Research on the Construction of Mobile Terminal Assisted Language Learning Model Based on Artificial Intelligence Technology

Yiqiao Deng*, Chengchen Wu

Jincheng College Nanjing University of Aeronautics and Astronautics, Nanjing, Jiangsu, China

Abstract: This paper aims to construct a mobile terminal-assisted language learning model based on artificial intelligence technology. It provides an overview of the development of language learning research and introduces the evolution from computer-assisted language learning to mobile-assisted language learning. Regarding the characteristics of artificial intelligence technology, this paper explores its learning ability, automation, simulation of human intelligence, multifunctionality, and efficiency. By using AI technologies natural, such as language processing, data-driven learning, intelligent tutoring systems, and chatbots, language learners can access personalized guidance and achieve more efficient learning outcomes. Mobile terminal-assisted language learning offers advantages such as flexibility, easy access to resources, individualized learning, simplified learning content, interactivity, and contextual learning. The significant findings of this study emphasize the advantages of mobile terminal-assisted language learning, including portability, access to authentic materials, interactivity, and collaborative learning. An outlook on the future development of personalized tutoring in language learning is also provided in this paper, which aims to assist the effectiveness and efficiency of language learning.

Keywords: Artificial intelligence; Mobile terminal-assisted; Language learning; Model designing

1. Introduction

1.1 The Development of Language Learning Research

From the 18th century to the early 19th century, linguistics mainly focused on the structure and rules of language and the historical evolution of language. It is necessary to remember that the 19th century was not dominated, culturally, by the emergence of evolutionary theory, but, on the contrary, by a very conservative, theological view of nature, according to which the Bible was the basic source for knowledge, and thus also for science[1].

In the early 20th century, behavioral psychology had a far-reaching influence on linguistic research. Behaviorists believe that language learning is carried out through stimulation and response, and they mainly pay attention to the process of language acquisition. Representative studies include Skinner's theory of operant conditioning.

In the mid-20th century, researchers began to pay attention to the internal mechanism and laws of language acquisition and explore the relationship between language acquisition and language use. According to Crystal (1985:5), "Language acquisition refers to the learning of a linguistic rule", i.e., the rule of grammar, phonology or semantics, and language development implies the further use of this rule in an increasingly wide range of linguistic and social situations. [2].

From the end of 20th century to the beginning of 21st century, social-cultural linguistics has become the main research trend. This theory holds that language acquisition is carried out in a social and cultural environment and is influenced by social and cultural factors [3]. Researchers began to pay attention to the relationship between language acquisition and identity, social interaction and other factors.

1.2 The Development Process from CALL to MALL

Computer-aided language learning (CALL) refers to the method of using computer technology to assist language learning. With

the popularity of mobile devices and the development of mobile Internet, mobile assisted language learning (MALL) has gradually become one of the hot spots in the field of language learning. The following is the development process from computer-assisted language learning to mobile-assisted technology-assisted language learning can be divided into four stages: Computer-aided language learning, Network-assisted language learning, Mobile-assisted language learning, and Personalized tutoring language learning. The earliest appearance of computer-aided language learning is to help learners with language learning through software on personal computers, such as language learning software and online courses[4]. With the popularity of the Internet, network-assisted language learning has become the mainstream. Learners can get more learning materials and communication opportunities through online resources, such as online courses and language exchange communities. With the popularity of smart phones and tablets, mobile-assisted language learning has begun to rise. Learners can learn language through mobile devices anytime and anywhere, such as using language learning App and listening practice App.[5] The future development direction is personalized tutoring language learning.[6] Through artificial intelligence and big data technology, customized counseling services can be provided according to learners' individual needs and learning conditions to help learners learn languages more efficiently.

2. Application and Development of Artificial Intelligence Technology in Language Learning

Artificial intelligence technology has so many advantages that facilitates people in their daily life. It can learn and adapt to new situations and problems according to a large amount of data, and constantly improve its performance and efficiency.[7] Artificial intelligence technology can automatically complete complex tasks and decisions, reducing labor and time costs. Artificial intelligence technology can be applied to many fields, such as medical care, finance, transportation, etc., to solve various practical problems, and also can efficiently handle large-scale data and complex tasks, and improve work efficiency and accuracy. Artificial intelligence technology can

simulate human thinking and behavior, and realize the cognitive and decision-making process similar to human beings. Nowadays, AI technology assisted language leaning has become a more and more popular study. Scholars and technicians tried to use different AI technologies to help language learning.

2.1 Natural Language Processing

Natural Language Processing (NLP) enables machines to comprehend human language and is employed to enhance AI as a valuable tool for language learning[8]. One significant application of NLP is machine translation (MT), which involves the automatic conversion of text from a source language to a target language[9]. Previous research in the field of NLP has focused on various areas, including methods for assisting learning and providing learner feedback improving the analysis of learner input across different tasks and optimizing processing architectures[10]. The researchers have also explored the potential of computer systems to generate activities using pedagogical techniques such as questioning, commonly employed by teachers [11].

2.2 Data-Driven Learning

Data-Driven Learning (DDL) in language learning is facilitated by the utilization of corpora, which allows students to explore and investigate patterns naturally occurring in their target language. Corpora provide learners with authentic linguistic data, enabling them to analyze and learn from real-life language usage [12]. In research, efforts have been made to enhance the implementation of DDL in practical language learning contexts.

For instance, researchers have focused on leveraging corpus data for tasks such as essay writing correction [13], scientific report writing [14], and extensive reading[15].

2.3 Intelligent Tutoring Systems

Intelligent Tutoring Systems (ITSs) are computer systems specifically designed to deliver personalized and interactive instruction to students without the need for human intervention. These systems have been widely adopted in the field of language education and are considered one of the primary applications of AI in this domain. In the context of English as a Foreign Language (EFL), ITSs aim to

support foreign language learning effectively and efficiently[16]. They can serve as supplementary tools to traditional instructional approaches or function as standalone applications for self-study.

2.4 Chatbots

A chatbot, also referred to as a bot, chatterbot, dialogue system, conversational agent, virtual assistant, or virtual agent, is a software application designed to engage in conversations with users through chat interfaces

The emergence of ChatGPT has garnered significant attention across diverse domains. This language model demonstrates the capacity to generate comprehensive written responses by leveraging extensive databases. With meticulous planning and application, ChatGPT presents a promising avenue for language educators to enrich language instruction and foster an immersive and captivating language learning environment for their students.

3. A Review of Empirical Studies on Mobile Terminal Assisted Language Learning

3.1 Characteristics of Mobile Terminal Assisted Language Learning

The theory of Mobile-Assisted Language Learning (MALL) encompasses the utilization of mobile devices, including smartphones and tablets, to facilitate and enhance language learning. MALL is a subset of technology-enhanced language learning (TELL), rooted in the concept that mobile technologies offer learners flexible and convenient opportunities to engage with language materials and activities

Mobile devices provide learners with the capability to access authentic language materials, such as videos, podcasts, and online articles. This access facilitates exposure to genuine language usage and diverse linguistic contexts, enabling learners to encounter language as it is used in real-world situations. Mobile applications and platforms often incorporate interactive features. Such as quizzes, games, and communication tools, to enhance learner engagement and motivation. Mobile devices facilitate communication and collaboration among language learners and with speakers of the target language. This can include language exchange apps, online

language communities, and collaborative learning activities. Mobile technologies can adapt to individual learners' needs through features. Such as adaptive learning algorithms, tracking progress, and providing customized feedback. We can get a clearer picture of its characteristics through the table1.

Table 1. Features of Mobile Learning

Features	Contents
Mobility of learning spaces	Learning function through free movement without space restrictions Expanding learning places and experience opportunities
Flexibility and easy access to resources	Fast and flexible access to a variety of learning resources Timely learning is possible with instant access to the desired learning materials
Individualized learning topic	Customized learning tailored to the characteristics of the learners Personalized learning that meets the needs of learners
Simplicity of learning content	Systematic, structured, simplified, and modularized learning contents Provide learning focusing on concise and condensed core contents
Interactivity with learning objects	Changes in tools and methods of interaction Cooperative learning possible through immediate interactions

3.2 Advantages of Mobile Terminal Assisted Language Learning

Mobile terminal assisted language learning has the advantage of Mobile Portability. Mobile devices, such as smartphones and tablets, offer the advantage of portability. Learners can carry these devices anywhere, allowing for on-the-go language learning opportunities. This portability enables learners to engage in language learning activities anytime and anywhere, maximizing their learning time and flexibility.

Mobile terminal assisted language learning can personalized learning experiences. Mobile devices offer personalized learning experiences through adaptive learning apps and tools. These applications can tailor content, exercises, and assessments based on learners' proficiency levels, interests, and learning goals. Personalization enhances engagement, motivation, and the effectiveness of language learning by providing targeted and relevant content to individual learners.

Mobile terminal assisted language learning can feedback mechanisms. Mobile devices enable

immediate feedback on language performance. Language learning apps can provide automated feedback on pronunciation, grammar, and vocabulary usage. This instant feedback helps learners identify and correct errors, reinforcing their language skills and promoting self-directed learning.

4. Designing of a Mobile Terminal Assisted Language Learning Model with Artificial Intelligence

4.1 Presentation of the Model Concept

With the rapid advancement of artificial intelligence technology, mobile terminal-assisted language learning models have emerged as a significant innovation in the field of language education. These models integrate key functionalities such as task-based learning, interactivity, and convenience, providing language learners with a new way of learning and an enhanced learning experience. Task-based learning allows learners to acquire practical and authentic language skills through the completion of real tasks. Interactivity, on the other hand, enables learners to interact with the model through intelligent dialogue systems and feedback mechanisms, receiving personalized guidance for their learning journey. The convenience of mobile terminals empowers learners to engage in language learning anytime, anywhere, making the most of fragmented time for knowledge accumulation.

4.2 Model Construction

4.2.1 Model Run Flow and Functions

Based on Figure1 we can find that AI in language teaching can provide more scientific and personalized guidance for students in the four aspects of listening, speaking, reading, and writing.
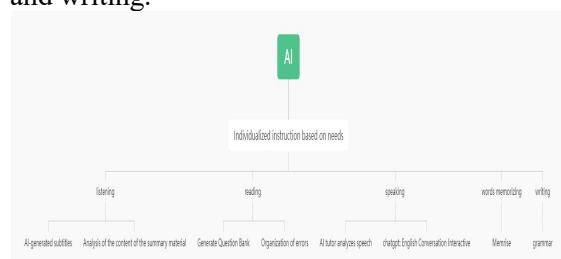

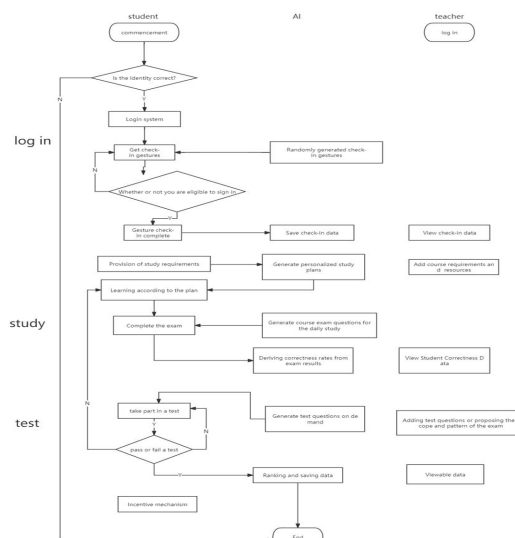**Figure 1: Advantageous Functions and Methods of AI for Language Teaching and Learning**

Figure 2: The Operating Principles of a Mobile Terminal Assisting Language Learning Model with Artificial Intelligence Technology

In terms of listening, AI can analyze learning videos of the target language, such as TED talks, and generate subtitles for learners to improve their listening accuracy. By organizing learners' listening materials, AI can classify and categorize them, as well as analyze errors to provide insights into the reasons behind mistakes.

In reading, AI can create a question bank with similar question types based on existing teaching materials and learners' error patterns, enriching the teaching resources and offering personalized analysis of learners' mistakes.

For speaking practice, AI tutors or chatbot plugins can be used to enable human-computer interaction. Learners can engage in conversations with AI to enhance their language learning abilities. AI can assess learners' performance based on their responses and provide feedback and suggestions for improvement.

In vocabulary learning, AI can employ techniques similar to Memorize, creating contextual scenarios to facilitate learners' acquisition. Additionally, by analyzing learners' learning habits and memory patterns, AI can generate personalized learning plans.

In writing, AI can first learn from a large number of exemplary essays and identify patterns to provide learners with excellent writing templates. Furthermore, learners can input their own essays into the model, and AI can analyze them, including word

segmentation, to correct grammar errors and offer suggestions for improvement in sentence structures and other aspects.

In summary, AI in language teaching can offer students more scientific and personalized guidance in listening, speaking, reading, and writing. By leveraging AI technologies, students can enhance their language skills in a more effective and tailored manner.
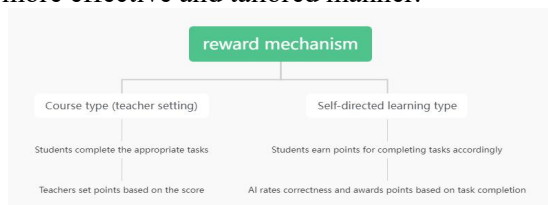

Figure 3. Flow of Operation of the Reward Mechanism

As shown in figure 3, the main purpose of the reward mechanism of artificial intelligence is to stimulate the enthusiasm of users to participate in learning and improve the activity and loyalty of users. After the user completes the task, the AI can analyze the user's feedback and comments through natural language processing technology to determine whether the user has actually completed the task and give the rewards accordingly.

In the course type set by the teacher, the teacher will give grades to the students after they complete the assigned practice tasks. The scores obtained by students can be converted into corresponding points, which can be used to redeem the number of times punched in the card or upgrade the user's level.

In the self-directed learning type, first of all, users enjoy a check-in reward, daily login to the app can get a check-in reward, continuous check-in can also get additional rewards. Secondly, users can customize tasks and get rewards for completing tasks, set tasks in the application according to their own needs, and artificial intelligence evaluates the accuracy rate and gives points according to the completion of tasks. AI can analyze users' needs and preferences through natural language processing technology and provide users with personalized reward choices. Finally, users can get rewards for referring friends, invite friends to sign up or use the app, and get rewards such as coupons and points.

4.2.2 The principles of the model
4.2.2.1 Machine Learning (ML)
Based on the steps in the Figure2, we can see

that there is a "training the model" process in both the testing and learning stages. This indicates the use of machine learning principles in this process. Machine learning (ML) is a branch of artificial intelligence (AI) and computer science that focuses on using data and algorithms to enable AI to imitate the way that humans learn, gradually improving its accuracy.

During the generation of the plan, both teachers and students need to input their learning requirements and corresponding course resources to the AI. Through continuous learning from the input provided by teachers and students, AI expands its understanding and ability to write learning plans, increasing its knowledge base for generating and analyzing plans. Additionally, based on the assessment accuracy of students' daily classroom tests, AI can help students adjust their learning plans through core learning algorithms. The goal of the learning algorithm is to optimize the parameters or internal settings of the model to minimize the difference between predicted outputs and actual data outputs. By continuously inputting suitable learning requirements, students enhance the learning capabilities of AI, ultimately optimizing the generated learning plans to gradually align with the expectations of the students, thereby achieving the effect of deep learning.

By training the AI model on data, the AI learns to recognize patterns or make predictions for students' learning needs and create learning plans. In this process, machine learning is used to train an AI so that it can classify new requirements or make recommendations in subsequent steps.

4.2.2.2 Natural language processing (NLP)
In the flowchart, we can also see a "text analysis" step. This indicates that the process may involve the principles of natural language processing. Natural Language Processing (NLP) is a field of artificial intelligence that focuses on enabling computers and digital devices to understand, interpret, and generate human language. It combines computational linguistics, which involves rule-based modeling of human language, with statistical and machine learning models to achieve this goal. NLP has various applications, such as text classification, sentiment analysis, machine translation, and speech recognition. During the

execution process, students or teachers input resources to the AI, and the AI selects and filters appropriate datasets from the input text, images, and other resources. The AI also needs to utilize natural language processing techniques that include functions such as tokenization, part-of-speech tagging, named entity recognition, and syntactic analysis to analyze the input resources and convert them into computer language.

During the generation of the plan, AI needs to generate personalized learning plans by combining the learning needs of both students and teachers. In the generation process, AI needs to apply NLP principles to extract key points from the input information and integrate them.

During the teaching process, AI needs to learn a large amount of material and organize and classify the input language resources. For example, in the testing phase, AI needs to process and translate the teacher-provided large question banks and generate new question types that meet the teacher's requirements. Additionally, AI needs to process the student's exam answers and compare them with the set answers to finally grade the student's performance.

4.2.2.3 Computer vision

Based on the steps in the flowchart, we can also see a "image processing" step. This indicates that the process may involve the principles of computer vision.

Computer vision is a field of artificial intelligence (AI) that uses machine learning and neural networks to enable computers and systems to extract meaningful information from digital images, videos, and other visual inputs. It allows them to make recommendations or take actions based on what they perceive from these visual inputs. In this process, a convolutional neural network (CNN) is utilized to "see" by breaking down images into pixels and assigning them tags or labels. These labels are then used to perform convolutions, which are mathematical operations on functions to produce a third function. By analyzing the convolutions, the neural network makes predictions about what it is perceiving in the images. The network continuously runs convolutions and iteratively checks the accuracy of its predictions until they align with the actual observations.

During the sign-in process, AI first generates random gestures for the learners to view within a specified time. In this step, a neural network is used to teach the computer to recognize the gestures performed by the learners and compare them with the generated gestures. This comparison helps determine whether the student has successfully signed in and decides whether the overall program should continue.

4.3 Technical Support

4.3.1 ChatGPT in language modeling

4.3.1.1 Language input and output

ChatGPT plays a crucial role in language transformation within the model, leveraging the principles of Natural Language Processing (NLP). It enables seamless communication with learners from different countries and language backgrounds by accepting input in their preferred language and providing feedback in a language they understand.

By utilizing NLP, ChatGPT has the capability to understand and generate text in multiple languages, making it a versatile tool for language learning. Learners can input their questions or statements in their native language, and ChatGPT will respond with relevant information or guidance in the same language. This ensures that learners can receive personalized feedback and assistance tailored to their specific linguistic needs.

Moreover, ChatGPT's adaptability allows learners to choose the output language they desire. They can opt to learn and practice different languages, receiving responses in those languages, or they can select a language they have already mastered to proofread and refine their written work. This flexibility empowers learners to explore and enhance their language skills in a way that suits their individual learning preferences.

4.3.1.2 Personalized learning

In this language learning model, Learners have the opportunity to communicate their language learning goals and interests to ChatGPT, which then tailors the learning experience by offering relevant materials, exercises, and suggestions. This customized approach allows learners to delve deeper into the aspects of the language that captivate their interest, leading to a more comprehensive understanding and mastery.

Furthermore, after setting a personalized learning plan, learners can engage in post-learning conversations with ChatGPT, providing feedback on the difficulty of their

studies. This feedback enables ChatGPT to adjust the learning plan, ensuring it aligns with the learner's needs and preferences. Unlike traditional teaching methods, ChatGPT's limitless scalability enables a multitude of learners to simultaneously receive personalized instruction, thus enhancing overall teaching efficiency.

4.3.1.3 Real-time feedback

ChatGPT plays a vital role in this language learning models by providing real-time and immediate feedback to learners. It offers timely responses to their questions, allowing learners to quickly assess the correctness of their language usage and make necessary corrections. ChatGPT can identify grammar errors, provide pronunciation guidance, and suggest more appropriate vocabulary choices to enhance language expression. With its natural language understanding and generation capabilities, ChatGPT creates an illusion of human-like communication, making it an engaging tool for conversational language learning.

The interactive nature of ChatGPT allows learners to actively engage in the language learning process. Through this human-machine interaction, learners receive personalized feedback and guidance tailored to their individual needs. This eliminates the limitations of a single teacher addressing multiple student queries simultaneously, thereby improving overall learning efficiency. By offering timely and accurate responses, ChatGPT enhances the learning experience, ensuring learners have targeted and relevant support throughout their language learning journey.

4.3.1.4 Continuous learning and updates

ChatGPT plays a crucial role in language learning models by offering continuous learning and updates. Through ongoing training and updates using machine learning principles, ChatGPT improves its own learning capabilities over time. This ensures that learners have access to the latest language learning resources, avoiding any delays in accessing up-to-date materials.

With its continuous learning approach, ChatGPT can cater to learners of various skill levels. Regardless of their proficiency, learners can receive effective guidance and instruction tailored to their individual needs. This eliminates concerns about outgrowing the level of instruction provided, as ChatGPT continuously enhances its own learning ability and adapts to learners' progress. This allows learners to consistently acquire new language knowledge and skills as they advance in their language learning journey.

4.3.2 UI used in the model

4.3.2.1 Reasonable colour matching

Color and graphic elements are the visual forms of the main expression medium. Based on big data technology, the UI can simplify the process and hierarchy of information transmission. In the UI, color is also a very visually effective part, which directly affects the user's first impression. The function of color is mainly to help people carry out cognitive operation, meet people's emotional needs, enrich the interface artistic aesthetic effect, etc[17]. The color is divided into the combination of main color, auxiliary color and finishing color in the classification. The main color refers to the main color of the interface[18], which occupies the dominant position of the whole interface. It determines the design style of the software interface. For the choice of color, practice shows that the clearer the tone standing on the main body of the interface, the more it often determines the tendency of the overall style of the interface. The auxiliary color has the function of transforming the main color, which can make the interface richer and more diverse, thus improving the user's sense of experience[19]. The designer uses finishing touches in the design, such as the text button in the title, which can play a role in emphasizing and guiding users to read, while highlighting the unique interface style.

4.3.2.2 Page element design

The page elements of the English learning software interface UI design include pictures, text and icons. In the picture setting, designers need to not only pay attention to the fit between the picture and the relevant information, but also design the picture proportion reasonably[20]. In the icon setting, it is not only necessary to reasonably design the size of the system icon and function icon, but also to select the icon shape according to the software theme. For example, "English Fun Dubbing" uses a parrot singing to the microphone. Parrots have the characteristics of learning tongues and singing into the microphone, which not only reflects that this is

a language learning software, but also names the software "fun dubbing" to ensure that the visual effect and information content of the software are unified[21].

4.3.2.3 Interaction design

In the process of using English software for users to learn, the interactive process can not only help users obtain information more deeply and maintain attention, but also lay the foundation for the realization of diversified software functions. In the practice of interaction design, designers need to take simple and easy to understand and optimize the user experience as the starting point, and promote users to adjust the software interface UI according to their own habits and preferences by providing users with more custom setting space[22]. College students use software to learn English, first of all, to improve their English scores and exam-taking level, secondly because of their interests, and finally to broaden their horizons and enrich their British and American cultural literacy. Therefore, UI needs to start from the user's use characteristics, encourage users to carry out interaction, master interaction skills and obtain a good experience in the process of participating in and completing tasks. Literature elaborates that the data mining technology in big data technology can "portrait" the user through the user's usage habits of the application platform, so as to realize the inference of various information such as the user's personality, interests, hobbies and purpose of use, so as to meet the user's needs, and then recommend various information[23]. Therefore, when using UI for English study, you need to understand the English level of each user, which requires user portraits. Before entering the main page, there should be a welcome interface (that is, customized personalized learning content). After big data analysis in the background, the general direction of the user's English learning level is determined and the relevant content is pushed in the later stage. At the same time, different from the traditional English learning method, in order to better solve the user's lazy psychology, the software should help users make personalized learning plans, and remind users to learn in time through daily punching. The upcoming learning plan is used separately as a sub-menu on the navigation bar. By displaying the user's learning time (min),

completion plan (times) and opening times (times), a chart plan learning report is generated every week, and all the learning plan historical data of the learning plan is counted with a pie chart, so that the user can feel the interface more directly and intuitively[24]. Design, truly from the user's point of view, through the incentive mechanism, to help platform users improve their English proficiency. Secondly, English learning software requires the function of an intelligent new word book to record the user's new word learning. For example, when users query certain words, in the interface displayed by word search, or when they encounter strange words when reading an article, you can long press to add a new word book so that users can query and memorize words. By meeting the needs of users, the UI interface is designed to increase the human-computer interaction experience of the software and improve the stickiness of English learning software.

5. Conclusion

This study explores new avenues in the field of language learning by constructing a mobile terminal-assisted language learning model based on artificial intelligence technology. Mobile terminal-assisted language learning offers advantages in terms of flexibility, personalization, and interactivity, leading to more efficient learning experiences. In the future, personalized tutoring in language learning will be an important direction for development. Through continuous innovation and application of artificial intelligence technology, it will provide language learners with better learning environments and outcomes.

References

[1] Alinei, M. (2006). Darwinism, traditional linguistics and the new Palaeolithic Continuity Theory of language evolution. In: Gontier, N., Van Bendegem, J.P., Aerts, D. (eds) Evolutionary Epistemology, Language and Culture. Theory and

Decision Library A:, vol 39. Springer, Dordrecht. https://doi.org/10.1007/1-4020-3395-8_7

[2] Mehawesh, Mohammad. (2014). Stages in Language Acquisition: A Case Study. English Language and Literature Studies. 4. 10.5539/ells.v4n4p16.

[3] Mpofu, P. . (2013). HIV/AIDS awareness advertising: representation of the linguistic and socio-cultural repertoires on ZBC/ TV.

[4] CHEN Xiaobin. Research on mobile assisted language learning J Journal of South China University of Technology (Social Sciences Edition), 2013,15 (1): 114-119

[5] Li, F., Fan, S. & Wang, Y. Mobile-assisted language learning in Chinese higher education context: a systematic review from the perspective of the situated learning theory. Educ Inf Technol 27, 9665–9688   (2022). https://doi.org/10.1007/s10639-022-11025-4

[6] Chen, Xieling, Di Zou, Haoran Xie, and Gary Cheng. "Twenty Years of Personalized Language Learning: Topic Modeling and Knowledge Mapping." Educational Technology & Society 24, no. 1   (2021):   205–22. https://www.jstor.org/stable/26977868.

[7] Thakur, K., Pathan, AS.K., Ismat, S. (2023). Artificial Intelligence Technology. In: Emerging ICT Technologies and Cybersecurity.   Springer,   Cham. https://doi.org/10.1007/978-3-031-27765-8_2, 45-77.

[8] Lee, S.-M. (2023). The effectiveness of machine translation in foreign language education: A systematic review and meta-analysis. Computer Assisted Language Learning,   36(1–2),   103–125. https://doi.org/10.1080/09588221.2021.1901745Search in Google Scholar.

[9] Esit, Ö. (2011). Your verbal zone: An intelligent computer-assisted language learning program in support of Turkish learners' vocabulary learning. Computer Assisted Language Learning, 24(3), 211–232. https://doi.org/10.1080/09588221.2010.538702Search in Google Scholar

[10] Amaral, L., Meurers, D., & Ziai, R. (2011). Analyzing learner language: Towards a flexible natural language

processing architecture for intelligent language tutors. Computer Assisted Language Learning, 24(1), 1–16. https://doi.org/10.1080/09588221.2010.520674Search in Google Scholar.

[11] Chinkina, M., Ruiz, S., & Meurers, D. (2020). Crowdsourcing evaluation of the quality of automatically generated questions for supporting computer-assisted language teaching. ReCALL, 32(2), 145–161. https://doi.org/10.1017/S0958344019000193Search in Google Scholar.

[12] Pérez-Paredes, P. (2022). A systematic review of the uses and spread of corpora and data-driven learning in CALL research during 2011–2015. Computer Assisted Language Learning, 35(1–2), 36–61. https://doi.org/10.1080/09588221.2019.1667832Search in Google Scholar.

[13] Tono, Y., Satake, Y., & Miura, A. (2014). The effects of using corpora on revision tasks in L2 writing with coded error feedback. ReCALL, 26(2), 147–162. https://doi.org/10.1017/S0958344014000007XSearch in Google Scholar.

[14] Crosthwaite, P., Luciana, & Wijaya, D. (2021). Exploring language teachers' lesson planning for corpus-based language teaching: A focus on developing tpack for corpora and DDL. Computer Assisted Language Learning. Advance online publication.   1392-1420, https://doi.org/10.1080/09588221.2021.1995001Search in Google Scholar.

[15] Hadley, G., & Charles, M. (2017). Enhancing extensive reading with data-driven learning. Language, Learning and Technology,   21(3),   131–152. https://doi.org/10125/44624Search   in Google Scholar.

[16] Choi, I.-C. (2016). Efficacy of an ICALL tutoring system and process-oriented corrective feedback. Computer Assisted Language Learning, 29(2), 334–364. https://doi.org/10.1080/09588221.2014.960941Search in Google Scholar.

[17] Wang Jiaqi. Innovative research on visual transmission design in UI interface from the perspective of household experience J Art Science and Technology, 2024, 37 (1): 184-186.

[18] LEI Jing. Research on Mobile UI Design for Internetworking Software Products J

Science and Technology Innovation, 2024 (5): 86-89.

[19] ZHANG Meizhen. Analysis of the application of color in UI design J Design, 2014, 27 (7): 97-98.

[20] CHEN Zhaoni. User interface design using cognitive psychology J Packaging Engineering, 2017,38 (16): 30-33.

[21] Jiang Xiujuan, Guo Hanying, Wu Jingling. The Feasibility Study of Handset Software "English Fun Dubbing" in English Teaching in Higher Vocational College J English Language Square (Academic Research), 2016 (5): 103-104.

[22] Zhang Jun. The conception and creation of UI user interface design course J Art and Design (Theoretical Edition), 2011 (7X): 99-101.

[23] CHEN Yuehong, WANG Youyao. Analysis of visual psychological cognition and emotional design in UI design J Art Design Research, 2021 (2): 74-79.

[24] Wan Jian, Sun Bin. Interface model that supports automatic generation of user interface J Computer Engineering and applications, 2003, 39 (18): 114-118.