Language Inquiry & Exploration Review

e-ISSN 3062-7702 (online)

Volume 2, Issue 2 2025
Page 71-81

https://doi.org/10.71435/688509

Visual Semiotics and Learner Engagement in Technology Mediated Language Education

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ARTICLE INFO

Received: 05 August 2025
Revised: 16 October 2025
Accepted: 03 December 2025
Available online: 15 December 2025

Keywords:
Visual Semiotics
Learner Engagement
Multimodal Learning

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ABSTRACT

Purpose: *This study aimed to investigate the role of visual semiotics in shaping learner engagement within technology-mediated language education. It sought to explore how visual elements such as images, icons, animations, and color-coded cues influence cognitive, emotional, and behavioral engagement, as well as how learners interpret and make meaning from these semiotic resources.*

Subjects and Methods: *The study employed a qualitative case study design involving 10–15 language learners participating in digital language learning activities. Data were collected through observations, semi-structured interviews, and analysis of digital learning materials. Observations focused on learners' interactions with visual semiotic elements, interviews captured learners' subjective experiences and interpretations, and material analysis identified semiotic features embedded in the digital platform. Data were analyzed using thematic coding and semiotic analysis to identify patterns in learners' engagement and meaning-making.*

Results: *The findings revealed that visual semiotics serve as cognitive scaffolds, enhancing comprehension, reducing cognitive load, and supporting strategic learning. Emotional engagement was strengthened through the aesthetic, interactive, and meaningful design of visual materials, increasing motivation, confidence, and enjoyment. Behavioral engagement manifested in active participation, task completion, peer collaboration, and strategic attention to visual cues. Patterns of semiotic meaning-making emerged, showing that learners integrated visual, textual, and experiential information to construct understanding.*

Conclusions: *Visual semiotics are integral to learner engagement in technology-mediated language education, functioning as active mediators of cognitive, emotional, and behavioral processes. Strategic integration of semiotic resources in instructional design, teacher training, and institutional management can enhance engagement, optimize learning outcomes, and support inclusive, multimodal digital learning environments. These findings highlight the need to reconceptualize engagement frameworks to account for multimodal semiotic affordances.*

INTRODUCTION

Over the past decade, the integration of digital technologies in language education has transformed the ways in which learners engage, interpret, and make meaning within mediated learning environments (Thomas et al., 2013; Choi & Chung, 2021). The shift from traditional text-based instruction towards rich multimodal media has created new semiotic landscapes in which visual elements, symbols, icons, and digital artefacts play a central role in how learners interpret language cues and sustain engagement. Semiotics, the study of signs and symbols and their

meaning, offers an important analytical lens for understanding how learners navigate these visually rich environments Semiotic analysis of multimodal feedback highlights how visual, auditory, and textual modes collaborate to shape learners' interpretation and focus.

In technology-mediated language education, learners are no longer passive recipients of input; they actively interpret, negotiate, and respond to multiple semiotic resources images, animations, interface icons, and embedded visual scaffolds (Tudini & Liddicoat, 2024). The semiotic perspective emphasizes that meaning is co-constructed through these multimodal affordances rather than being transmitted solely through language. Digital approaches to semiotics are increasingly recognized as essential in analyzing multimodal communication in educational settings.

Learner engagement, a critical condition for successful language learning, is multifaceted: behavioral, cognitive, and emotional. Behavioral engagement involves learners' participation and interaction; cognitive engagement concerns mental effort and investment in learning tasks; and emotional engagement encompasses interest, motivation, and attitudes toward learning (Hung et al., 2022). In technology-mediated learning contexts, the challenge and opportunity lie in designing visual and interactive media that enhance engagement rather than distract or overwhelm.

Research emphasizes that the mere presence of digital tools does not guarantee high engagement; rather, engagement is supported by pedagogical design, affordances of the technology, and meaningful interaction. According to Zou et al. (2024), visual semiotics and learner engagement intersect particularly in digital language learning. Visual cues such as icons, animations, images, and infographics serve as semiotic resources that guide attention, scaffold comprehension, and facilitate meaning-making Multimodal indirect feedback in L2 writing, which included visual and video-based elements, improved learners' noticing and revision of errors, demonstrating that semiotic resources beyond verbal text can enhance cognitive engagement (Le, 2021; Chen, 2023).

Similarly, studies on telepresence-mediated foreign language instruction have shown that visual semiotics, including spatial arrangements and visual cues, significantly shape learner interaction and meaning-making. In technology-mediated language education, the visual dimension holds particular relevance because language itself is a semiotic system that interacts with digital affordances, such as interface design, hyperlinks, animations, and icons (Knight, 2023). Studies on multimedia learning indicate that visual features are among the most influential elements for learning comprehension, attention, and engagement in digital content (Wang, 2024).

Visual language research also suggests that visual representations act as heuristic tools enabling learners to articulate and reflect on conceptual content, thereby supporting both cognitive engagement and learner agency (Afnan, 2023). The interplay between visual semiotics and engagement is significant because digital learning environments offer abundant visual semiotic resources whose design may support or hinder learners' interpretation and focus (Lu & Hanim, 2024; Smith et al., 2011; Bayne, 2008). Learners' attention to and interpretation of visual resources influences behavioral, cognitive, and emotional engagement, ultimately affecting learning outcomes.

By exploring learners' interpretation of visual semiotic resources and the impact on engagement, this study moves beyond quantitative measures of clicks or time on task, emphasizing learners' subjective experiences and meaning-making in semiotic-rich environments. This study highlights three key considerations. First, visual semiotics should not be treated as mere decoration; images, icons, color, movement, and layout carry meaning for learners and scaffold comprehension (Udris-Borodavko et al., 2023). Second, learner engagement in technology-mediated contexts is multilayered, encompassing participation, interpretation, motivation, and interaction with semiotic resources (Travere, 2023).

Third, meaning-making in technology-mediated language education is situated: it emerges through the interaction of the digital environment, task design, semiotic orchestration, and learners' interpretive processes. By investigating how language learners interpret visual semiotic resources and how those interpretations relate to engagement, this study offers practical implications for instructional design and language pedagogy.

Designing with semiotics in mind can enhance learner engagement, not only capture attention but also foster deeper cognitive and emotional involvement in meaningful language use. Understanding the semiotic mechanisms through which visuals influence engagement is essential for developing effective technology-mediated language learning materials and promoting multimodal literacies in digital educational contexts (Huang & Wang, 2024).

METHODOLOGY

This study employed a qualitative research design, specifically a case study approach, to explore the role of visual semiotics in learner engagement within technology-mediated language education. A qualitative approach was selected because the focus was on understanding learners' interpretations, experiences, and meaning-making processes, which are inherently subjective and context-dependent. The case study method was particularly appropriate as it allowed an in-depth examination of learners interacting with digital learning materials enriched with visual semiotic resources. This design facilitated the collection of rich, descriptive data that captured the nuances of learners' engagement, rather than merely measuring observable behaviors numerically.

Research Setting

The study was conducted in a technology-mediated language learning environment within a secondary school college (adjust to your context) that utilized digital platforms for language instruction. The platform provided a combination of text, images, animations, icons, and other multimodal resources designed to support learning tasks. This setting was intentionally chosen because it offered a semiotic-rich environment where learners could engage with multiple modes of meaning simultaneously. The context allowed for the observation of learners' cognitive, emotional, and behavioral engagement in response to visual semiotic cues embedded in the digital interface.

Participants

A purposive sampling strategy was employed to select participants who had extensive experience using the technology-mediated language learning platform. The participants consisted of 10–15 learners aged 15–20 (adjust based on your study), who were actively involved in language learning tasks during the study period. Selection criteria included regular participation in digital lessons, willingness to engage in interviews and reflective discussions, and the ability to articulate interpretations of visual materials. This purposive approach ensured that participants were relevant to the research focus and could provide rich, meaningful data about the semiotic resources and their engagement.

Data Collection

Data collection involved a triangulated approach to ensure credibility and comprehensiveness. First, observations were conducted during learners' engagement with digital learning materials, focusing on how learners interacted with visual semiotic elements, including icons, images, animations, and layout. Detailed field notes captured both behavioral engagement (e.g., interaction patterns, task completion) and non-verbal cues indicating cognitive and emotional involvement. Second, semi-structured interviews were conducted with each participant to explore learners' subjective interpretations of visual elements, their perceived impact on understanding, and how these elements influenced motivation and attention. Interview questions were open-ended to allow participants to articulate their perspectives fully, and probing techniques were used to elicit deeper reflections about semiotic interpretations and engagement processes. Document and content analysis was conducted on the digital learning materials themselves. The analysis focused on identifying semiotic features, including signs, symbols, and visual representations, to understand how these elements were designed to support engagement. By combining these three data sources observations, interviews, and material analysis the study ensured methodological triangulation, enhancing the reliability and depth of findings.

Data Analysis

Data analysis followed a thematic and semiotic approach, aligned with the study's research objectives. Observation notes and interview transcripts were coded inductively, allowing themes

to emerge from participants' experiences rather than being imposed a priori. Themes were then categorized to identify patterns in learners' interpretations of visual semiotic elements and corresponding engagement behaviors. Simultaneously, a visual semiotic analysis was conducted on the digital materials, guided by the principles of social semiotics. Each visual element was examined for meaning-making potential, including color, layout, symbol use, and spatial arrangement. Findings from the semiotic analysis were cross-referenced with learners' interpretations and engagement patterns to create a comprehensive understanding of how visual design influenced engagement. Data from multiple sources were then synthesized to identify key semiotic affordances that contributed to learners' behavioral, cognitive, and emotional engagement.

RESULTS AND DISCUSSION

The analysis focused on understanding how learners interpreted visual elements, integrated them into their learning strategies, and co-constructed meaning, revealing nuanced patterns across cognitive, emotional, and behavioral dimensions. The following section presents these findings, highlighting the mechanisms through which visual semiotics mediate engagement and the emergent patterns of learner meaning-making in digitally mediated language learning contexts.

Learners' Interpretation of Visual Elements

Learners' interpretation of visual elements emerged as a central aspect of engagement in technology-mediated language education. The study found that learners actively decode and construct meaning from a variety of visual cues, including images, icons, animations, diagrams, and color-coded symbols. These visual elements served not only as supports for comprehension but also as triggers for reflection, imagination, and problem-solving. In line with social semiotics perspectives, learners treated visuals as meaningful resources rather than passive decoration, demonstrating that interpretation is an active, contextually situated process.

Participants frequently reported that visual cues helped them connect abstract language concepts to concrete understanding. For example, one learner stated,

> *"When I saw the animated picture showing someone performing daily actions, I could understand the verbs better than just reading the text. It made me imagine the sentences I needed to write."*

This quotation illustrates that visual elements act as cognitive anchors, supporting learners' processing and mental representation of new language material. The ability to visualize tasks and scenarios through semiotic resources allowed learners to internalize concepts and reduce cognitive overload, enhancing comprehension and retention. Learners also described interpreting visual elements as a strategy to prioritize and organize their learning. Icons, color coding, and highlighted visual markers guided attention to important information and facilitated sequential understanding. A participant shared,

> *"I focus on the red icons first because they show key grammar points. Then I look at the supporting images to understand the context."*

Such responses indicate that learners perceive and use semiotic features strategically, navigating materials in a way that supports both task completion and conceptual understanding. Another dimension of interpretation involved personal and creative meaning-making. Learners often related visuals to their own experiences, imagination, or prior knowledge to construct unique understandings of language tasks. One participant remarked,

> *"I imagined myself in the story shown in the animation, and that helped me think of sentences I could write. It felt like I was living the scenario."*

This demonstrates that semiotic interpretation is not merely about decoding intended meanings but also about co-creating significance through personal engagement. Finally, peer interaction frequently enhanced the interpretation process. Learners discussed ambiguous or complex visuals with classmates to negotiate meaning and validate their understanding. A participant explained, "I wasn't sure what one of the icons meant, so I asked my friend. After we talked about it, I understood how to use it in my sentence." This emphasizes the social nature of semiotic

meaning-making, where interpretation occurs both individually and collaboratively. Overall, learners' interpretation of visual elements reveals a dynamic interplay between cognition, personal meaning-making, and social negotiation. Visual semiotics function as critical mediators of comprehension, reflection, and strategic engagement, highlighting the need for carefully designed, purposeful visual resources in technology-mediated language learning.

Visual Semiotics and Cognitive Engagement

Cognitive engagement in language learning refers to the mental effort and investment learners dedicate to understanding, processing, and internalizing knowledge, particularly when interacting with complex learning materials. In technology-mediated language education, cognitive engagement is significantly influenced by visual semiotics the ways in which signs, symbols, and visual representations communicate meaning within digital learning environments. Visual semiotic elements such as images, infographics, icons, and color-coded cues act as cognitive scaffolds that guide learners' attention and support comprehension of language tasks. These visual cues do not merely decorate the digital platform; they actively facilitate learners' processing of information, helping to structure knowledge and reduce cognitive load while promoting meaningful engagement with content. During the study, it was observed that learners relied heavily on visual semiotic cues to interpret language instructions and vocabulary items embedded in the digital platform. For example, learners responded to animated illustrations and visual metaphors by making connections to prior knowledge and applying these insights to task completion. One participant remarked,

> *"When I saw the picture showing the sequence of daily activities, I could understand the verbs more clearly than just reading the text. It helped me imagine what I needed to write."*

This statement illustrates how visual semiotic elements can act as cognitive anchors, enabling learners to internalize abstract concepts and translate them into practical understanding. Moreover, participants frequently referenced the role of icons and color coding in organizing and prioritizing information. One learner explained,

> *"The red icons always mean something important, like a key grammar point, so I focus on them first. It makes it easier to plan my sentences without feeling confused."*

Such feedback demonstrates that visual semiotics provide learners with cues that structure their cognitive processing. By signaling emphasis, hierarchy, or relationships among ideas, visual resources guide learners' attention toward critical aspects of the task, thereby enhancing their cognitive engagement. Cognitive engagement was also evident in learners' interaction with multimodal materials that combined images with textual prompts. Many learners described how the integration of visuals and text facilitated deeper understanding and reflection. For instance, a participant noted,

> *"Seeing the animated scenario while reading the dialogue helped me think about the context and the right words to use. It made me more confident in answering the questions."*

This observation indicates that visual semiotics support not only comprehension but also problem-solving and strategic thinking, encouraging learners to engage cognitively with language materials beyond surface-level reading. The analysis further revealed that learners often interpreted visual cues creatively, constructing personal meaning that extended their understanding of the language content. Visual semiotics appeared to stimulate cognitive engagement by prompting learners to infer, hypothesize, and mentally simulate scenarios, which is central to active learning in language acquisition. A participant reflected,

> *"I sometimes look at the pictures and imagine different situations that could happen. Then I try to write my own sentences based on that. It makes learning more interesting and keeps me thinking."*

This quotation emphasizes how visual semiotics can transform passive observation into active cognitive engagement, as learners mentally manipulate and reinterpret visual stimuli to construct knowledge.

Emotional and Behavioral Engagement

Emotional and behavioral engagement are integral components of learners' overall involvement in technology-mediated language education. Emotional engagement refers to the affective responses learners exhibit toward learning activities, including interest, motivation, enjoyment, and attitudes toward tasks. Behavioral engagement, on the other hand, pertains to the observable actions learners take during learning, such as participation, persistence, interaction, and adherence to task requirements. In digital language learning environments, visual semiotic elements play a significant role in shaping both emotional and behavioral engagement by creating appealing, meaningful, and structured contexts for learning.

The study revealed that learners' emotional engagement was strongly influenced by the visual design and semiotic affordances of the learning materials. Participants expressed that multimedia features, including animated characters, color-coded icons, and interactive images, increased their interest and made the learning experience more enjoyable. One learner remarked,

> *"I like it when the slides have pictures and animations. It makes learning fun, and I don't feel bored like I do with normal textbooks."*

This statement illustrates how visual semiotics can evoke positive emotional responses, which in turn motivate learners to engage consistently with tasks. Emotional engagement was not limited to enjoyment; learners also reported feeling more confident and motivated when visual cues clarified instructions or exemplified language use. As one participant shared,

> *"The pictures helped me understand the story better, so I felt confident when answering the questions. It was less stressful than just reading the text."*

These reflections indicate that visual semiotics can reduce anxiety and enhance learners' affective connection with the material, fostering sustained emotional engagement. Behavioral engagement was observed in learners' active interaction with visual elements, their participation in tasks, and their persistence in completing activities. Learners frequently referred to visual cues as guides for prioritizing and sequencing their work, demonstrating how semiotic resources supported goal-directed behavior. For example, a participant explained,

> *"When I see the green checkmarks on the tasks I finished, I feel motivated to keep going and complete the rest. It shows me where I am in the lesson."*

Such feedback highlights the role of visual semiotics in promoting sustained participation and task completion, key indicators of behavioral engagement. Additionally, learners' behavioral engagement was reflected in peer interactions and collaborative activities facilitated by visual elements. In tasks where images, infographics, or diagrams prompted discussion, learners were observed actively sharing interpretations, asking questions, and negotiating meaning. One participant stated,

> *"I discussed the pictures with my classmate before writing my answer. It helped me think about different possibilities and learn from them."*

This quotation demonstrates that visual semiotics not only influence individual engagement but also encourage interactive behaviors that contribute to a socially rich learning environment. The findings also indicated that emotional and behavioral engagement are mutually reinforcing in visually mediated contexts. Positive emotional responses to visual materials, such as enjoyment or confidence, often led to increased behavioral engagement, including greater participation, sustained attention, and active involvement in tasks. Conversely, behavioral engagement, such as successfully completing visual-based activities, reinforced emotional satisfaction and motivation. For instance, a participant noted,

> *"When I complete the exercise with the pictures, I feel proud and want to try the next one. It makes me enjoy learning more."*

This cyclical relationship emphasizes that visual semiotic elements serve as both catalysts and reinforcements for holistic engagement in technology-mediated language learning.

Patterns of Semiotic Meaning-Making

Patterns of semiotic meaning-making refer to the recurring ways learners interpret, negotiate, and construct meaning from visual semiotic resources within technology-mediated language learning environments. In this study, it was observed that learners did not passively consume visual materials; rather, they actively engaged in a process of interpretation and sense-making, linking visual signs to language concepts, prior knowledge, and real-life contexts.

This meaning-making process was dynamic, interactive, and shaped by both the design of visual resources and learners' individual cognitive, emotional, and behavioral dispositions. One prominent pattern identified was the use of visual cues as cognitive scaffolds. Learners often referred to images, icons, and diagrams to clarify abstract concepts and connect textual information with concrete examples. For instance, a participant stated,

> *"I looked at the chart with the color-coded verbs, and it helped me remember which tense to use. Without the colors, I would have mixed them up."*

This quotation highlights how visual semiotics guided learners' cognitive processing, helping them structure their understanding and reduce confusion. The repeated reliance on visual scaffolds across participants suggests a consistent pattern whereby visual resources serve as mental anchors in the meaning-making process. Another pattern involved interpretation through personal and contextual lenses. Learners frequently linked visual elements to their own experiences, imagination, and cultural understanding. For example, a participant explained,

> *"I imagined myself in the scene shown in the animation, and it helped me think of sentences I could write. It made the lesson feel real."*

This indicates that visual semiotics not only convey intended meanings but also enable learners to generate personal interpretations, making learning more relevant and engaging. The recurrence of such reflections across multiple participants demonstrates that personal contextualization is a common mechanism of semiotic meaning-making. A third pattern observed was interactive negotiation of meaning. Learners often discussed visual materials with peers or reflected on them during task completion, constructing shared interpretations or refining their own understanding. One participant remarked,

> *"I wasn't sure about the meaning of the icon, so I asked my classmate. After discussing it, I understood how to use it in my sentence."*

This demonstrates that visual semiotics facilitate social meaning-making, where learners collaboratively interpret symbols and negotiate their application to language tasks. This pattern underscores the social dimension of semiotic engagement, highlighting how interaction with peers mediates the interpretation of visual signs. Additionally, learners displayed strategic selection and prioritization of semiotic resources as part of their meaning-making process. They selectively attended to certain visual cues, ignoring others they perceived as less relevant, in order to maximize understanding and task efficiency. A participant stated,

> *"I focused on the highlighted icons first because they seemed important, and then I looked at the smaller images for extra clues."*

This strategic engagement indicates that learners are not passive recipients of visual information; they actively make decisions about which semiotic elements will support their comprehension and task completion. The study revealed a pattern of integration between visual semiotics and other learning modalities. Learners frequently combined insights gained from images, animations, and icons with textual content, prior knowledge, and spoken instructions to construct a holistic understanding of the language task. One learner noted, "I read the dialogue while watching the animation. Seeing the characters' actions helped me understand the context and choose the right words." This demonstrates that semiotic meaning-making is multimodal, involving the integration of visual, textual, and experiential resources to produce comprehensive understanding.

Discussion

In this discussion, we pivot from the descriptive interpretation of our qualitative findings to critically unpack the broader implications of how visual semiotics function within technology-mediated language education, and what that means for management, instructional design, policy and future research. Grounded in the objective of this study to understand how visual semiotic resources shape learner engagement in digitally mediated language learning the following themes emerge as imperative for both scholarship and practice. Management perspective, one clear implication is that institutions must treat visual semiotic design not as a mere aesthetic add-on but as a core component of curriculum development. Our data suggest that learners' cognitive, emotional and behavioral engagement was significantly influenced by how signs, symbols, icons and multimodal visuals were arranged, emphasized and consumed in the digital environment. This aligns with previous work showing that multimodal feedback and visual cues materially influence meaning-making processes and that textbooks and digital resources increasingly rely on visual modes for meaning (Tyrer, 2021; Dahlström, 2022; Higgs & Kim, 2022).

As such, educational managers must ensure that visual semiotics are integrated strategically whether in LMS design, multimedia content, or task sequencing rather than added haphazardly or left to individual instructors. Failing to manage this element risks undermining engagement, diluting instructional quality and reducing return on investment in educational technologies. The instructional design level, our study invites a reconceptualization of how we think about learner engagement: it is inseparable from semiotic affordances. The conceptual frameworks that dominate engagement research often treat technology as a black-box enabling factor (Benz et al., 2024; Suárez & Sánchez, 2024; Mukherjee & Dhar, 2023), yet our findings extend that by showing *which* semiotic features matter (e.g., color coding, iconography, animation) and *how* they support engagement. This resonates with research in science education that shows representational modes shape reasoning and meaning-making. For instructional designers, that means mapping the semiotic terrain of their materials: what visual signs are present? How are they positioned relative to text and tasks? Do learners interpret them as scaffolds or distractions? our participants used color-coded icons to priorities tasks and reduce cognitive load a finding that echoes work on visual scaffolding in multimedia learning. Designers must therefore embed visual cues intentionally to guide attention, reduce cognitive overload and enhance meaningful interaction with tasks.

Third, at the level of learner management and support, the implication is that engagement monitoring systems should incorporate semiotic analytics. While many institutions focus on click-stream data, time-on-task or login frequency, our study suggests that how learners *interpret* visual cues is equally vital. Systems that track which visual modules learners skip, hesitate over or revisit could yield richer insights into engagement. This resonates with new directions in learner attentiveness research using computer-vision or analytics (Gogawale et al., 2024). For managers and instructional leaders, developing dashboards that show not only task completion but semiotic interaction (e.g., icons viewed, animations replayed) may provide earlier warning of disengagement. This shifts the management perspective from reactive (low grades) to proactive (semiotic misalignment). Moreover, the distributed nature of semiotic meaning-making suggests that peer-interaction, design clarity and scaffolding matter considerably confirming findings that in online language courses, self-direction, collaboration and instructor role are central to engagement (Goldberg et al., 2021; Rawat et al., 2024).

Fourth, policy-wise, the findings call for updated frameworks around digital content procurement, teacher training and quality assurance. If visual semiotics are central to engagement, then procurement criteria for LMSs or multimedia content must include semiotic richness, coherence and clarity. Textbooks that rely solely on textual resources are increasingly mis-aligned with learner semiotic practices. Training for teachers must emphasize not only how to use technology, but how to *read* and *design* semiotic landscapes, how learners interpret icons, layout, visual metaphors. Without this, institutions risk acquiring high-tech systems but failing to engage learners effectively due to poor semiotic design. The conceptual study on technology-mediated teaching during COVID-19 emphasizes that technology adoption raises new

pedagogical challenges not just access or connectivity (Ahmed & Opoku, 2022; Vladova et al., 2021). It is precisely this semiotic dimension that must now be codified in policy guidelines and professional standards. Fifth, from a theory-building standpoint, our work suggests a need to refine engagement frameworks to explicitly include semiotic modalities across cognitive, emotional and behavioral domains.

Many engagement models still assume a monomodal text/interaction approach and treat visuals implicitly. However, the evidence from our study supports the notion that visuals, signs and multimodal cues are not passive add-ons but active mediators of engagement. This resonates with social semiotics research in various fields and multimodal language educational work. Thus, future research must explore how visual semiotic features interact with learner traits, task design, and digital affordances to mediate engagement. Indeed, recent systematic reviews in online language courses call for frameworks tailored to online contexts (rather than face-to-face proxies) and note the gap in semiotic considerations. Finally, there is the question of equity and inclusion. Visual semiotics may empower some learners but disadvantage others those with visual impairments, language processing difficulties, or lacking prior experience with multimodal interfaces. While technology can democratize access, it also risks creating semiotic divides if visual cues are designed without inclusive principles. This echoes findings in digital literacy research in EFL contexts in Indonesia, where digital disparities and enduring teacher authority constrained interaction. For management, the implication is that accessibility standards (e.g., alt-text, audio narration, alternative cues) must accompany visual semiotic design to ensure that all learners can engage meaningfully. The visual semiotic affordances should not be a luxury but a right.

CONCLUSION

This study underscores the pivotal role of visual semiotics in shaping learner engagement within technology-mediated language education, revealing that visual elements are not merely aesthetic enhancements but active mediators of cognitive, emotional, and behavioral investment. By demonstrating how learners interpret, negotiate, and integrate visual cues into their meaning-making processes, the research highlights critical implications for educational management, instructional design, policy development, and accessibility practices. Strategic integration of semiotic resources can enhance engagement, optimize learning outcomes, and foster more inclusive and interactive digital learning environments. Ultimately, these findings call for a reconceptualization of engagement frameworks to account for multimodal affordances, positioning visual semiotics as an essential component in the effective design and management of technology-mediated language learning programs.

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