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Analysis of the Implementation of AI in Education Impact on Personalized Language Learning

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Abstract:

The education field is now stepping into an innovative era under the advancement of AI technologies, and AI-empowered tools bring new opportunities for education to overcome the obstacles that remain in traditional education mode. Educators have highlighted the significance of promoting personalized learning in language learning to address the differences in sociocultural factors, level of knowledge, and individual identity. AI technologies have been employed in second language (L2) learning for decades, but it is worth discussing whether the implementation of AI-empowered tools can facilitate personalized language learning (PLL) among L2 learners. This paper analyzes recent practices of using AI-empowered applications in L2 learning and explores the practicability of using AI to achieve PLL. Based on the analysis, current practices can be categorized into implementation in autonomous learning and in-class learning, and both types have limitations in terms of lacking sociocultural considerations and adoption of the latest technologies. Thus, it is critical to enhance collaboration with the AI field to increase AI readiness and familiarity so that the educational field can keep up with the path of AI development and refresh the educational field with new opportunities and innovations.

Keywords: Artificial intelligence; technological education; personalized language earning; second language

1. Introduction

The rapidly advancing technological innovation cultivates fertile ground for education to revolutionize the traditional practices in learning and instruction. The ascending topic, Artificial Intelligence (AI), brutally crushes education and command for adaptation. Since the past decade, second language (L2) learning education has pioneered its practice in AI integration to facilitate the language learning experience. Meanwhile, the implementation attempts to address the need to unlearn the traditional language pedagogy's drawbacks. For example, based on the development of theoretical theories on language learning, recently, educators aimed to emphasize social and cultural factors on different individual learners by providing more individualized instructions [1]. In this case, AI can particularly target problems caused by the diversity of individual differences through personalized learning learning (PLL) [2]. AI-powered tools make immediate adjustments based on students' language proficiency and learning styles so that the students can optimize the learning experience. Currently, even though AI-enhanced educational practices have brought new applications to the language-learning field and made new progress, there are remaining limitations for educators to resolve. With the unceasing AI development, PLL is continuously facing the latest AI technologies' implementation opportunities and challenges. This paper will discuss the practicability of utilizing AI technologies in PLL and give suggestions for further improvement.

2. Progress of Language Learning Theories

2.1 Development of Language Learning Theories

Language Learning Theories are significant references for educators to make appropriate pedagogical designs for language learners. Different theories emphasize different aspects and features of language learning, so the development of language learning theories embodies uncovering the limitations of previous theories and refining the overall language learning field.

Behaviorism was first introduced in the L2 learning field, which highlights the stimulus-response (S-R) theory. It explains the L2 acquisition process, which is formulated by mechanical repetition without internal mechanisms [1]. Then, Chomsky proposed the Innactist, which includes

the Universal Grammar theory, claiming that the environmental determinants are not sufficient to impact L2 learning because human beings are biologically equipped with language learning processors, which undermines the significance of repetition proposed in behaviorism. Meanwhile, UG stresses the theme of cognitive scaffolding in guiding L2 learners within an abstract linguistic system [3]. However, both Behaviorism and Innactionism lack discussion on external factors in language learning. Therefore, in recent years, interactionism, which is rooted in Vygotsky's social constructivism, diverts researchers' attention to highlighting environmental and interpersonal interactions to facilitate L2 learning [1]. In this case, L2 acquisition now steps into the era that stresses the importance of social and cultural factors.

As Interactionism underscores the teacher's critical role as a facilitator to guide L2 learners to develop language skills, teachers are responsible for understanding students' approximating competence and personal background. In doing so, being familiar with students' cultural backgrounds and prior knowledge becomes an additional preparation for teachers, and such a process contradicts the traditional "one-fit-all" paradigm. Instead, teachers should learn about students' individualized learning styles and backgrounds, which pushes the new trend of L2's personalized language learning (PLL) for the current generation.

2.2 AI and Personalized Language Learning

The key challenge in traditional language pedagogy is to address learners' differences, and the new framework, personalized learning, is proposed to address such differences [2]. To model providing personalized instruction or assistance by the system, the source of personalization can be categorized into the learner's knowledge level, learner's behavior, learner cognitive and metacognitive skills, learner's performance, and learning style of learners. To respond to the promotion of PLL, language instructors attempt to gather students' personalized information. However, it is hard to proceed with data collection in traditional learning environments because the private data is trivial and detailed, which makes the process time- and labor-consuming. Therefore, the educational field must utilize up-to-date and appropriate technologies to support PLL.

AI implementation has been attempted in language education in various practices, and different formats of AI implementation are associated with different concentrations in learning. Thus, it is critical to discover the appropriate format of AI implementation for PLL so that learners and educators can make better decisions for L2 language learning. Thus, educators should follow the AI-empowered paradigm, which accentuates its function of fostering personalized learning to empower learners to take full agency in learning using personalized information supported by AI tools [4]. EDUCAUSE Horizon Report from 2022 to 2024 persistently encourages educators to embrace AI-empowered tools to encourage personalized learning [5]. Several past studies have investigated the positive impact of AI-empowered language learning tools on overall learning outcomes and specific language skills [6]. As a result, it is significant to analyze the practicability and outcomes of implementing AI-empowered applications in L2's personalized language learning (PLL).

3. Practicality of AIEd Implementation

3.1 Practices in L2 Learners' Autonomous Learning

Since the AI-empowered paradigm aims to facilitate the learner's agency with the means of AI tools to achieve personalization, it helps to cultivate the learner's ability to reflect on learning and achieve a learner-led learning style. Thus, AI-empowered applications can be utilized in L2 leaner's autonomous learning.

The most common AI-empowered tools are mobile- and computer-assisted language learning applications (MALL and CALL), which develop personalized content generators based on users' learning levels, interests, and learning cycles. For instance, many vocabulary MALL develop a learning model that includes three entities: the learning feedback agent, the degree of vocabulary cognition calculation, and the memory cycle calculation, collaboratively generating feedback to achieve personalization to enhance students' vocabulary mastery [7]. Similarly, Intelligent Personal Assistant (IPA) can utilize Automated Speech Recognition (ASR) to recognize individual users. The mechanism allows IPA to grasp contextual nuances and provide personalized responses, and the system can further generate various complex conversational situations for enriching experiences based on the learner's individual word levels, which ensures its versatility and flexibility [8]. Therefore, IPA allows L2 learners to conduct their L2 autonomous learning in a personalized, self-directed, and interactive way, which has been proven that such language learning is more effective compared to traditional pedagogy [9].

However, such tools have been used for years and rely on the basic algorithm to edit the L2 learner's learning process. Related to the language learning theories, MALL and CALL only offer the "right-and-wrong" feedback to make personalized but simple adjustments to the learner's learning process, which is only associated with Behaviorism's stimulus-response theory that lacks considerations

of L2 learners' cognitive and sociocultural development. On the other hand, even though IPA increases the conversational content to enhance cognitive development, it fails to meet the PLL's sociocultural requirement. Nowadays, only a few products are built using innovative AI technologies such as machine learning and deep learning to actualize the adaptive system in response to contemporary expectations for PLL. As a result, current progressive educators should not stay satisfied with past positive learning outcomes conducted by MALL and IPA; instead, it is important to integrate the advances of the latest AI technologies to promote these tools.

The Intelligent Tutoring System (ITS) represents a new type of autonomous learning system that provides individualized instruction, simulating the activities of a human teacher to a one-to-one personalized tutoring experience [10]. Taking advantage of currently developed NLP techniques, ITS can tailor learners' specific needs and levels of knowledge to provide optimal feedback, evaluation, and recommendation. Abundant research has concretely demonstrated ITS's outstanding effectiveness in speaking skills, grammar learning, and reading comprehension [11]. Compared to MALL and IPA's rigid personalization, ITS ensures dynamic difficulty adaptation by embracing the latest AI technologies. However, ITS still lacks the function of bringing in a sociocultural context to achieve personalization. Indeed, improving language proficiency shows positive learning outcomes, but it does not consider how the learner's sociocultural background can affect their learning efficiency and real-life usage. Therefore, the learning outcomes achieved by ITS fail to escape from the traditional "one-size-fits-all" mode because learners' identities are not taken into account.

In summary, AI-empowered applications now show evidence of promoting PLL by generating immediate feedback and adjustments based on the learner's live learning status. However, they do not reach PLL's intention of addressing the complexity of the learner's themselves' diversity. Moreover, the empirical practices are obsolete in advancing AI development.

3.2 Practices in In-class Learning

Even though AI-empowered applications enable L2 learners to conduct independent learning, it does not mean that AI replaces in-class learning in an instructional setting. The Horizon Report 2024 emphasizes the partnership between AI, schools, and teachers and advocates for teachers to get prepared for AI-empowered applications. Therefore, it is indispensable to support in-class L2 learning with the involvement of teachers and schools.

Current empirical practices show evidence that AI-empowered tools can encourage PLL by overcoming obstacles in traditional L2 learning environments, including identifying cognitive factors, such as students' concentration, emotion, and motivation during the learning process [11]. Additionally, teachers can tailor better learner-centered curricula and lesson plans based on the valuable data and insights from each student's process rather than simply letting teachers direct the learning progress.

Some practices have demonstrated that the integration of AI-empowered applications in classroom settings can benefit students' L2 proficiency. For example, Using AI-mediated instruction can facilitate Chinese university students' L2 proficiency, and teachers act as the class facilitators to conduct the lesson plan using Duolingo [6]. The findings demonstrate that AI-empowered platforms can provide valuable data and insights into each student's challenges and areas of improvement. Correspondingly, teachers can more effectively provide immediate feedback and support to each learner so that the students can build learning confidence during L2 learning. Additionally, using group dynamic assessment can effectively provide mediation with students with varied language abilities in an L2 classroom, and teachers can base on the assessment results to categorize students' abilities and provide respective instructions and feedback [12]. The result also positively shows that L2 learners' language skills improved under such collaboration between teachers and AI-empowered applications. Meanwhile, the learners gain personalized scaffolding assistance under the support of AI assessment, which allows them to get rid of the limitations in conventional learning environments.

Therefore, AI-empowered applications can benefit L2 students' learning performance in various ways, and teachers can also utilize these applications to fabricate individualized learning plans for each student to foster the learners' learning effectiveness.

Compared to the empirical study on autonomous learning, the in-class implementation is not actualized in reality, and much of the research remains in the operation process without result production. For instance, the Interact-4School project investigates the effectiveness of using ITS in L2 individualized learning in an institutionalized schooling environment [11]. Even though the project can systematically analyze the usefulness of AI-empowered systems in influencing L2 learners' PLL and learning outcomes. However, the study remains blank in the result section for further research.

4. Suggestion

4.1 Toward Learner‘s Autonomous Learning

Within the PLL framework, current practices on improving L2 autonomous learning exhibit different outcomes

and effects when using various applications. Generally, ITS performs better in developing L2 learners' linguistic abilities in a more comprehensive way than MALL, CALL, and IPA [13]. Since ITS can customize each learner's learning materials, curriculum sequencing, and levels of learning difficulties from a wide range of linguistic aspects, ITS is the more suitable AI-empowered tool to meet the framework of PLL. However, the current ITS lacks sociocultural considerations, which indicates a need to integrate other related technologies into ITS. For example, AI-powered virtual reality (VR) platforms can help to add cultural content into L2 learning experiences by providing immediate feedback, cultural insights, and direction, encouraging efficient cross-cultural communication abilities [14].

Even though current ITS has been proven to improve L2 learners' language proficiency, there is improvement space for further engagement through the cognitive aspect. Thus, it is critical to incorporate emotional and motivational factors into PLL. For instance, some AI-empowered applications utilize gamification systems to stimulate users' motivation to increase learning interactivity and engagement [15].

4.2 Toward Teacher-Directed Learning

There are very limited empirical studies discovering the effectiveness of AI-empowered applications in in-class learning, and some research still stagnates in the operation process, which indicates insufficient data can be used to analyze the AI's effect on PLL. As a result, it is necessary to address the paucity of such practices.

As the existing practices have shown, familiarity and proficiency in AI-empowered tools are the prerequisites for teachers to manage the teaching and learning process effectively. Thus, teachers should have appropriate training and enough AI exposure in their daily teaching environment so that they can be more willing to adopt the innovative implementation of AI-empowered applications in their classrooms [13]. In addition to teachers' activeness in utilizing AI-empowered tools in classroom settings, school administrators and governments must support teachers in conducting more practices on AI-empowered learning in classroom settings to prevent education from being laggard in terms of technological advances. Aiming to achieve this, educational institutions should fund enough equipment for teachers' professional development, and the government and educational administrators should actively seek to collaborate with the AI industry for consistent training in learning the latest AI technologies [14].

Additionally, as AI cannot replace human teachers in in-class learning, teachers can focus on addressing the uncovered aspects that AI is incapable of. For example, in response to PLL's emphasis on individuals' sociocultural differences, teachers can personally collect students' identity and sociocultural background information to identify their possible learning preferences. Therefore, teachers should actively build collaborative connections with students and respect students' positionality in the learning environment, and the learner-centered environment can eventually facilitate PLL.

5. Conclusion

In summary, the current education field makes many innovative attempts to integrate AI-empowered tools into L2 learning to achieve PLL. The main success is embodied through the improvement in linguistic skills and language proficiency in terms of cognitivism and behaviorism. AI-empowered applications can utilize its algorithm to analyze L2 learners' learning data to provide immediate feedback and adjustments to optimize learners' learning performance and efficiency. Meanwhile, the teachers can obtain rich data on learners' learning processes from various dimensions, which fills the cognitive blank that autonomous learning is incapable of achieving. Therefore, educators should further put effort into integrating AI-empowered tools in both autonomous learning and teacher-involved in-class learning. However, to fully achieve PLL, it is necessary to take L2 learners' sociocultural and identity backgrounds into consideration, which implies educators should collaborate with the AI field and try to fill the gap for future L2 learners' PLL.

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