, E17, E18, E19, E20, E23, E24, E25, E26, E27, E29, E30, E31, E32
Quantitative	4	E3, E9, E21, E28

Note. See Appendix for definition of citations and References for full citations.

Strategies

After a thematic coding process based on the grounded theory, we categorized the eligible articles into four common themes according to the type of strategies presented in each one: instructor actions, learner behaviors, environment characteristics, and learning activity designs. As shown in Table 2, the four common themes were further divided into 18 subthemes.

Table 2

Frequency of Common Themes in Strategies

Theme and subtheme	Frequency, *n* (%)	Citations
Instructor actions		
Interacting informally before and after class	7 (22)	E1, E3, E4, E8, E15, E17, E19
Encouraging the expression of ideas	7 (22)	E1, E2, E3, E4, E15, E25, E29
Giving immediate feedback	6 (19)	E2, E15, E18, E19, E23, E26
Providing learning scaffolding	4 (13)	E24, E25, E26, E29
Learner behaviors		
Building rapport with peers	6 (19)	E2, E3, E10, E12, E27, E30
Recognizing individual accountability	6 (19)	E12, E15, E16, E21, E26, E32
Developing self-regulation	5 (16)	E15, E17, E22, E24, E30
Stimulating positive feelings	3 (9)	E2, E9, E12
Environment characteristics		
Creating supportive atmosphere	8 (25)	E1, E2, E4, E15, E16, E18, E20, E23
Selecting communication modes	7 (22)	E2, E8, E17, E18, E22, E25, E30
Providing technical support	5 (16)	E10, E17, E20, E21, E25

Activity design		
Interaction enhancement		
Using breakout rooms	8 (25)	E7, E13, E16, E17, E18, E19, E25, E27
Creating interaction opportunities	7 (22)	E1, E12, E13, E17, E19, E20, E26
Content enhancement		
Embedding diverse elements	6 (19)	E5, E6, E11, E14, E28, E31
Designing inquiry-based tasks	2 (6)	E7, E29
Linking with real-life situations	2 (6)	E13, E32
Process support		
Using cognitively assistive tools	4 (13)	E6, E11, E15, E21
Personalizing learning process	3 (9)	E4, E15, E20

Strategies Related to Instructors

For promoting learners' emotional engagement in SOL from the perspective of instructor actions, the common strategies identified in the reviewed literature included: interacting informally before and after class (n = 7, 22%), encouraging the expression of ideas (n = 7, 22%), giving immediate feedback (n = 6, 19%), and providing learning scaffolding (n = 4, 13%).

Interacting informally before and after class contributes to fostering a closer instructor-student relationship and strengthening students' sense of belonging in online learning. It was found that instructors spending time to greet and engage in non-academic conversations before class helped to build emotional engagement (E1, E19). In two studies, the instructors reminding learners to check their devices and Internet connectivity, and establishing clear protocols and ground rules for the learning process also helped to emotionally engage students (E1, E17). To set a positive emotional tone, it seems that warm-up activities at the beginning of each class played an important role (E4, E8, E15). Furthermore, two additional studies also emphasized the significant role of informal interaction after class in promoting students' emotional engagement (E3, E19).

Encouraging the expression of ideas refers to instructors motivating learners to voice their thoughts and feelings, share personal experiences, and articulate their expectations. Allowing learners to express emotions in text chat and responses such as using emojis was helpful for keeping them emotionally engaged (E3, E29). To elicit learners' positive emotional responses, three studies employed the strategy of assisting students in connecting content, providing them with the opportunity to share their thoughts (E2, E15, E25). In addition, instructors sharing their own experiences with the students and encouraging the learners to share their feelings helped to alleviate negative experiences (E1). In the study of Brown et al. (2023), the implementation of weekly news bulletins, coupled with reminding students of expectations, proved conducive to fostering emotional engagement (E4).

Giving immediate feedback to learners could meet learners' psychological needs and foster their emotional engagement (E26). In three studies where formative, immediate, and high-quality feedback from

instructors was provided to individual learners, the students were generally emotionally engaged (E2, E15, E23). In two other studies, instructors checking in with each group during the group discussions to provide guidance and feedback proved instrumental in elevating learners' sense of connectedness (E18, E19). In addition, providing learning scaffolding was about setting learning plans and offering materials based on learners' experiences and background knowledge (E24). Two studies suggested that teachers' actions in epistemic scaffolding design were the most determining factor in promoting student engagement (E25, E26). Furthermore, questions such as "What do you think would bring you confidence?" were included in the scaffolding provided by instructors to enhance learners' emotional engagement (E29).

Strategies Related to Learners

Learners are also responsible for their own emotional engagement in SOL. The common strategies applied in the reviewed literature included: building rapport with peers (n = 6, 19%), recognizing individual accountability (n = 6, 19%), developing self-regulation (n = 5, 16%), and stimulating positive feelings (n = 3, 9%).

Building rapport with peers is the exchange process of emotional and information support among online learners. Giving appropriate peer comments on learning tasks or assignments, and addressing learners' mistakes in a proper manner helped reduce negative emotional responses (E12). Furthermore, five studies suggested that students actively involving themselves in Q&A activities (E30), exchanging opinions and sharing experiences (E3, E12, E27), and providing assistance when peers were unable to answer teachers' inquiries (E2) helped learners to be more emotionally engaged. To build a deeper emotional connection with peers, displaying empathy through body language was shown to be an effective strategy (E10). In addition, the reviewed literature underscored the significance of enabling learners to recognize their accountability (E16). For instance, learners being given more ownership and autonomy also helped to increase their level of reciprocal emotional relationships (E15, E26, E32). Furthermore, two studies suggested learners' accountability and awareness in group activities were related to their own and group members' emotional experiences (E12, E21).

Developing self-regulation includes learners' external regulation in aspects such as learning goals, study plans, learning spaces, and help seeking. In the study E24, learners' goal-setting helped to increase positive emotions. Three studies suggested that students developing routines to spend time wisely on learning tasks helps to maintain emotional engagement (E15, E22, E30). Besides, arranging learning spaces, including selecting a desk position by a window and clearing learners' workspace, were considered an external strategy to engage students emotionally (E22). Finally, learners searching for additional materials and finding ways to make them relevant and interesting were highly helpful (E17, E22). Stimulating positive feelings is about promoting learners' personal experiences and internal regulation of personal feelings. Two studies suggested that learners' satisfaction and personal pride, coupled with positive emotions, played a crucial role in significantly enhancing their emotional engagement (E2, E9). Learners' positive feelings can be stimulated indirectly through some manipulable behaviors such as moderating learners' sensitivity. In another study (E12), learners who are sensitive to peer criticism usually experienced less emotional engagement.

Strategies Related to Learning Environments

The common strategies related to the learning environment included creating a supportive atmosphere (n = 8, 25%), selecting communication modes (n = 7, 22%), and providing technical support (n = 5, 16%).

Creating a supportive atmosphere entails establishing an environment that fosters stress reduction, facilitates the exchange of ideas, and encourages seeking help in SOL. The reviewed studies showed that creating a warmer and more familiar learning environment helped alleviate learners' stress (E4, E20). It was reported that the environments that fostered a sense of safety and openness empowered learners to feel comfortable asking questions and sharing their thoughts and ideas (E1, E15, E16, E18, E23). In addition, two studies have highlighted the significance of cultivating a friendly online class environment, wherein instructors and peers demonstrate a willingness to assist and genuinely care about meeting learners' needs (E2, E15).

Selecting communication modes determines the characteristics of SOL, including interactivity and visibility. For example, Dao et al. (2021) discovered that the video chat via Facebook Messenger enabled learners to see each other and talk quickly, and hence facilitated greater emotional engagement compared to the text chat (E8). Besides, to promote the visibility of synchronous interaction, webcams were employed and further discussed in six studies (E2, E17, E18, E22, E25, E30). They all indicated that turning on the webcam helped students see each other's facial expressions and body language, maximizing their positive emotional experiences. Nevertheless, the research of E22 also suggested that the camera-induced self-awareness and negative feelings of discomfort contributed to learners' emotional disengagement. Thus, the influence of the camera on learning engagement is worth further exploration based on the characteristics of learners and contexts (Händel et al., 2022).

Providing technical support aims at addressing technical issues such as platform use and network connectivity. The reviewed literature suggested that technical issues about Internet connection, browser compatibility, and microphones made learners feel frustrated and caused unpleasant emotional experiences. To address these issues, four studies (E10, E17, E21, E25) emphasized that checking devices and Internet before class, and establishing an accessibility task force to provide students with prompt solutions were highly helpful. Besides, using the library and other resources available during the class helped to alleviate learners' concern arising from technical issues (E20).

Strategies Related to Learning Activities

To enhance learner emotional engagement, strategies related to the learning activity were categorized into three groups: interaction enhancement, content enhancement, and process support.

Interaction Enhancement. The activities in this strategy are designed to foster both learner-learner and learner-instructor interactions, thereby promoting emotional engagement among learners. This involves using breakout rooms (n = 8, 25%) and creating interaction opportunities (n = 7, 22%). Five studies suggested that organizing online small group activities and using breakout rooms helped to build a sense of social connectedness, and increase positive emotions (E16, E17, E18, E25, E27). Another study suggested that breakout sessions facilitated learners' content understanding and further contributed to emotional engagement (E7). Besides, two studies emphasized that randomly assigning students to groups

and maintaining the same team for the whole semester could contribute to positive emotional engagement (E13, E19). It was also suggested that creating opportunities for the effective design of lecture time (E20), collaborative assignments (E13, E19) and online discussion activities (E1, E12, E17, E26) helped to break the social isolation of lockdown.

Content Enhancement. The activities within this strategy are tailored to facilitate learner-content interaction, thereby stimulating positive emotional experiences. This encompasses embedding diverse elements (n = 6, 19%), designing inquiry-based tasks (n = 2, 6%), and linking with real-life situations (n = 2, 6%). In the reviewed literature, games (E6, E31), role-play activities (E5, E11), storytelling trailers (E14), and interactive VR (E28) were used to extend emotional engagement. Two reviewed studies reported that designing inquiry-based tasks stimulating students' inquiry and exploration enabled students to engage emotionally in learning activities (E7, E29). Linking with real-life situations requires learners to be provided with content that encompasses authentic tasks and reflects real-world situations (E13, E32), and helps learners to relate to the course on an emotional level.

Process Support. The strategies include using cognitively assistive tools (n = 4, 13%) and personalizing the learning process (n = 3, 9%). Thinking tools were used in two studies, which included using the Six Thinking Hats framework to assist learners in considering multiple perspectives (E11) and employing a think-aloud strategy fostering critical thinking during the planning and execution of tasks (E15). Furthermore, a visualization tool demonstrating the engagement level of each group member motivated learners to work on the group task and enabled them to express positive emotions (E21). Additional supportive tools, such as Google translator, were introduced in E6, aiding in promoting affective engagement associated with the development of students' self-efficacy in learning. The personalization was emphasized as a crucial aspect of promoting emotional engagement in two studies (E4, E20). For example, in E4, a module map was created that allowed students to track their personalized progress.

Discussion

Findings and Trends for Promoting Emotional Engagement in SOL

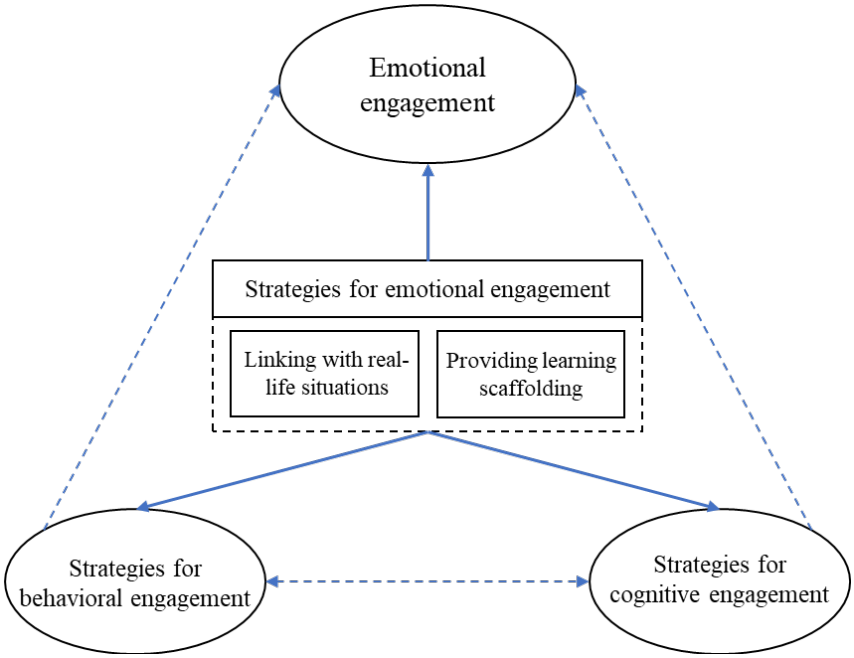
This review discovered that instructors, learners, learning environments, and course activities could offer robust support for facilitating emotional engagement of learners in SOL. This finding is consistent with the result of another study conducted by Wang et al. (2023), who identified the factors and strategies for engaging learners in SOL but targeting engagement in general.

Among the strategies identified, we posit that certain strategies were more specifically tailored to enhance emotional engagement. For example, instructors encouraging students to express their ideas helped students engage emotionally, breaking the silence on emotion between students (Beatty, 2002). Another strategy of learners, recognizing individual accountability, is helpful for building emotional connectedness, as students who are emotionally connected to peers and instructors often adopt prosocial values (Jdaitawi, 2015). In addition, a supportive atmosphere should be created, as learners will feel safe and become loving and engaged emotionally in their environments (Keville et al., 2013).

Some strategies that are useful for emotional engagement could also be used to support other dimensions of engagement. For example, linking with practice was also reported to enhance learners' cognitive engagement in the study by Heilporn and Lakhal (2021). Providing learning scaffolding was helpful for engaging students behaviorally as well (Yang, 2011). This finding supports the notion that the three dimensions of engagement are interconnected rather than isolated (Martin & Borup, 2022). Figure 2 shows how some strategies useful for promoting emotional engagement, such as linking with real-life situations and providing learning scaffolding, may also work for behavioral or cognitive engagement.

Figure 2

The Relationships Between Behavioral, Cognitive, and Emotional Engagement Strategies



Note. The solid lines represent relationships confirmed in this study, while dashed lines indicate those that require further exploration.

Implications

The findings of this review have implications for instructors, course developers, and researchers. Instructors must realize the importance of promoting emotional engagement in SOL and employ strategies to enable learners to engage in learning emotionally. Before and after a synchronous online session, instructors should spend time interacting with learners informally and set warm-up activities to build emotional connections. During the session, instructors should provide proper learning scaffolding and give immediate feedback to support effective learning, further meeting learners' emotional needs. Moreover, instructors should actively encourage learners to express their thoughts, ideas, and feelings, facilitating community-building and learners' emotional expression (Berry, 2019).

The establishment of safe, open, and warm environments and the design of multi-oriented learning

activities are crucial for promoting students' emotional engagement, which need joint efforts from instructors, learners, and course developers. More specifically, video-based synchronous techniques can be widely implemented to promote emotional engagement. Instructors should build an environment that supports learners to comfortably exchange ideas and seek help. Learners also need to understand their dominant roles in the SOL process. The strategies they can use include exchanging emotional feelings and offering support to peers by giving comments kindly, generating empathy, and sharing their experiences. In addition, establishing an accessibility task force to promptly provide students with helpful solutions for technical issues will alleviate learners' psychological stress.

For course developers, they need to consider the diversity in learning activities design orientation, aiming to increase the opportunities for interactions between learners and instructors, peers, content, and tools. Especially in terms of the design of course content, learning activities can embed inquiry-based tasks and interesting elements, and be relevant to real-life situations. In addition, there is a need for increased focus on the design and development of emotional engagement analysis and intervention systems that facilitate the implementation of various strategies.

The results of this study have implications for researchers as well. First, researchers should pay particular attention to the inconsistent findings concerning emotional engagement enhancement. For example, there is a need to further explore the varying effect of using webcams in SOL as some studies show students were comfortable with webcams (e.g., Jia et al., 2022) while other studies do not (e.g., Oittinen et al., 2022). Second, the way certain strategies affect the emotional, cognitive, and behavioral dimensions of engagement needs to be further explored. Third, learners' individual factors, such as self-regulation and individual accountability, are deemed significant and are highlighted, but they prove challenging to influence through external sources (Hofer et al., 2021). Therefore, the internal mechanisms of promoting emotional engagement from positive psychological perspectives should be further investigated.

Conclusion

This study presents a systematic review of the strategies for promoting emotional engagement in SOL and aims to develop a comprehensive and systematic understanding of this topic. This review not only outlined the current research characteristics and trends in the literature but also classified the strategies for promoting emotional engagement in SOL. Based on the results of the analysis, this review provides implications for instructors, learners, course developers, and researchers. We hope that the findings of this review provide guidance for practitioners and researchers looking to adopt the SOL approach to better engage online learners emotionally.

Nevertheless, this study has a few limitations. Firstly, there is limited availability of empirical articles on emotional engagement in SOL within peer-reviewed journals, posing challenges in drawing definitive conclusions regarding the effectiveness of the applied strategies. Another limitation is the lack of in-depth exploration into how to provide support to educational stakeholders, such as instructors and institutions, to help promote students' emotional engagement. The review also identified some other areas that warrant further exploration in future research. First, greater attention should be given to the creation of supportive

and warm learning environments leveraging intelligent technology. Specifically, immersive technologies such as VR/AR and metaverse could be incorporated into SOL to enhance learners' emotional experiences and engagement (Lee & Hwang, 2022). Besides, the measurement of emotional engagement in the reviewed literature mainly relies on questionnaires and individual interviews. In future research, using multimodal data, such as facial expressions and body movements, could offer a more comprehensive understanding of learners' emotional engagement.

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Appendix

Table A1

Articles Included in the Systematic Review

Eligibility no.	Citation
E1	Andrew et al., 2021
E2	Apridayani & Waluyo, 2022
E3	Aubrey & Philpott, 2023
E4	Brown et al., 2023
E5	Cornelius et al., 2011
E6	Daher et al., 2022
E7	Daher et al., 2021
E8	Dao et al., 2021
E9	D'Errico et al., 2016
E10	Garcia & Jung, 2021
E11	Gregory & Masters, 2012
E12	Hafour & Alwaleedi, 2022
E13	Heilporn & Lakhal, 2021
E14	Hisey et al., 2022
E15	Jaber Rafidi & Wagner, 2023
E16	James et al., 2022
E17	Ji et al., 2022
E18	Jia et al., 2022
E19	Jia et al., 2023
E20	Limniou et al., 2022
E21	Liu et al., 2018
E22	Oittinen et al., 2022
E23	Ole & Gallos, 2023
E24	Qiu & Bui, 2022
E25	Raes, 2022
E26	Shi et al., 2023
E27	Thacker et al., 2022
E28	Verhoef et al., 2022
E29	Yang, 2011

E30	Yuyun, 2023
E31	Zainuddin et al., 2022
E32	Zhou et al., 2022