

ELTC Framework: Revolutionizing MUET Learning by Crafting a Dynamic Chatbot Learning Experience

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Abstract

Intelligent Tutoring Systems (ITSs) are designed to aid and enhance the teaching and learning process in a specific field of knowledge while acknowledging the uniqueness of each learner. Chatbots are becoming increasingly prevalent in contemporary life, with applications ranging from personal assistants on mobile devices to providing technical assistance over the phone lines in various sectors, including business, retail, health, and education. Unlike other fields, the application of chatbots in education requires careful pedagogical considerations. This article outlines a theoretical framework and theories used in developing a chatbot for the Malaysian University English Test (MUET) learning and testing, incorporating the ELTC (Education, Learning, Teaching, and Communication) Framework. The four underpinning theories of the theoretical framework in this study are education theory, language theory, technology theory, and communicative theory. The education theory adopted in this study is Lev Vygotsky's Social Constructivist Theory, aligning with the ELTC Framework's focus on active learning and interaction. The language theory involved is Krashen's Second Language Acquisition. Meanwhile, the technology theory includes Bower's Technology-Mediated Learning Theory and George Siemens's Connectivism Theory, resonating with the ELTC Framework's emphasis on utilizing technology for effective learning. The communicative theory, which highlights Social Presence Theory, underscores the importance of meaningful interaction in language learning. The suggested theoretical framework may be utilized as a reference for developing chatbot intelligent teaching systems. The chatbot can be expanded to other courses in future research. The assessment of the chatbot could be conducted with different participants and customized to meet the requirements of various learners with varying levels of language proficiency.

Keywords: Intelligent Tutoring Systems, Chatbot, MUET, Theories, Language Testing

Introduction

Educational technology has played a pivotal role in transforming standardized language testing. The integration of technology in language testing has been a catalyst for enhancing the efficiency and effectiveness of assessment, creating sustainable improvements (Norris, 2023; Hartono, 2020). Lee (2021) has emphasized the profound impact of technology integration in language testing, which has opened the doors to flexible and personalized test

administration, real-time student progress monitoring, and instantaneous test feedback, thereby enriching the landscape of learning and teaching (Brunfaut, 2023). Such technological advancements empower educators to tailor their instruction to the unique needs of individual students, address specific learning gaps, and ultimately elevate the overall learning experience, thereby propelling student achievement (Office of Education Technology, 2017).

The foundation of scientific inquiry relies on theories, which are comprehensive explanations of natural or social phenomena and actions (Kivunja, 2018). Luk (2017) and Udo-Akang (2012) define scientific theory as a collection of constructs (principles) and propositions (relationships between those constructs) that provide a rational, structured, and coherent explanation of relevant phenomena, all within certain preconceptions and limitations. Chiu et al (2022); Lodico et al (2010) explained that the utilization of theories in research carries multiple advantages. Firstly, theories unveil the underlying principles governing natural or human events, elucidating the fundamental factors and outcomes associated with predictive tasks and the variables that regulate these occurrences. Secondly, theories facilitate a deeper understanding of previous empirical findings by assimilating them into a theoretical framework and resolving inconsistencies by identifying contextual variables that influence the relationship between various factors across different studies. Thirdly, theories guide future research by aiding in the identification of hypothesized components and connections. Finally, theories contribute to the accumulation of knowledge by establishing connections with other concepts and encouraging the re-evaluation of existing theories in innovative ways (Lodico et al., 2010).

Concurrently, a theoretical framework encompasses essential concepts, definitions, and established theories that are pertinent to the study (Kivunja, 2018). Grant and Osanloo (2014) aptly liken the understanding, selection, and integration of a theoretical framework to the process of drafting the blueprint for a home before construction begins. The theoretical framework serves as the supporting structure for the theory underpinning a research investigation, offering the conceptual framework for comprehending why the research problem exists.

This study leveraged theories to develop a chatbot application for language learning and testing, aiming to provide adaptive teaching and personalized support through a web-based intelligent tutoring system. In pursuit of this goal, the research project introduced MUETBot, a chatbot meticulously designed to enhance the teaching and learning experience of the Malaysia University English Test (MUET).

Literature Review

The Malaysian University English Test (MUET) plays a pivotal role in the English Language Education Reform in Malaysia: The Roadmap, 2015-2025, aimed at enhancing English proficiency among Malaysians (Ministry of Education (MOE), 2019). MUET serves as a mandatory English language proficiency examination for students aspiring to pursue bachelor's degrees in both public and private Malaysian universities and colleges (Malaysian Examinations Council (MEC), 2020). A review of statistics from the MUET March 2019 session, published on the official portal of the Malaysian Examination Council, reveals a notable pattern: out of 49,081 candidates who undertook the test, a mere 1.56% scored at Band 1;

28.85% achieved Band 2; 48.79% secured Band 3; 19.67% earned Band 4; only 1.12% managed to reach Band 5, with a disheartening 0% reaching Band 6. These figures unequivocally highlight that a significant proportion of test-takers exhibit only modest English proficiency, marked by limited fluency and appropriacy (MEC, 2020), with the ability to understand English but coupled with a tendency for misinterpretation.

Several factors contribute to the stagnation of MUET performance, despite consistent educational efforts. Firstly, current MUET materials are predominantly limited to textbooks, worksheets, and online resources (Amylia et al., 2017), failing to provide students with in-depth strategies for excelling in the four components of MUET. Furthermore, the limited time allocated for MUET preparation in schools and higher education institutions poses a significant obstacle, leading to a decrease in motivation among MUET test-takers (Yabis & Hamid, 2023). The MUET Test Specifications and associated circulars stipulate a clear requirement of "240 hours of instructional time spread over three school terms" and eight 40-minute sessions per week (MEC, 2020). However, the stark reality in most schools is that English teachers often do not prioritize MUET preparation (Parnabas, 2022).

Thus, there is an urgent need to offer students opportunities to prepare for MUET beyond the classroom. To address this need, the researcher aims to develop a chatbot to facilitate MUET teaching and learning. Beyond its role in enhancing teaching and learning, providing online support through a chatbot allows MUET test-takers to gain an understanding of the test format for different papers, master strategies for answering questions, and resolve challenges in the learning process. Consequently, it is essential to elucidate the theoretical underpinnings guiding the development of this chatbot.

In alignment with the concepts of Industrial Revolution 4.0, there has been a surge in the utilization of web-based intelligent tutoring systems (ITSs) to support instructional procedures and assist students in adaptive navigation of online learning resources (Meltem and Afaf, 2020). Intelligent Tutoring Systems (ITSs), as defined by Pedrag et al (2016); Goswami et al (2019), are sophisticated, integrated application software employing artificial intelligence (AI) principles and methods to provide personalized instruction to learners, facilitating effective and meaningful learning experiences. These systems enable students to seek models appropriate to their knowledge levels and employ learning strategies to enhance or revise their understanding. Jakobsche et al (2023); Chrysafiadi and Virvou (2014) emphasize that ITSs can revolutionize remote learning, providing easy access to knowledge across diverse fields and educational experiences, accessible at any time, catering to learners with varying backgrounds, needs, preferences, and characteristics.

Among ITSs, educational chatbots have gained prominence in various domains, from personal assistants on mobile devices to providing technical support in businesses, retail, healthcare, and education (Sari et al., 2020; Anshu et al., 2021; Kavitha & Murthy, 2019; Wollny et al., 2021). Chatbots represent computer-assisted programs that accept human requests through text or voice using machine learning and natural language processing. In the educational context, chatbots stand out by employing algorithms to understand requests and deliver responses post-processing; hence, educational chatbots demand meticulous pedagogical considerations to ensure their efficacy.

Analysis

The ELTC framework at the heart of this study is supported by four crucial theoretical pillars: education, learning, teaching, and communication theories. These theories together form the guiding principles for developing the chatbot for MUET learning and testing.

The learning theory is based on Lev Vygotsky's Social Constructivist Theory, highlighting the collaborative nature of learning. The technology theory incorporates Bower's Technology-Mediated Learning Theory and George Siemens's Connectivism Theory, emphasizing the role of technology in mediating learning and the importance of digital resources. Krashen's Second Language Acquisition theory informs the language aspect, focusing on natural language acquisition and comprehensible input. Additionally, Social Presence Theory (SPT) emphasizes the perceived presence of others in mediated communication, enhancing the interpersonal aspects of digital education. This comprehensive framework ensures the chatbot aligns with best practices in education, technology, language learning, and effective communication, promising an enriched learning experience for MUET test-takers.

Learning Theory

Social Constructivist Theory

Social constructivist theory, pioneered by Lev Vygotsky in 1968, contends that effective learning occurs when learners emphasize interaction, collaboration, and group work as integral components of the learning process (Vera et al., 2020). According to Vygotsky (1978), social constructivism involves "a social group collectively crafting things for each other, collaboratively building a small culture of shared artifacts with shared meanings." As McKinley (2015) points out, social constructivism is a social and philosophical approach that posits human development as socially oriented, and knowledge as a product of interactions within one's culture and society. Through social negotiation and the exchange of ideas, individuals acquire new information and expand their existing knowledge.

Vygotsky introduced the concept of the Zone of Proximal Development (ZPD), which denotes "the gap between the actual developmental level, determined through independent problem-solving, and the potential development level, determined through problem-solving with adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). He emphasized that learners should be instructed within their ZPD, with the teacher assuming the role of the more knowledgeable other who recognizes the learner's ZPD and provides support for them to overcome it. Subsequently, the teacher gradually reduces assistance until the student becomes capable of performing the task independently.

Zone Of Proximal Development

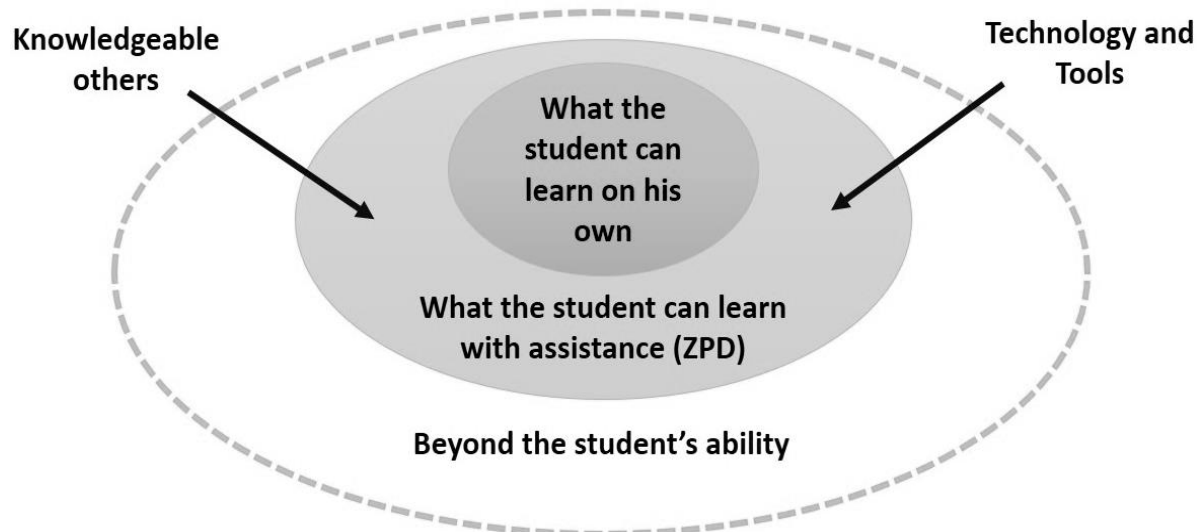


Figure 1. Model of Vygotsky's zone of proximal development.

As an interactive learning assistant, a chatbot can provide a conducive platform for students to acquire new information through interactions with experts in specific subjects, offering intelligent responses in natural language (Nuria, 2019). In contrast to traditional printed MUET materials, which primarily focus on exam tips and MUET skills, the chatbot provides an additional space where students can engage in conversations and pose questions on the subject matter. When students send a message to the chatbot, it processes the message using Natural Language Processing (NLP) and responds based on its existing database. Students can enhance their learning by engaging in guided discussions, focusing on specific topic areas throughout their conversation with the chatbot. This feature makes it a powerful tool for increasing student engagement, aiding retention, fostering the exchange of ideas, and actively involving learners in the learning process.

Additionally, the chatbot serves as a means of delivering course content, including syllabi, questions, and other relevant materials. Teachers can use chatbots to convey concepts and share course content with their students. In this scenario, students become actively engaged in the learning process and take ownership of their education. They acquire information through an open inquiry approach while using chatbots for learning. Within their zone of proximal development, students are provided with opportunities to process information, ask questions, solve problems, and make decisions with the assistance of the chatbot. Teachers can scaffold the learning environment for their students and design appropriate tasks to facilitate student learning through the chatbot application.

Technology Theories

Technology-Mediated Learning Theory

Technology-mediated learning is a relatively recent concept in remote education. Bower (2019) provides a definition of technology-mediated learning (TML) as an "umbrella" term that encompasses a variety of strategies for utilizing computers in education. These strategies include computer-assisted learning (CAL), computer-supported research tools, computer-

mediated communication (CMC), and generic computer-based production and presentation tools (Shield, (n.d.)). In contrast, Alavi and Leidner (2001) define TML as "an environment in which advanced information technology facilitates the student's interactions with educational resources, peers, and instructors." They further assert that, in technology-mediated learning settings, it is humans, not technology, who control the intentional use of technology. In other words, individuals gain mastery over the information transmitted by technology.

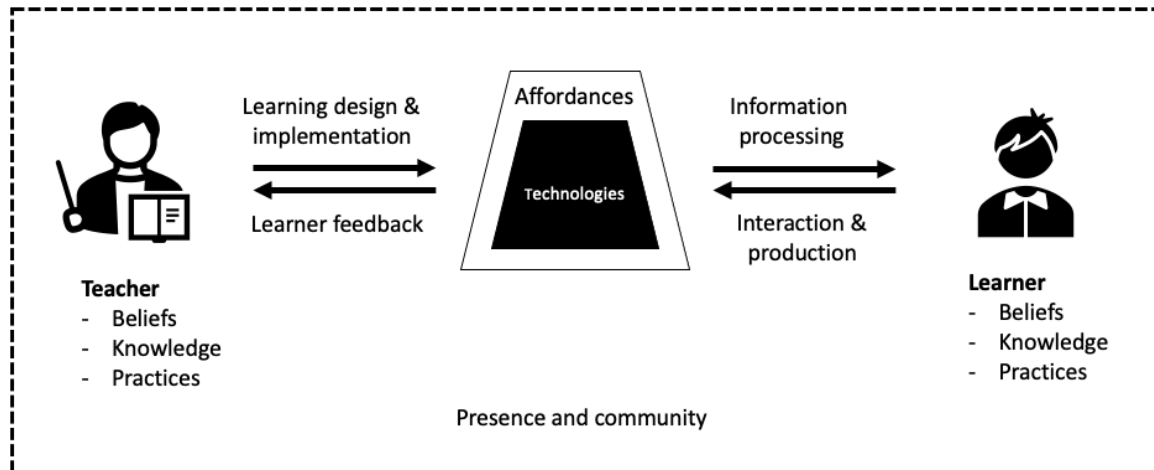


Figure 2. Schematic representation of technology-mediated learning theory (Bower, 2019)

TML theory examines how technology influences and mediates the learning process. Bower (2019) emphasized the role of digital technology as a mediator in helping participants achieve their learning objectives. In technology-mediated learning settings, participants' attitudes, knowledge, behaviors, and environment influence each other (Oliver and Herrington, 2003). Teachers play a crucial role in assisting students in achieving improved learning outcomes and experiences through the judicious use of learning technologies (Ghavifekr and Rosdy, 2015). The affordances of the technologies used determine the types of representation, interaction, production, and learning that can occur (Badia et al., 2011). The ways in which modalities are used and combined affect how information is processed, interpreted, produced, and linked (Bower, 2019). How technology mediates interaction patterns and opportunities among networks of participants impacts the amount of learning that takes place. Finally, the organization of technology and its usage influences one's level of immersion and sense of togetherness.

Ahmad (2023); Mayer and Schwemmler (2023) posited that TML can meet the needs of learners who engage in flexible, remote, and open learning, reaching a wider range of geographically and educationally diverse learners than conventional face-to-face or distance courses, all while being cost-effective. Mayende et al (2014) further asserted that because TML is delivered via specialized computer technologies, the teacher and learners do not need to be in the same place at the same time. TML aligns with the preferences of learners who are comfortable with technology in today's educational landscape. Learners in contemporary schools and educational institutions use technology for conducting research, completing course assignments, and accessing information. After classes, students may use technology

to search for materials that enhance their understanding of their study topics. In this context, technology is seen as mediating and facilitating learning.

TML can take various forms, one of which is chatbot-mediated learning (CML). CML is primarily web-based, synchronous, self-paced, and student-centered (Bower, 2019). It offers a unique personalized learning experience where students can actively use chatbots in their learning process to enhance the quality and outcomes of their learning. In this study, the researcher specifically designed the chatbot for teaching and learning MUET, with a focus on listening and reading skills. The chatbot is equipped with features such as instructions, practice exercises, assessments, and reinforcement of MUET content. As a result, students can interact with the chatbot, ask questions, navigate different sections such as practice exercises and assessments, process information, and enhance their MUET skills.

Connectivism Theory

George Siemens pioneered connectivism theory in 2005 as a learning theory for the digital age. Learning theories in the digital age are becoming increasingly student-centered and output-oriented. They prioritize the acquisition of skills and abilities over the mere collection of knowledge with no practical application (Harasim, 2017). Bell (2011) also contends that connectivism serves as a learning theory that can revolutionize learning in various digital contexts. Connectivism results in new pedagogies in which authority shifts from the instructor to the students (Kop and Hill, 2008), reminiscent of the constructivist shift advocated by networked learning (Goodyear et al., 2001). Teachers can replace traditional lectures with active learning, incorporate self-paced learning programs, and ultimately empower students to take responsibility for their educational progress by enabling them to create their learning experience.

Siemens (2005) has examined critical educational developments that should be considered in a modern educational environment. To begin, it's essential to recognize that the scope of applications for acquired knowledge continues to expand. Informal learning is also gaining popularity. Furthermore, learning is an ongoing process that occurs throughout one's life. Both organizations and individuals are continual learners. Additionally, technology has the potential to support a wide range of learning processes. Lastly, knowing where to find information is crucial. In contrast, traditional classroom teaching and one-way lecturing can make it challenging to keep up with changing trends.

According to Siemens (2005), there are several principles of connectivism theory. First, learning and knowledge require a variety of viewpoints. Second, learning is the process of establishing connections between specialized nodes or sources of knowledge. Third, learning can take place within non-human devices, such as a network. Moreover, the ability to expand one's knowledge is more valuable than current knowledge. Additionally, connections must be nurtured and maintained to facilitate ongoing learning. Learning involves the ability to make connections across disciplines, ideas, and concepts. Each connectivism learning activity aims to enhance currency or transfer current and accurate information. Lastly, decision-making is an integral part of the learning process, as learning content and the interpretation of incoming information are influenced by a changing environment. What is considered correct today may become incorrect tomorrow when the information landscape evolves.

Meanwhile, Downes (2007) defines connectivism as the idea that knowledge is made accessible through a network of connections, and learning is the ability to build and traverse such networks. Connectivism is a pedagogical approach that focuses on effective networks and the behaviors that result from them, both in individuals and society. Downes also emphasizes that a teacher's primary role is to provide the initial learning environment and context that connects learners and to assist learners in establishing the learning settings that enable them to connect to successful networks. In this way, learning occurs naturally due to exposure to information flow and individual autonomy (Downes, 2007).

The principles of connectivism align well with chatbot technology in this context. Connectivism views chatbots as essential and effective educational tools in the modern educational setting. It encourages educators to explore and empower students to design their learning experiences. This approach extends learning activities beyond the classroom and promotes the idea that technology can be a helpful resource rather than a hindrance.

Technological Pedagogical Content Knowledge (TPACK) Framework

The TPACK framework, which emphasizes technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK), delineates the types of knowledge educators need to effectively employ educational technology in their classrooms. According to this framework, teachers must understand how technology impacts both pedagogy and content. The successful use of educational technology necessitates a blend of technological, content, and pedagogical expertise. By distinguishing these three knowledge types, the TPACK framework demonstrates that content and pedagogy should form the basis for any meaningful integration of technology in education (Koehler and Mishra, 2009). This sequence is crucial because technology should convey content and complement pedagogy to enhance students' overall learning experiences.

According to the TPACK framework, the optimal utilization of technology tools is for educating and guiding students toward a deeper understanding of the subject matter (Koehler and Mishra, 2006). Within the TPACK framework, the three knowledge types—TK, PK, and CK—are interconnected and interrelated in various ways. First, technological pedagogical knowledge (TPK) pertains to the interplay between technological tools and specific pedagogical techniques. Meanwhile, pedagogical content knowledge (PCK) is the connection between pedagogical methods and specific learning objectives. Finally, technological content knowledge (TCK) refers to the intersections and overlaps between technology and learning objectives. These three categories are then combined to form TPACK, which recognizes the connections between these categories and acknowledges that educators operate within a complex environment.

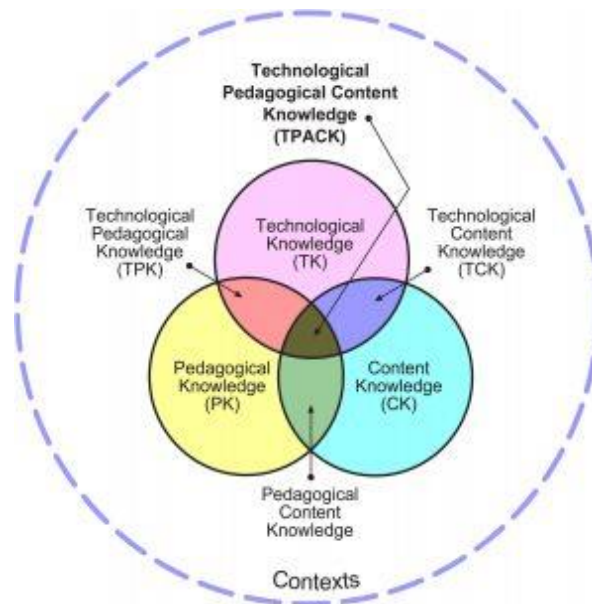


Figure 3. TPACK Framework (Mishra and Koehler, 2006)

Effective technology use in the classroom requires an understanding of the dynamic, transactional relationship between content, pedagogy, and the technology employed—all within the context of different schools, classes, and communities (Ponnaiah & Abdul Aziz, 2022). Teachers must realize that teaching methods are shaped by knowledge based on content, pedagogy, and technology. As a tool to facilitate student learning in MUET, chatbots serve as promising instructional technology for integration into the educational setting. In this study, the chatbot complements and augments the teacher's role. Pedagogical considerations must be integrated into the chatbot's design. This allows teachers and students to efficiently achieve learning objectives based on the teacher's pedagogical guidance in developing and instructing the chatbot. Teachers can configure the chatbot for instruction, demonstration, practice, and assessment and guide students in mastering the content. With the chatbot specifically designed for MUET learning, students can easily navigate the skills they want to improve, pose questions to the chatbot, and receive necessary feedback to support their learning.

Language Theory

Stephen Krashen developed the Second Language Acquisition (SLA) hypothesis in 1981, in which he emphasized five critical theories regarding SLA: the acquisition-learning distinction, the natural order hypothesis, the monitor hypothesis, the input hypothesis, and the affective filter hypothesis. In this literature, the researcher focuses on the acquisition-learning distinction and the input hypothesis.

The Acquisition-Learning Distinction

Krashen (1987) distinguishes between language learning and language acquisition. According to him, language learning is "conscious knowledge of a second language, understanding the rules, being aware of them, and being able to speak about them" (p.6). On the other hand, language acquisition is a subconscious process of picking up a language in which the acquirer is not consciously aware of the grammatical rules of the language (Cherifi, 2015; Krashen, 1982). Language acquirers are unaware that they are acquiring a language and are only

conscious that they are communicating in it. Krashen emphasizes that language acquisition is more crucial than language learning because the former establishes linguistic competence, which impacts fluency. He highlights that learned language competence can only modify the language produced by acquired language competence (Cherifi, 2015; Tricomi, 1986).

Both acquisition and learning play a role in developing language competency in English teaching and learning. Learning English in the classroom allows students to receive clear feedback from instructors. In the formal classroom, instructors help students learn the language by providing input and assisting them in understanding the language's rules. This ensures that students can use the language correctly in terms of grammar, vocabulary, and sentence structure. However, by incorporating a chatbot into the teaching and learning of English, students may be able to acquire the language throughout the learning process. Chatbot environments immerse students in situations where they must interact with a programmed system to complete tasks and solve problems.

The Input hypothesis

According to Krashen (1987), the Input hypothesis elucidates the process through which a person acquires a second language. It is concerned only with 'acquisition,' not with 'learning.' According to this idea, when a student receives 'input' in a second language that is one level beyond their current level of linguistic competence, the student improves and progresses along the 'natural order.' For instance, if a learner is at stage i , acquisition happens when the student is exposed to 'Comprehensible Input' from level $i + 1$. Since not all learners are at the same level of linguistic competence simultaneously, Krashen believes that the key to developing a syllabus is to ensure that each student receives some ' $i + 1$ ' input appropriate to their current stage of linguistic ability.

The chatbot developed in this study provides students with customized MUET courses and practices tailored to their specific needs. It is a versatile platform that allows students to progress at their own pace, based on their preferences and current levels. As a result, students can master MUET skills as they advance through the levels. Furthermore, the chatbot enables students to receive personalized assistance while refining their language skills in a supportive environment. By engaging with the flexible chatbot, students receive second language 'input' that is one step above their current level of linguistic aptitude and can practice acquiring linguistic competence.

Communication Theory

Social Presence Theory (SPT), initially formulated by Short, Williams, and Christie in 1976, highlights the importance of others' visibility in mediated communication settings and its substantial impact on relationships. This theory provides a significant foundation for comprehending how communication tools, such as chatbots, can either enhance or reduce the experience of social presence, ultimately shaping the quality of conversation and learning outcomes. Gunawardena's (1995) modern interpretation of SPT emphasizes the importance of recognizing the existence of a "real person" in mediated communication (Bickle et al., 2019). Significantly, in the context of computer-mediated communication, social presence is identified as a crucial factor in determining audience satisfaction.

In the context of MUET learning, the utilization of SPT in chatbot-assisted learning encounters is quite relevant. The significance of learners viewing a chatbot as a "real person" within the mediated communication process is emphasized by SPT. The objective is to improve learners' perception of interacting with a human-like educational agent by incorporating this principle into the development of chatbots for MUET. This can result in a more engaging and efficient learning experience as learners actively interact with the chatbot, pose questions, and receive responses that mimic human interaction. The chatbot's ability to create a feeling of social presence can greatly enhance the effectiveness of communication and eventually enhance the learning outcomes of students who interact with the chatbot while striving to learn MUET.

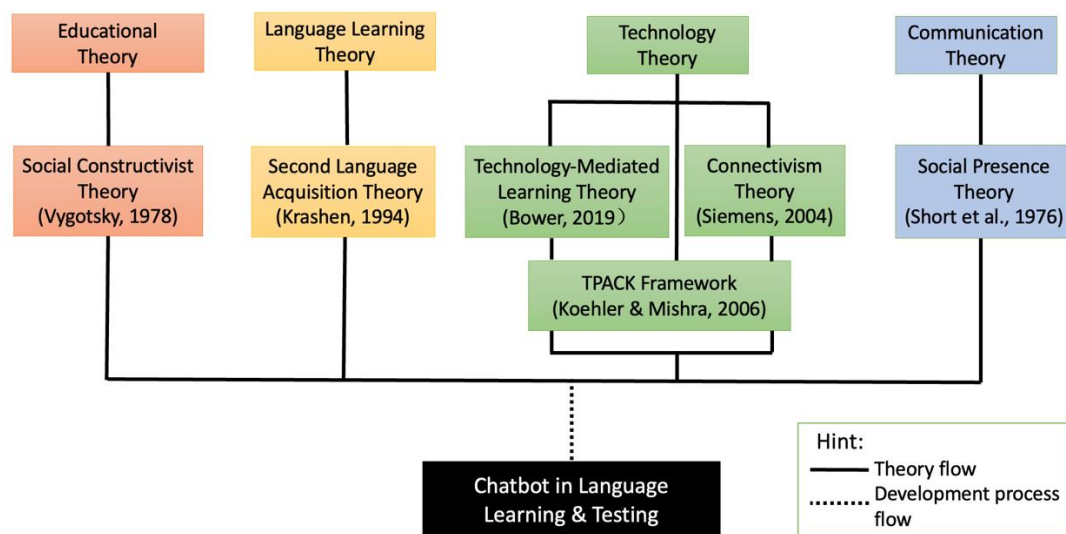


Figure 4. Theoretical Framework

Figure 4 illustrates the theoretical framework underpinning this study, providing a comprehensive insight into the theories and concepts that are integral to the utilization of chatbots in MUET learning and testing. Four primary theories, including learning theory, technology theory, language learning theory, and communication theory, together form the foundation of this framework. The integration of chatbots into MUET learning and testing is harmonious with Vygotsky's Social Constructivist Theory. Through interactions with the chatbot as a pedagogical agent, students engage in idea exchange, construct new knowledge, and expand upon their existing knowledge. The chatbot serves as a platform for students to ask questions, address issues encountered in their MUET studies, access new information, and make decisions within their zone of proximal development.

Bower's Technology-Mediated Learning Theory and George Siemens's Connectivism Theory also lend support to the application of chatbots in MUET learning and testing. Chatbot technology mediates learning by enabling students to interact with the chatbot to seek information, practice their MUET skills, and broaden their knowledge beyond regular class hours, making learning possible at any time and place, even in the absence of a teacher.

Furthermore, connectivism views chatbots as a crucial and effective educational tool, empowering both educators and students to explore new educational avenues and

encouraging students to perceive technology as a valuable asset. Consequently, teachers must adhere to the established framework for Technological Pedagogical Content Knowledge (TPACK) (Koehler and Mishra, 2009). This framework assesses teachers' capacity to effectively blend pedagogy and technology, such as chatbots, to convey specific subject matter. By merging pedagogy, technology, and content knowledge, while also incorporating other well-established learning theories and connectivism, the current teaching and learning process is enriched (Padmavathi, 2017).

The chatbot's design additionally places emphasis on the acquisition-learning distinction and Krashen's Second Language Acquisition Theory's input hypothesis to ensure students effectively acquire language skills. A focus on communication theory underscores the role of chatbots in fostering social presence.

The researcher believes that the chatbot, developed within the framework presented above, has the potential to serve as an invaluable pedagogical tool to support the teaching and learning of MUET. By integrating chatbots into MUET learning and testing, they can act as teaching guides and assistants throughout the learning journey, facilitating tasks such as information retrieval, knowledge dissemination, and enhanced comprehension.

Conclusion

In conclusion, the integration of the ELTC framework is of paramount significance in the design and development of a chatbot tailored for MUET learning. Just as a building requires a well-structured blueprint, the research rests upon a robust theoretical framework that not only supports the study but also ensures coherence and structure in various aspects, including the problem statement, rationale, research objectives, study significance, and research questions (Grant and Osanloo, 2014).

Within the ELTC Framework, the researcher seamlessly embedded key theories that encapsulate the essence of education, learning, teaching, and communication. These encompass Lev Vygotsky's Social Constructivist Theory, Bower's Technology-Mediated Learning Theory, George Siemens's Connectivism Theory, Krashen's Second Language Acquisition Theory, and Social Presence Theory. This comprehensive theoretical foundation serves as the guiding light for the chatbot's development and its potential expansion into diverse educational domains in future research. Additionally, it underscores the chatbot's adaptive nature, ensuring it can effectively cater to the distinct needs of learners at various language proficiency levels.

This research makes a substantial theoretical contribution by synthesizing key educational theories, including Social Constructivist Theory, Technology-Mediated Learning Theory, Connectivism Theory, Second Language Acquisition Theory, and Social Presence Theory, within the ELTC Framework. This innovative integration provides a comprehensive foundation for the development of a chatbot tailored for MUET learning and transcends traditional language pedagogy. The amalgamation of these theories not only addresses the intricacies of MUET learning but also establishes a versatile blueprint applicable to a broader educational spectrum, influencing the ongoing discourse on effective language pedagogy in the digital age.

In a broader contextual sense, the ELTC Framework contributes to the evolving landscape of educational technology and language pedagogy. Beyond immediate applications in MUET, its adaptability to different language proficiency levels positions it as a valuable asset in various language education scenarios. Furthermore, the framework serves as a benchmark for future developments in intelligent chatbot teaching systems, offering insights into the dynamic interplay between technology, social interaction, and individual cognitive processes. As educators and researchers explore the possibilities of the ELTC Framework, its implications extend beyond language learning, influencing the design of intelligent tutoring systems and personalized learning environments, thus redefining the way we conceptualize and implement technology-enhanced learning experiences.

In summary, the proposed theoretical framework serves as a valuable reference for the creation of intelligent chatbot teaching systems, extending its utility well beyond the current context. As the researcher charts the path for future research, there is an anticipation of broadening the chatbot's assessment to include a diverse range of participants to maximize its educational impact. The chatbot's flexibility and customization capabilities remain essential in meeting the unique requirements of learners at different language proficiency stages, thus solidifying its position as a versatile educational tool.

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