

Implementing a Comprehensive Instructional Design Framework for Technology-Enhanced Language Learning to Enhance Engagement, Self-Confidence, and Reduce Cognitive Load: A Qualitative Study on Learning Experiences

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Abstract—The global pandemic has accelerated digital transformation, prompting a need to investigate the outcomes of technology-enhanced learning environments on students' success. The current study develops a multimedia-based English language learning tool and assesses its impact on students' engagement, self-confidence, and learning outcomes within a tertiary-level setting. Using a focus group interview protocol, this study involves 25 tertiary-level students to gather insights into their perceptions and experiences with technology-enhanced language learning tools. The findings contribute valuable insights into the evolving domain of language learning and underscore the significance of designing instructions for the learning material considering a comprehensive approach. The study reveals a positive shift in learning dynamics, with students demonstrating heightened engagement, increased self-confidence, and reduced cognitive load. Understanding these shifts is crucial for educators, policymakers, and stakeholders as face-to-face interactions diminish. The research bridges the gap between theoretical frameworks and practical applications, contributing to a deeper understanding of the dynamics of multimedia learning. The present study plays a pivotal role in shaping the future of tertiary language education, ensuring that learning tools meet educational standards and address the evolving needs of language learners.

Index Terms—learning experience, technology-enhanced language learning, multimedia-based instructional design, self-confidence and engagement, cognitive load

I. INTRODUCTION

Learning experiences encompass dynamic interactions among learners, content, and the environment, spanning formal, informal, and even game-based contexts. Their significance in shaping pedagogy and technology has steered the present study toward the evolving landscape of language learning, with a special focus on multimedia-based instructional design. In second language acquisition, Dörnyei (2022) underscores that the quality of learning experiences strongly influences motivation—a dynamic force driving learners' commitment, engagement, and persistence. He also notes that well-designed experiences are essential at all stages of language learning. Equally important, the integration of multimedia-based instructional design plays a crucial role by directly influencing cognitive load.

The cognitive theory of multimedia learning (CTML) proposed by Mayer (2017) highlights that working memory has limited capacity and that instructional materials must manage cognitive load. Excessive extraneous information can overwhelm learners and impede learning, whereas well-structured, coherent multimedia content enhances understanding and retention.

Multimedia tools (e.g., interactive videos and simulations) are now common in language classrooms, offering immersive experiences tailored to diverse learning styles. Research increasingly highlights the potential of technology-

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enhanced learning to improve knowledge, motivation, and self-confidence (Su & Zou, 2022). Yet, few qualitative studies have examined how multimedia-based instructional design affects learner motivation, engagement, and cognitive load (Khanduri & Teotia, 2023). This gap is notable given persistent global challenges in language learning (Bi et al., 2024). Addressing it could yield insights into designing multimedia materials aligned with human cognitive architecture to enhance motivation in second language learning (Ongor & Uslusoy, 2023).

This study employs a holistic framework that integrates four interrelated dimensions to enhance multimedia-based language learning. First, drawing on Keller's ARCS model—comprising Attention, Relevance, Confidence, and Satisfaction (Keller, 1987, 2021)—motivation is positioned as a central element of instructional design. To sustain learners' engagement, the multimedia tool incorporated features such as animations, interactive feedback, and gamified scoring. Relevance was established through real-life content and examples, while learners' confidence was built through scaffolding, clear expectations, and supportive feedback mechanisms. Satisfaction was promoted via progress indicators and task-completion rewards, reinforcing both intrinsic and extrinsic motivation. Second, in line with Mayer's CTML (2017), the design applied segmentation, signaling, and the reduction of extraneous load to optimize cognitive processing. Visual and auditory elements were carefully structured to support rather than overwhelm cognitive functions. Third, the study adopts Reigeluth's Elaboration Theory (1983), organizing instructional content from simple to complex to support gradual schema construction and enhance learners' understanding of grammatical structures. This sequencing approach fosters cumulative learning, particularly important in grammar instruction, where concept layering is essential. Finally, qualitative insights were gained through thematic analysis of student interviews, capturing learners' perceptions, emotional responses, and experiences with the tool. This qualitative dimension complements the theoretical foundation and adds valuable depth to a field often dominated by quantitative approaches. Collectively, the integration of motivational, cognitive, structural, and experiential components offers a comprehensive, theory-driven framework for designing effective multimedia materials in second language education.

II. LITERATURE REVIEW

In recent years, the integration of technology into language learning has emerged as an essential area of research, with a particular focus on the utilization of multimedia technology. The advent of mobile devices and assisted learning tools has further broadened the scope of multimedia applications, making them an indispensable resource in educational settings. Several key areas underpin the justification for this study, including technology-enhanced language learning, multimedia design, cognitive load, learner motivation, and qualitative insights into learner experience.

A. *Multimedia-Based Instructional Design*

In recent years, technology-enhanced language learning, particularly via multimedia, has become a major focus of study (Su & Zou, 2022). Multimedia instruction uses multiple media formats to enrich learning materials, and the spread of mobile devices has further expanded its educational reach. Numerous studies have examined multimedia-rich language learning in various contexts (computer-based, virtual, augmented, and web-based), generally reporting improved learner engagement and achievement (Lai & Chang, 2021; Chen & Yang, 2020; Kutbay & Akpınar, 2020). Empirical findings indicate that such interventions can enhance diverse language skills—from vocabulary to writing—and overall learning outcomes (Amalia, 2020; Subaidi & Aziz, 2020; Yawiloeng, 2020; Yang et al., 2022; Zhang & Zou, 2022; Mahdi, 2022; Mohsen et al., 2024). However, despite these benefits, many digital language learning tools lack a firm grounding in instructional design theory. Developers often emphasize visual appeal over pedagogical soundness, potentially neglecting fundamental principles of effective instructional design and undermining the long-term impact of multimedia learning materials.

B. *Cognitive Load Management*

Cognitive Load Theory (CLT) is a key theoretical lens for multimedia learning, highlighting the need to design materials within the limits of working memory (Mayer, 2017; Sweller, 2019). Effective multimedia design seeks to minimize extraneous cognitive load to facilitate learning. Empirical studies confirm that segmenting content, signaling essential information, and synchronizing text with visuals can reduce overload and improve retention (Klimova & Zamborova, 2020). However, further research is needed to understand how multimedia design interacts with individual learner differences (e.g., prior knowledge or learning strategies) in influencing cognitive load and learning outcomes (Chen & Kalyuga, 2021).

C. *Design Principles and Theoretical Foundations*

While many mobile-assisted language learning studies report positive outcomes, they often lack explicit grounding in established instructional design frameworks. Meta-analyses of technology-enhanced language learning tend to catalog digital tools without pinpointing which design factors drive gains (Chen et al., 2020; Hao et al., 2021). Similarly, numerous app-based studies describe technological interventions (Liu et al., 2021; Wilson, 2020) but offer little guidance on how to design effective multimedia instruction. Even when improvements are observed with mobile learning (Azlan et al., 2020; Viberg et al., 2020; Refat et al., 2020), few researchers qualitatively examine why these tools work, leaving underlying mechanisms unexplored. This gap underscores the need for principled multimedia design guided by theory.

Aligning ID with theoretical frameworks like Mayer’s (2017) CTML principles is critical to ensure that multimedia content engages learners while managing cognitive load. By grounding multimedia elements in cognitive principles, designers can better match human information processing and thereby enhance learner understanding and motivation (Cammeraat & de Koning, 2020; Hamidi, 2024).

D. Technology-Based Language Learning and Learning Experience

Advancements in educational technology continue to transform language learning, and researchers have increasingly focused on learners’ experiences in these digital environments. Mobile-assisted language learning, for instance, has shown improved outcomes and greater learner autonomy (Al-Shaikh et al., 2024). Such benefits align with CTML: well-designed multimedia content engages multiple cognitive channels and reinforces language acquisition. Additionally, gamified language learning—integrating game-like elements into lessons—can significantly boost student motivation and engagement. However, not all learners have equal access to technology, and online platforms can introduce distractions. These challenges require careful planning to ensure equitable and effective learning experiences (Azionya & Nhedzi, 2021). Table 1 provides a comparative overview of recent studies in this domain, highlighting their focus on learner motivation, cognitive load, instructional design frameworks, and use of CTML principles across various language learning contexts and research methods.

TABLE 1
A COMPARATIVE STUDY OF THE EXISTING STUDIES ON LANGUAGE LEARNING

Studies	Motivation	CL	LE	IDF	CTML	QT/QN /Mixed	GL/VoC Others
The current Study	☑	☑	☑	☑	☑	QT	GL
(Refat et al., 2020)	☒	☑	☒	☑	☑	QN	GL
(Sarwinda et al., 2020)	☒	☒	☒	☒	☑	QT	Others
(Azlan et al., 2020)	☒	☒	☒	☑	☑	LR	S2
(Yawiloeng, 2020)	☒	☒	☒	☑	☑	Mixed	VoC
(Amalia & Rochmat, 2020)	☒	☒	☒	☒	☑	Mixed	Writing
(Subaidi & Aziz, 2020)	☑	☒	☒	☒	☒	Mixed	Reading
(Yang et al., 2022)	☒	☒	☒	☒	☑	QN	Speaking
(Wilson, 2020)	☒	☑	☒	☒	☑	Concept	Others
(Alobaid, 2020)	☑	☒	☑	☒	☒	Mixed	Writing
(Hamidi, 2024)	☑	☒	☑	☑	☒	Mixed	S2
(Ayar & Kiziltan, 2020)	☒	☒	☑	☑	☒	QN	VoC
(Dörnyei, 2019)	☑	☒	☑	☑	☒	Concept	Others
(Hao et al., 2021)	☒	☒	☒	☒	☒	Meta-analysis	Vocabulary
(Honarзад & Rassae, 2019)	☑	☒	☑	☑	☒	QN	S2
(Refat et al., 2020)	☑	☒	☑	☒	☒	Mixed	GL
(Kutbay & Akpınar, 2020)	☒	☑	☒	☒	☑	QL	Others
(Chang & Hung, 2019)	☒	☒	☑	☒	☒	QN	S2
(Fernández, 2023)	☒	☒	☑	☒	☑	Mixed	Listening
(Liu et al., 2024)	☒	☑	☑	☒	☑	QN	Others
(Dhivya et al., 2023)	☑	☒	☑	☒	☒	QN	S2

*CL = Cognitive Load, LE = Learning Experience, IDF = Instructional Design Framework, CTML = Cognitive Theory of Multimedia Learning, QT = Qualitative Study, QN = Quantitative Study, GL = Grammar Learning, VoC = Vocabulary, S2 = Second language Learning

The studies under review exhibit several critical oversights that limit their effectiveness in understanding technology-based language learning. Firstly, they inadequately consider motivational factors like self-engagement and confidence, which are crucial for sustaining learner interest and success. Secondly, even when cognitive load is addressed, key elements such as the design and presentation styles of learning materials are often overlooked, despite their significant impact on learners’ ability to process and retain information. Thirdly, the studies fail to explore the instructional sequencing from simple to complex, a strategy vital for managing cognitive load and ensuring a smooth learning progression. Fourthly, there is a notable lack of qualitative research that examines learners’ experiences in multimedia-based environments, particularly in the context of English grammar learning. Finally, this absence of qualitative insights prevents a deeper understanding of how learners interact with and perceive the effectiveness of these tools. As this field continues to evolve, the focus must remain on developing multimedia instructional materials that are not only engaging and accessible but also pedagogically sound and effective in fostering language acquisition (Hamidi, 2024). To advance the field, the present research addresses these gaps by incorporating a more holistic approach that considers motivational factors, design principles, instructional sequencing, and qualitative insights into learners’ experiences, ensuring that multimedia instructional materials are both engaging and pedagogically sound.

III. METHODOLOGY

The present study focused on the qualitative research design by Braun and Clarke (2023), where a semi-structured interview was conducted. The data analysis process with coding steps was followed rigorously (see Figure 1). The detail of the research method is described in the following.

A. Participants

A total of 25 first-year tertiary students (aged 20–25) from a technical university on Malaysia's East Coast participated in this study. They were enrolled in a remedial English course, Fundamentals of the English Language, and selected voluntarily based on interest and availability. Only those who gave informed consent and participated in the qualitative phase were included. Exclusion criteria eliminated students not involved in technology-supported English learning, outside the target demographic or institution, or those who withdrew at any stage. Unrelated data segments, such as personal anecdotes disconnected from language learning or technology use, were also excluded to maintain analytical focus.

The sample size aligns with qualitative research standards prioritizing depth over breadth (Creswell, 2013). Creswell suggests 20–30 participants are sufficient for thematic saturation, while Maxwell (2013) emphasizes understanding meaning and context over generalizability. The sample was purposefully selected based on institutional collaboration, accessibility, and ethical considerations, ensuring alignment with the study's aims rather than convenience.

B. Instrument

To explore the learning experience of the students, a semi-structured interview was employed. To consider the themes such as self-confidence, engagement, and learners' cognitive load of the learner, a set of questions was designed. Participants were asked to describe in their own words. Open-ended questions fit well within this framework, as they provide a starting point for discussion while enabling the interviewer to follow up on responses that are particularly insightful or relevant to the research objectives.

In this present study, Braun and Clarke (2023) were adopted for analysing the data as they emphasize the flexibility of thematic analysis, allowing for both inductive and deductive approaches. The first theme was motivation, and the sub-themes were self-engaging and self-confidence. Every extraction was carefully considered to know their attitude towards the tool. 'Interesting' and 'nice' are considered with a positive vibe. On the other hand, the words expressing negative notions such as 'poor design', 'dull', or 'non-motivational' were taken for the negative impression of the design. If the students expressed ideas beyond the topic or shared new thoughts about the design, these were coded as 'exceptions' and observed. New information was important to know the exact reaction regarding the satisfaction with the use of the tool.

The second theme was cognitive load. In this theme, it was investigated to know the impact of the design on students' cognitive load was investigated. The replies are coded as 'increased', 'managed', or 'exceptions.' In this theme, the sub-themes were mental effort, content difficulty, and presentation of the illustrations, which are examined in detail. Every word is checked carefully, and replies are taken that support the theme of cognitive load. The new information regarding cognitive load was also taken as an important cue for the ID.

C. Ethical Consideration

This research was conducted with a focus on language learners at a particular university. Due to the nature of the study, which involved minimal risk, obtaining Institutional Review Board (IRB) approval was not mandatory for this type of research. However, to maintain high ethical standards, thorough consent processes were implemented. Before data collection, informed consent was a cornerstone of our ethical protocol. Consent was obtained from three classes of students, with class representatives signing the consent forms on behalf of the participating students. In addition, the consent was obtained from the specific language teacher who used to teach the classes of those students at this university, enhancing the ethical rigor of the study by involving all stakeholders in the consent process. Detailed information about the purpose of the study, use of the data, potential risks and benefits, and a statement of privacy and confidentiality were provided in written form to the participants. To safeguard participant anonymity, all data were de-identified, with personal identifiers removed and replaced with unique codes. By adhering to these rigorous ethical standards, this study ensures that the findings are not only scientifically valid but also ethically sound, providing valuable insights into the implementation of technology-based learning tools in educational settings.

D. Data Collection Process

To guarantee the validity and reliability of the data collected, a detailed and systematic process was undertaken. Initially, a thorough assessment of construct validity for the interview protocol was conducted. This task involved consulting two experts well-versed in technology-enhanced language learning and grammar instruction. These experts, who are members of the Center for Language Learning at a public university, provided critical insights that led to modifications in the interview questions.

After finalizing and refining the interview questions, the semi-structured interviews were conducted with 25 participants. To facilitate in-depth discussions, the participants were organized into five focus groups, each comprising five individuals. Each focus group session was scheduled for one hour, providing ample time for participants to delve into their experiences and perspectives. The semi-structured format allowed for a guided yet flexible conversation, where participants were encouraged to freely express their thoughts and insights, resulting in the collection of diverse and rich qualitative data.

To ensure that the data was captured accurately and without any disruptions, multiple audio recording devices were employed during the interviews. The use of multiple recording devices not only provided a backup in case of technical

issues but also ensured that no valuable input was lost. The audio recordings were meticulously managed to maintain the integrity of the data collection process.

Following the interviews, all recordings were carefully transcribed to facilitate a thorough analysis. The transcription process was handled with attention to detail, ensuring that the nuances of participants' responses were preserved. This meticulous approach enabled a comprehensive analysis of the data, allowing the research to accurately reflect the participants' experiences and contribute valuable insights to the study.

E. Analysis of Coding

The coding process was a critical step in extracting meaningful themes and patterns from the qualitative data. Participants were coded based on a system that included their gender and a unique identifier. For instance, codes like UMS10 represented a university male student with the identifier 10, and UFS12 indicated a university female student with the identifier 12.

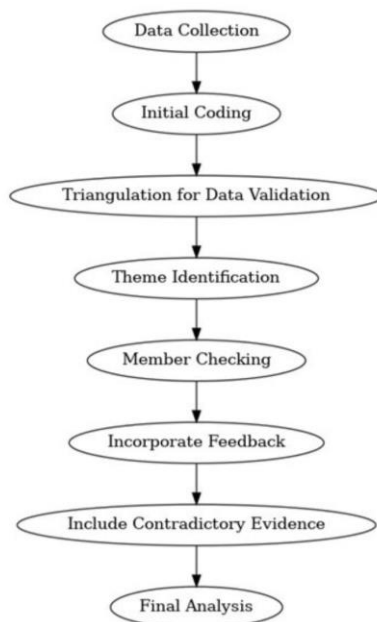


Figure 1. Data Analysis Process of the Study

To strengthen the validity of the findings, a triangulation method was used in the data analysis. This method included examining the perspectives of the researcher, the participants, and potential readers of the study to ensure consistency and robustness of the identified themes across different viewpoints. Furthermore, member checking was used to verify the accuracy of the interpretations. Participants were given transcripts of their interviews to review, allowing them to verify that their views were accurately represented. This member checking provided an additional layer of validation for the findings. Any negative or contradictory evidence was deliberately included in the analysis to ensure a comprehensive and nuanced portrayal of the learning experiences of tertiary-level students in technology-enhanced language learning settings.

IV. OVERVIEW OF THE INSTRUCTIONAL DESIGN OF THE TOOL

The framework of the present study is called a “comprehensive instructional design framework” because it encompasses a broad range of elements (elements to design a learning material such as content structure, instructional strategies, multimedia element, assessment and evaluation, technology integration, and learning flexibility) that are critical for effective learning and teaching. The study seeks to investigate the effectiveness of the tool on learners' self-confidence, engagement, and meaningful learning. The framework is briefly explained in the following (Figure 2), and the details are presented in sections from instructional design overview to evaluation and feedback.

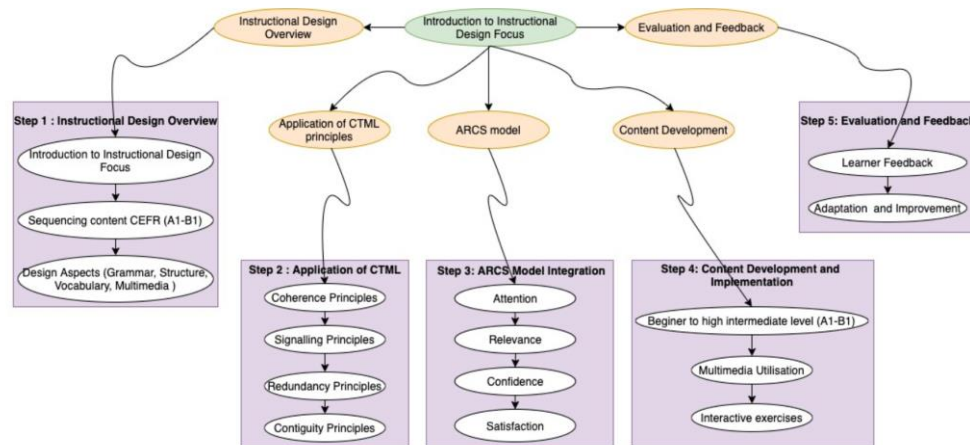


Figure 2. Interactive Diagram of Instructional Design of the Tool

A. Instructional Design Overview

The very initial phase of the design (step 1) is the instructional design overview that comprises different sections, such as

(a). Introduction to Instructional Design Focus

This initial phase involves orienting the instructional design process by establishing a clear focus. It lays the groundwork for all subsequent steps by defining the overall goals and direction of the instructional design.

(b). Sequencing Content (CEFR A1-B1)

The content is organized and sequenced according to the Common European Framework of Reference for Languages (CEFR) levels A1 to B1. This indicates a structured approach to teaching language skills, where learning materials are progressively designed from beginner to high-intermediate levels.

(c). Design Aspects

This part includes the key components of instructional content, such as grammar, structure, vocabulary, and multimedia. These elements are carefully planned to ensure that they align with the learners' needs and the instructional objectives.

B. Sequencing the Content From Simple to Complex

The second phase (Step 2) of the design incorporates the sequencing principle that involves organizing learning materials from simple to complex, rather than introducing them in their full complexity at once (Reigeluth, 1983). This approach allows content to be presented in manageable, meaningful, and objective segments. In this ID, initially, a small portion of the content is introduced, which is then elaborated upon progressively, providing a deeper understanding of the existing material. Effective knowledge construction is likely when the design of learning materials progresses from simple to complex, incorporating rich content, including various media forms like audio and video (Mayer, 2021). The instructional design in this study was crafted according to the Common European Framework of Reference (CEFR) from the English Grammar Profile. The instructional materials are tailored to these levels, and in this study, learners are categorized from A1 (beginner) to B1 (high intermediate). The study prioritizes learners' existing grammar knowledge, which encompasses various aspects. Therefore, the content and instructional design address four key areas: 1) grammatical items; 2) sentence structure; 3) vocabulary usage; and 4) multimedia integration. The instructional materials in MBTT are structured into three progressive levels: Beginner, Intermediate (Low), and Intermediate (High).

C. Design Principles of Multimedia-Based Instructions

Step 3 involves applying key principles from Mayer's Cognitive Theory of Multimedia Learning (CTML) to the instructional design of a multimedia-based grammar learning tool. Specifically, the study incorporates coherence, signaling, redundancy, and contiguity principles to manage extraneous cognitive load (ECL) and improve learning outcomes (Mayer, 2021; Sweller, 2020). The coherence principle was addressed by removing non-essential content, such as distracting visuals, excessive text, or decorative elements, to help learners focus on core material. Simple colour schemes and relevant graphics were used to maintain visual clarity. Signaling was implemented through visual cues that directed learners' attention to essential information, supporting comprehension and memory retention. The redundancy principle was observed by avoiding unnecessary duplication of information, while the contiguity principle ensured the simultaneous presentation of related text and visuals to strengthen cognitive connections. These design strategies

collectively enhanced instructional clarity and cognitive efficiency, enabling learners to process and apply grammatical content more effectively.

D. Principles of the ARCS Model

The instructional design (ID) of the multimedia tool is grounded in Keller's ARCS model, which emphasizes four motivational dimensions: Attention, Relevance, Confidence, and Satisfaction. To capture learners' attention, the design incorporates varied stimuli such as images and animations, particularly appealing to foundation-level students. Relevance is established by aligning content with learners' prior knowledge and interests through real-life examples and leveled exercises, ranging from basic to B1-level grammatical structures. Confidence is fostered via structured practice modules—including fill-in-the-blank, multiple-choice, and sentence construction exercises—that provide immediate feedback through a scoring system, allowing learners to track their progress and build self-assurance (Keller, 2021). Finally, Satisfaction is supported through end-of-level self-evaluation tasks, reinforcing motivation by offering learners a sense of achievement and recognition for their effort.

E. Content Development and Implementation

Step 4 for the instructional design is the content development, which consists of some segments such as

(a). Beginner to High Intermediate Level (A1-B1)

Content is developed specifically to cater to learners at different stages, from beginners to high intermediate levels. The focus is on creating materials that are appropriate for each level, ensuring that learners can build their skills progressively.

(b). Multimedia Utilisation

This involves integrating various multimedia elements into the learning materials, such as videos, audio, animations, and interactive tools. The use of multimedia is intended to enhance engagement, cater to different learning styles, and provide a richer learning experience.

(c). Interactive Exercises

The inclusion of interactive exercises is crucial for reinforcing learning and allowing learners to apply what they have learned in a practical context. These exercises help in solidifying the knowledge and skills acquired, making learning more effective and engaging.

F. Evaluation and Feedback

Step 5 incorporates few stages, i.e.,

(a). Learner Feedback

Step 5 emphasizes the importance of collecting feedback from learners about their learning experience. This feedback is crucial for understanding the effectiveness of the instructional design and identifying areas that may need improvement.

(b). Adaptation and Improvement

Based on the feedback received, the instructional materials and methods are adapted and refined. This continuous improvement process ensures that the instructional design remains effective and responsive to the learners' needs, making it an iterative cycle that evolves.

V. FINDINGS AND DISCUSSIONS

In unveiling the findings of the present study, the qualitative analysis delves into the multifaceted impact of multimedia technology on students' engagement, self-confidence, and cognitive load. As the following sections unfold, the richness of the collected data and the emergent patterns within will illuminate the multifarious ways in which technology, specifically multimedia tools, shapes the language learning journey for these students.

A. Findings

Learning experience is a crucial focus of contemporary research, aimed at understanding student involvement. The qualitative findings of our study are grounded in student opinions on key themes, namely: (1) Boosting self-confidence and self-engagement, and (2) Cognitive load.

(a). Boosting Self-Confidence and Engagement

Effective instructional design must prioritize enhancing self-confidence by linking knowledge to real-life applications, a principle integral to the design of this interactive tool. Drawing inspiration from technology-based learning research (Ahmadi Reza, 2018), the present instructional design incorporates interactive elements to foster a dynamic learning experience. Students were prompted to reflect on their interactions with the tool, yielding positive feedback such as

“Moreover, practise a tool with showing scores increases our motivation and satisfaction. It helps us to think more right use of the past tense because when we try to communicate in the past tense, we can take the help of the tool. It improves our learning experience with technology”.

Also, the student further mentioned that

“I feel that the past tense is important to know for us in daily life. Because in our life we often use so many sentences that are for the past. Before, I did not know so much about past tense use in my talk, but now, I think I can do better”. (UMS5)

This feedback underscores the essential role of confidence in achieving educational goals, with students expressing sentiments like

“The curiosity to next page and different ways of presenting the delivered sentences enhance the interest of knowing. The sound of the correct is motivational to the user”. (UMS6)

and

“When students learn anything, they need to know they can make it finish. Past tense is thus a grammar knowledge, a student can communicate with others easily, talking about the past”. (UMS8)

The study also delved into how the ID could foster self-engagement among learners, with many reporting that the ID was highly motivational and conducive to sustained usage as found in the remarks like “the presentation of the sentences is interesting, the sound of the correct is motivational to the user” (UM2) and “gaming is one of the contributors for making the tool attractive” (UMS1). The inclusion of short games was also praised for their motivational qualities, as some students noted,

“The game is good encouragement for getting correct and can be smoothly played to enhance the user's confidence toward the application”. (UMS4)

Further, the aesthetic and functional aspects of the tool, such as background color and content layout, played a significant role in maintaining student attention. Students appreciated the thoughtful design, mentioning that

“The tool is interesting because the use of images, videos, and animations is there into the tool. The tool is motivational, and it is helpful to engage our attention. There are different ways to present sentences. I can see the interesting images and audio there. The design is nice and bright. The movements of the figures are also mostly interesting. Games are good for practicing the right vocabulary and structures”. (UMS14)

Further, the aesthetic and functional aspects of the tool, such as background color and content layout, played a significant role in maintaining student attention. These design choices made the learning process more enjoyable and helped reinforce the linguistic structures being taught, facilitating deeper learning and greater retention. In a few instances, exceptions were observed in the motivational outcomes, with some students stating that “MBTT was not motivational” (UMS4) because they found it “very complicated” to navigate the technology-based tool for learning.

(b). Cognitive Load

To assess the cognitive load experienced by students on the multimedia-based ID, detailed feedback was gathered about their perceptions and interactions with the design elements. The attitudes towards the design revealed their extrinsic cognitive load as students predominantly viewed these elements positively, noting that specific features significantly alleviated the cognitive strain typically associated with learning. For instance, the animations included were often highlighted for their humorous aspects, which students felt helped reduce stress, as one student mentioned that

“The design of the interface and the content make the learner more knowledgeable and clearer, and easier to understand the topic... Video is more helpful in understanding the content compared to the theory. The interactive feature is helpful... when we answer the question wrongly, the correct answer will pop up... I think the activities will help to improve understanding and make them do more accurate and perfect sentences in past tenses”.

Additionally, the choice of colors in the tool's design was carefully selected to be visually pleasing without being overwhelming, described by a student as “nice, not too colorful” (UMS8). This choice was particularly appealing to undergraduate students, making the instructions as found

“The animations included were often highlighted for their humorous aspects, which students felt helped reduce stress, as one student mentioned, the animations have the funny elements, and it'll reduce the stress of the person that uses the application”. (UMS2)

The use of dialogue and conversational elements in the instructional design was effective in simplifying content and supporting communication skills. Students found it engaging and helpful for learning. Visually, the design's balanced colour enhanced appeal, especially for undergraduates. Features like bolded keywords improved clarity and reduced cognitive load, contributing to the overall effectiveness of the instruction.

The study also delved into potential frustrations associated with the multimedia-based ID, focusing on how different content delivery methods, such as conversations, storytelling, and videos, were received by the learners. Many students found the video content particularly accessible and helpful for understanding complex ideas. One student highlighted the advantages of the video format,

“They don't need to bring a dictionary to find the words that they cannot understand. So, it's quite helpful because Malaysian people use only the basic English in our daily life to use it”. (UMS12)

The simplicity of the vocabulary and attractiveness of the illustrations were also noted as factors that eased learning, as found in the statement of a student

“The content is very easy because it uses simple vocabulary, and the illustration is also very attractive. It’s easy for us to learn past tense in English”. (UMS3)

By incorporating those feedback points, the study aimed to measure different aspects of cognitive load and evaluate the effectiveness of the ID in facilitating language learning, ensuring it was both engaging and reducing cognitive load, and thereby providing effective learning experiences.

B. Discussion

The exploration of self-confidence, particularly within technology-enhanced learning environments, is vital due to its profound influence on the overall learning experience. Self-confidence, or self-efficacy, is a key psychological factor that empowers learners to engage deeply with educational content, fostering greater motivation to apply acquired knowledge in practical scenarios. When self-confidence is higher, the learner engages more in the learning process, and thereby his or her cognitive function is uninterrupted with loads and therefore brings effective learning experiences.

(a). Boosting Self-Confidence and Engagement

Self-confidence plays a critical role in learning, directly influencing how learners perceive their ability to succeed. According to Cognitive Load Theory (CLT), a strong sense of efficacy enhances cognitive processing and contributes to successful learning outcomes (Le et al., 2023; Schunk, 1984; Sweller, 2019). Motivational materials that strengthen self-confidence are linked to improved learning achievements (Keller, 2021; Dörnyei, 2019). Findings from this study indicate that well-designed instructional materials, particularly those incorporating interactive and engaging elements, enhance learners’ self-confidence. Students reported that the material’s connection to real-life contexts increased their confidence in applying language skills. As reflected in student comments, “the tool helps a student to increase self-confidence” (UMS5) and “past tense is thus grammar knowledge, a student can communicate with others easily, talking about the past” (UMS8), that real-world relevance plays a key role in successful language acquisition. Moreover, interactive exercises and immediate feedback further supported content mastery while reinforcing confidence. As one participant noted, “the correct answers after each exercise are very important” (UMS5), and “it shows the right answers if one is mistaken”, which aids in learning the past tense more effectively (UFS6). This aligns with educational theories that emphasize the value of formative assessment in learning (Huang et al., 2020).

Self-engagement also emerged as a key theme. The multimedia design—featuring animations, videos, and interactive dialogues—effectively captured student interest. Such engagement encourages active knowledge construction and enhances the learning experience. Research supports the idea that multimedia tools significantly boost engagement, especially when learners can interact dynamically with the content (Ullah Anwar, 2020). In this study, students consistently reported that these elements made the learning process more enjoyable and motivating.

(b). Cognitive Load and Instructional Design

Cognitive load was a central consideration in our instructional design, which we managed by simplifying complex information and avoiding unnecessary strain. Content difficulty was moderated in word choice, sentence structure, and topic relevance. Students appreciated the tool’s accessibility, noting its basic English vocabulary was helpful for everyday use. One participant explained, “students don’t need to bring a dictionary to find the words that they cannot understand. So, it’s quite helpful because Malaysian people use only the basic English in our daily life to use it” (UMS12). This simple vocabulary, combined with attractive illustrations, eased the learning process. This approach echoes research that sequencing content, starting with easier material and gradually increasing complexity, helps manage intrinsic cognitive load (Choi et al., 2024; Nückles, 2020). The use of “bold words in a sentence” (UMS5) further enhanced clarity by highlighting key information and simplifying the content. This practice aligns with CTML principles recommended in the literature (Hamidi, 2024; Cammeraat & de Koning, 2020). We also examined whether content delivery methods (conversations, storytelling, videos) caused frustration. Participants instead found these formats engaging, with videos particularly praised for accessibility and effective conveyance of complex ideas. These engaging approaches prevented frustration that could arise from overly complex or dull material (Shardlow et al., 2022; Yildirim, 2023). Content was tiered from low to high intermediate, allowing students to progress at their own pace and build on prior knowledge. Our findings align with recent research on multimedia in language learning. Segmentation of multimedia materials reduces cognitive load and improves vocabulary retention (Liu et al., 2024), and captioned videos positively impact ESL learners’ speech (Alobaid, 2021). These studies support our participants’ reports of improved comprehension and reduced cognitive overload with well-structured multimedia content (Liu et al., 2024).

This study extends the literature by integrating multiple theoretical frameworks—ARCS Model, Cognitive Load Theory (CLT), Cognitive Theory of Multimedia Learning (CTML), and Elaboration Theory—into a unified instructional design for language learning. This integrative approach addresses motivational, cognitive, and structural aspects of learning and is both theoretically grounded and practical. Furthermore, focusing on Malaysian tertiary-level learners provides cultural and contextual insights often underrepresented in multimedia learning research. The interplay between their multilingual backgrounds and emotional engagement with multimedia highlights the need for culturally responsive instructional design.

VI. CONCLUSIONS AND EDUCATIONAL IMPLICATIONS

This comprehensive analysis revealed that effective instructional design that incorporates a comprehensive framework in technology-enhanced language learning can significantly enhance both the engagement and confidence of learners. By providing a structured, supportive learning environment that gradually introduces complexity, educational tools can minimize cognitive overload and maximize learning efficiency. This approach also facilitates a deeper engagement with the material, allowing for a more thorough understanding and retention of knowledge. The findings from this study underscore the importance of integrating cognitive and motivational theories into the design of multimedia technologies. Such integration not only enhances learning outcomes but also supports the development of key psychological attributes like self-confidence, which are essential for academic and personal success. The incorporation of these theories ensures that learning tools are more than just repositories of information. They become dynamic platforms that actively participate in the cognitive and emotional development of the student. From the educational perspective, the integration of cognitive and motivational theories into the design of educational technologies holds profound potential for transforming learning environments. This study lays the groundwork for future research to delve into the long-term impacts of such technologies on diverse learner demographics and varied educational settings.

The study acknowledges some limitations. The first one was the sample size. In this research, 25 students participated in the study. While this sample size is acceptable, a larger sample would have enhanced the accuracy and generalizability of the results. Additionally, including students from multiple universities rather than just one could have provided a broader range of attitudes and levels of participation, contributing more comprehensive data to the study. The second limitation was related to the multimedia-based instruction, which relied on computers in the multimedia laboratory of the university. Despite living in a technologically advanced era, many students were not fully accustomed to using this technology, which sometimes led to difficulties in operating the instructional tools on their computers.

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