



Paper Type: Original Article

The Role of AI in Identifying and Addressing Individual Learning Gaps in Foreign Language Acquisition

Shivam Mishra*

Department of Foreign Languages Studies, Central University of Karnataka, Kalaburagi, India; mshivam@cuk.ac.in.

Citation:

Received: 27 November 2024

Revised: 18 January 2025

Accepted: 07 February 2025

Mishra, S. (2025). The role of AI in identifying and addressing individual learning gaps in foreign language acquisition. *Information Sciences and Technological Innovations*, 2(2), 102-107.

Abstract

Recently, artificial intelligence (AI) powered tools and software in education have been rapidly integrated. Because of the advantages they bring to the learners and the teachers, the development in this field is taking place at an unprecedented pace. As a result, various applications and technical assistants have emerged in foreign language learning. These collaborative efforts of data scientists, software engineers, machine learning experts, and linguists are not just revolutionizing the methods of learning foreign languages; they are also bringing the world closer by overcoming language barriers. The major success that the AI has brought in the area of teaching and learning in general and in foreign language learning in particular lies in its ability to bring the individual to the center. AI is rapidly making it possible to customize the learning for individuals by identifying the gaps in their learning and addressing them promptly. Along with this, it also helps the teachers to provide the learners with the lesson plans that are devised specifically for their needs. This helps a learner retain confidence and interest in learning and boosts learning. This paper will briefly discuss the factors contributing to the success of the integration of AI in the education sector in general. Then it will discuss how the potential of AI can be harnessed by using various methods, such as an adaptive learning system and Natural Learning Process (NLP). Further, it will deal with the question of how AI can help diagnose individual learning gaps through the mechanism of diagnostic assessment, real-time feedback, and learning progress analytics. To summarize, this paper will discuss the pertinent issues related to integrating AI in foreign language learning in a calibrated manner and how teachers can incorporate AI tools in a meaningful manner to enrich a learner's learning experience.

Keywords: Artificial intelligence in education, Identifying gaps in learners, Adaptive learning methods, Natural learning process, Foreign language learning, Diagnostic assessment, Real-time feedback.

1 | Introduction

Since the advent of computers, there have been constant efforts to develop Artificial Intelligence (AI). As a result, in today's time, there is hardly any area that is not experiencing a transformation through AI. Whether in banking, tourism and hospitality, manufacturing, health care, science and technology, or other fields, AI

✉ Corresponding Author: mshivam@cuk.ac.in

doi <https://doi.org/10.48314/isti.v2i2.42>



Licensee System Analytics. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0>).

has become a cornerstone for future progress almost everywhere by producing human-like or even far better outputs. This is an attribute from which the AI derives its definition as well. As per Minsky [1], "AI is the science of making machines do things that would require intelligence as if done by men"¹. The main reason behind the AI's massive success is that it not only saves crucial time but also increases the output while adding unprecedented efficiency and accuracy. The ability of AI to undertake complex actions with ease expands the scope of harnessing human intellect to take on newer challenges and take human development and welfare to a new dimension.

In such a scenario, dominated by AI's all-pervasive nature, the education field has also not remained unaffected. Considering the magnitude of this influence and the pace at which AI is revolutionizing the education sector, claiming that in a few years, it will drastically transform the future of education and the experience of teaching and learning would not be an exaggeration. Though there are constant debates over the use of AI in education, especially with reference to the traditional methods of learning and the ethical issues, there is no denying its positive impact, especially from the point of view of a learner. Below, we will briefly discuss the factors contributing to this perception.

1.1 | Enhanced Access to Knowledge

The most crucial factor about the positive impact of AI in the education sector is the enhanced accessibility to knowledge for learners. With AI, knowledge resources are now available 24*7 for learners, overcoming physical barriers. If a learner has a query or seeks information on any subject, topic, or issue, they do not need to wait till the next session at the educational institution or the next meeting with the instructor. One can instantly get their queries addressed.

1.2 | Confidence Building

This is one area where the AI has acted as a significant positive catalyst. In the traditional learning atmosphere, a learner was often at risk of being judged. The feeling of an inferiority complex often arises from this judgment, creating a formidable hindrance to active participation in the classroom. As a result, the learner's confidence also took a hit, and in some cases, this resulted in complete detachment from the learning. On the contrary, the AI provides a learning atmosphere in which a learner feels safe and secure and can ask queries without the fear of being judged or ridiculed, which fills the learner with a renewed sense of confidence.

1.3 | Personalized Learning Experience

With the advent of various AI tools and applications, learners have acquired significant freedom to personalize and customize the learning process. In the traditional classroom setting, the teacher must maintain a balance between the slow and fast learners. Still, this approach may not often do justice to either group completely. The slow learners may still find the pace beyond their capacity. On the other hand, the fast learners may also feel at a disadvantage because of the compromised tempo of the course progression. AI can make it possible for both groups to learn at a convenient pace, thus making optimum utilization of their time.

1.4 | Creating a Level Playing Field

The AI has started creating a level playing field in learning because those with resources can afford additional support through a one-on-one tutor, but many cannot afford this luxury. In its advanced form, the AI also plays a supportive role as a tutor for the learners. The best and the latest example is the Khanmigo, an AI-powered assistant, or a student buddy, as it describes on its official website. We have developed it with the support of the founders of AI and have been successfully used for students from 3rd to 12th grade with astonishing results.

The AI in the form of various applications and software has shown positive results for both learners and teachers. It helps them to plan their classes effectively and provides valuable ideas to make a session engaging

and interactive. Because of its potential to benefit all stakeholders, AI has become almost inalienable in teaching and learning.

2 | Use of Artificial Intelligence in Foreign Language Learning

In the earlier part, we discussed how AI transforms the learning process. Now, we will discuss its utility and other aspects specific to learning foreign languages, and what makes it a game-changer regarding individual benefits.

2.1 | Adaptive Learning System

The feature of the AI that sets it whole apart from traditional teaching and learning is its focus on the individual. Unlike other subjects, learning foreign languages requires more focus on the individual learner (considering the fact that it involves developing four different abilities). Focusing on individual learners becomes daunting in institutions where the teacher-student ratio is not standard. In such a scenario, an Adaptive Learning System can help bridge the gap with its programming mechanism, aimed at understanding the needs and abilities of the individual learner and accordingly devising a learning plan. These systems adapt learning content and activities based on learners' individual needs and progress [2]. A perfect example of this is apps like Duolingo. It asks the user the purpose of learning a language, like whether one wants to learn a language for business, travel, learning a new culture, or casual socialization. Further, it also asks for the existing knowledge of that language, whether a person is just beginning from scratch or already possesses some knowledge. It also obtains information on how much time one can devote daily. Based on this information, it prepares lessons for individuals, catering to their specific needs. This is something not that easy to achieve in traditional learning methods.

2.2 | Natural Learning Process

Natural Learning Process (NLP) is a rapidly developing field involving inputs from linguistics, computer science, and AI. As per an article published in Harvard Business Review, “(NLP is) the branch of AI focused on how computers can process language like humans do”². The NLP technologies aim to make machines intelligent enough to understand, interpret, and generate human language [3]. Collecting and analyzing a vast quantity of written and oral content responds to human language. This has become very useful in learning foreign languages. Consider the following scenario: A language learner at the beginner stage wants to congratulate a couple for having a baby. However, he does not know a suitable expression in that particular culture. He can simply ask AI questions and get the answer using ChatGPT. This way, the AI lends the learner a sense of empowerment and confidence.

2.3 | Identifying Individual Learning Gaps

The above discussion underscores that a significant factor behind the success and popularity of AI in learning is its ability to empower the individual. It can not only customize the learning for individuals based on their skills, abilities, requirements, and interests, but can also identify their weaknesses. In a traditional classroom learning atmosphere, especially in larger groups, it becomes a mammoth task for a teacher to identify the learning gaps for each individual, let alone fix them. The AI-driven tools and software are handy in such a scenario and can be instrumental assistants to teachers.

2.4 | Diagnostic Assessment

In any classroom, not every student will be at the same level. Diagnostic assessment is a method that helps identify individual learning gaps, which the teacher would have to deal with to help guide the learners. Explaining the importance of the diagnostic assessment, Bejar [4] writes:

“Standardized test results frequently have little or no impact on instruction because the test results offer little help in designing optimal instruction for an individual student”.

The diagnostic assessment methods are constructive in cases of large groups. In foreign languages classes, apps like Schoology can be used to track a learner's progress after completing a particular unit. Since the app evaluates all the responses, it saves significant time and energy for the teacher to identify the individual learning gaps, and they can devote more time to work to address those issues. It must be noted that the purpose of the diagnostic assessments is not to develop any opinion about a learner that may reinforce any preconceived notions about the learner. The assessment is to be used only as a reference for devising a learning plan for the learner.

2.5 | Real-Time Feedback

Real-time feedback is a mechanism to collect feedback from learners when the learning experience is fresh and offer immediate corrections and recommendations [5]. It refers to the immediate response one receives to their action or performance. Unlike traditional feedback, which often takes hours, days, or weeks, real-time feedback happens instantly or quickly. Whether in a classroom or in an online course, understanding this concept can make a huge difference in how one learns and improves. This immediacy allows learners to understand precisely what they are doing right or wrong at that very moment of action. For example, when practicing pronunciation with an app (such as Duolingo or Busuu) that analyses speech, the app might instantly highlight mispronounced words, offering the learners a chance to correct themselves immediately.

Also, some apps allow one to connect with a native speaker in the concerned language, from whom a learner gets feedback and recommendations in pronunciation and other aspects, like correct or better expressions for a particular situation, grammar, or vocabulary-related suggestions, etc. Another example here would be the writing exercises. With software like Grammarly, one can get the write-ups evaluated instantly or suggestions for better expressions. This instant feedback loop helps learners adjust their efforts on the spot, making learning more effective and efficient. This is why Real-time feedback combined with AI can become a highly valuable AI mechanism to accelerate learning, as it allows one to monitor one's progress instantly. The immediate results or recommendations help learners identify and correct the mistakes promptly.

Real-time feedback is particularly crucial in learning languages for various reasons. First, it identifies mistakes as they happen, preventing the reinforcement of the incorrect patterns. Second, it offers immediate corrections and suggestions, which aid in rapidly acquiring new skills. Lastly, it keeps learners engaged and motivated as they can see their progress in real-time, encouraging them to keep practicing and improving.

2.6 | Learning (Progress) Analytics

Learning Analytics optimizes learning and leverages decision-making related to learning and teaching. Their use helps the teachers identify learners' learning difficulties and provide them with specific support for improvement by analyzing their progress over time. This data is used by the AI-powered tools to identify patterns, indicating potential learning gaps [6]. Critical analysis of these data also aims to improve teaching efficiency. Again, I would like to mention the example of the language learning app Duolingo. It analyses the progress of a learner and identifies weak zones. Accordingly, it provides more exercises, so the learner can practice more in those areas before starting with the new topic. The teacher can also evaluate the weekly or monthly statistics generated here, get crucial information about a learner's regularity, intensity, enthusiasm, and progress, and accordingly make informed decisions to devise teaching plans or modify teaching strategy.

3 | Addressing Individual Learning Gaps

3.1 | Personalized Learning Paths

AI-assisted learning can be instrumental in strengthening individual-centric teaching, making it easier to identify and fix the gaps. Personalized learning mechanisms can include differentiated learning materials, activities, and exercises aimed at addressing specified learning gaps [7]. In a language class where individual attention becomes necessary for a learner to gain proficiency, the AI tools can be integrated to guide the

learners based on their specific needs, and customize their learning by providing them with the materials and exercises relevant exclusively.

3.2 | Adaptive Exercises

The diagnostic assessment results show that adaptive exercises can be incorporated into teaching languages to address the learning gaps. While creating adaptive exercises, the focus should be on the ability level of the learners to give them targeted challenges that address their specific weaknesses [8]. As I mentioned earlier, AI-based software like Schoology can be helpful not only in identifying individual-level and specific weaknesses and provide targeted and well-structured problem exercises to help the learner overcome these challenges without being intimidated. The AI tools can thus support them in ensuring steady progress and confidence-building.

3.3 | Intelligent Tutoring System

ITS is an AI-based mechanism that aims to provide learners personalized instructions, tailored to their individual needs [9]. The idea of an intelligent tutoring system stems from the fact that students' learning improves significantly when they get immediate feedback, recommendations, and guidance based on their specific shortcomings. Their learning is optimized when they have someone around them to point out their mistake and to tell them how to avoid them next time, and someone who can encourage them, nudge them, appreciate them for their efforts, and motivate them without the fear of being judged. Even the best institutions or teachers may struggle to support the learners on these lines despite their best intentions because of the group size. Often, it becomes challenging to provide every single student with a one-on-one teaching assistant or a tutor.

Thus, the prime objective of ITS is to develop software agents that can provide learners with feedback when the learning is still fresh, and because they are software agents, they are available all the time. They don't have an hourly cost associated with them. The AI tools can certainly fill the gaps when it comes to intelligent learning system as they can assume the role of one-on-one tutors who can understand the learners' specific needs, provide them with prompt feedbacks, at the same time also providing them the much needed psychological boost up in form of appreciation for the efforts made by the them and encourage them for further learning; thus providing the most effective form of instruction i.e. individualized instruction [10].

4 | Conclusion

With the constant advancements in technology, AI is being integrated in many new ways, transforming the learning experiences. In the context of languages, AI is pioneering the dawn of a new era by increasingly breaking language barriers. Apps like Bhashini are making it possible to connect with the speaker of any language.

In the above discussion, this article tried to explore the potential benefits of AI in teaching and learning. With specific reference to foreign language learning, and with the help of limited examples, it also showed how the potential of AI can be harnessed for teaching and learning languages. There is no denying that various challenges are associated with using AI in education. From ethical concerns to worries about the awareness among all stakeholders to use these tools in a reasoned manner, the concerns are genuine and at times grave; therefore, they need to be discussed in academia at a broader level, before the full-fledged integration of AI is allowed in educational institutions and at the individual level. But the prime focus of this paper is not these challenges and concerns, but AI's ability to boost learning by identifying and addressing the gaps.

In the area of foreign language learning, AI has made significant breakthroughs. The various AI-powered tools and software have widened the scope of focusing on individual learners. They have made it comparatively easier to identify and address the learning gaps in larger learners. It is worthwhile to note that by the time many learners start learning a foreign language, there is a significant decline in their cognitive ability to acquire a new language (considering the case of students who start learning foreign languages at the

university only, and those of the immigrants who start even at a much later stage of life). The use of AI can help make learning a foreign language interesting for them and customize lesson plans as per their specific requirements, allowing the teachers to be more effective. As the technology advances, extended deliberations on incorporating AI in language learning will help harness AI's potential like a controlled chain reaction.

Conflict of Interest

The authors declare no conflict of interest.

Data Availability

All data are included in the text.

Funding

This research received no specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

References

- [1] Minsky, M. L. (1969). *Semantic information processing*. The MIT Press. <https://doi.org/10.5555/1096479>
- [2] Kulik, J. A., & Fletcher, J. D. (2016). Effectiveness of intelligent tutoring systems: A meta-analytic review. *Review of educational research*, 86(1), 42–78. <https://doi.org/10.3102/0034654315581420>
- [3] Parsing, C. (2009). Speech and language processing. In *Power point slides* (pp. 1–36). Prentice hall. <https://people.cs.pitt.edu/~litman/courses/cs1671f18/cs1671/lec/slp11.pdf>
- [4] Bejar, I. I. (1984). Educational diagnostic assessment. *Journal of educational measurement*, 21(2), 175–189. <https://doi.org/10.1111/j.1745-3984.1984.tb00228.x>
- [5] Shute, V. J. (2008). Focus on formative feedback. *Review of educational research*, 78(1), 153–189. <https://doi.org/10.3102/0034654307313795>
- [6] Baker, R. S., & Inventado, P. S. (2016). Educational data mining and learning analytics: Potentials and possibilities for online education. In *Emergence and innovation in digital learning: Foundations and applications* (pp. 83–98). Athabasca University Press Edmonton, AB, Canada. <https://doi.org/10.15215/aupress/9781771991490.01>
- [7] Pane, J. F., Griffin, B. A., McCaffrey, D. F., & Karam, R. (2014). Effectiveness of cognitive tutor algebra I at scale. *Educational evaluation and policy analysis*, 36(2), 127–144. <https://doi.org/10.3102/0162373713507480>
- [8] Kalyuga, S. (2007). Expertise reversal effect and its implications for Learner-Tailored instruction. *Educational psychology review*, 19(4), 509–539. <https://doi.org/10.1007/s10648-007-9054-3>
- [9] Anderson, J. R., Corbett, A. T., Koedinger, K. R., & Pelletier, R. (1995). Cognitive tutors: Lessons learned. *The journal of the learning sciences*, 4(2), 167–207. https://doi.org/10.1207/s15327809jls0402_2
- [10] Merrill, D. C., Reiser, B. J., Ranney, M., & Trafton, J. G. (1992). Effective tutoring techniques: A comparison of human tutors and intelligent tutoring systems. *The journal of the learning sciences*, 2(3), 277–305. https://doi.org/10.1207/s15327809jls0203_2