

Exploring Artificial Intelligence Discourse on Students' Learning Environment and Performance: A Comprehensive Review

Hafizah Hajimia^{1*}, NurudeenBabatunde BAMIRO², AbishevAssylkhan
Rahimzhanovich³, Iskakov Taiyrzhan⁴, G. Kassymova⁵, NurBaitibinti Ismail Shauki⁶,
Anita a/p Kanestion⁷, Muhammad Nazri Bin Muhd⁸

^{1*}*School of Education, Universiti Utara Malaysia, Kedah, Malaysia*

²*Department of Language, Arts and Social Science Education, Lagos State University, Nigeria*

³*Abai Kazakh National Pedagogical University, Almaty, Kazakhstan*

⁴*Abai Kazakh National Pedagogical University, Almaty, Kazakhstan*

⁵*Abai Kazakh, National Pedagogical University; SuleymanDemirel University; Institute of Metallurgy and Ore Beneficiation, Satbayev University, Almaty, Kazakhstan*

⁶*Tunku Abdul Rahman University of Management and Technology*

⁷*Kolej MatrikulasiKejuruteraan Kedah, Kedah, Malaysia*

⁸*MyFinB Group, One Marina Boulevard, Level 20, Singapore 018989*

Abstract: This article reviews the impact of AI Discourse on students' learning environment and performance. It delves on AI as a discourse, application of AI in education, role of AI on student's learning performance, subconscious learning and machine learning for language learning and assessments. The outcome contributes to the perspectives and paradigm of discourse studies and technology in education. While the study contributes valuable insights to discourse studies and technology in education, it acknowledges the need for further research to explore AI's specific impact on English learning, particularly among Malaysian students.

Keywords: *AI Discourse, Technology in Education, Students Learning, Language Learning, Machine Learning.*

1. Introduction

In recent years, Artificial Intelligence (AI) technology has seen significant advancements, penetrating the educational environment and transforming the teaching process in schools (Costello, 2022). To keep up with AI development, the present generation must engage with the AI discourse, which is intertwined with various cultural elements in reality. Understanding this discourse could provide insights into lifestyle adjustments necessary to prepare for AI and address current educational challenges. The educational sphere has increasingly recognized the importance of AI, as it has proven beneficial in teaching and classroom management (Tyagi, 2020). Despite widespread discussions about AI's progress, little is known AI in education, especially from language learning perspectives, highlighting the need to understand students' experiences with AI technology (Carvalho et al., 2021). This study aims to bridge the gap and uncover educational perspectives on AI. To comprehend the broader social contexts of discourse, past corpus-based studies have integrated analysis of interviews and focus group discussions involving writers, readers, and academic specialists (Hyland, 2000). For instance, Hyland expanded traditional textual discourse analysis by incorporating focus groups, unstructured interviews, and discourse-based interviews with subject specialists, facilitating in-depth discussions about specific written pieces and the evaluation of their rhetorical effectiveness (Biber et al., 2007). Moreover, while AI has typically been studied from a technological perspective, this study treats AI as a discourse (AID) in itself, encompassing spoken and written discourse (Carvalho et al., 2021). Therefore, the research aims to analyze AI discourse from students' and authors' perspectives, considering its impact on education, students' learning environments, and performance.

Artificial Intelligence (AI) as a Discourse

Scholars advocating the New Rhetoric highlight the importance of comprehending the social context surrounding texts to aid writers in selecting rhetorical strategies that are effective within a given situation. In this study, the term "discourse" encompasses both the perspectives of students and the viewpoints of authors expressed in commentaries. Firstly, AI can be considered as a form of language and/or communication, encompassing its own set of ideologies and principles. AI can be viewed as a form of language and communication in several ways, as follows; AI systems are developed using programming languages, which serve as a means of communication between human developers and the AI algorithms. Through programming languages such as Python or C++, developers write code that instructs the AI system on how to process and analyze data, make decisions, and perform specific tasks. These languages provide a structured and systematic way for developers to communicate their intentions and instructions to the AI system (Scargall, 2020). Furthermore, AI systems utilize machine learning algorithms and natural language processing (NLP) techniques. Machine learning algorithms enable AI systems to learn from large datasets and identify patterns, enabling them to recognize speech, understand text, or classify data. NLP techniques, on the other hand, enable AI systems to process and generate human-like language. These techniques involve tasks such as language understanding, sentiment analysis, language translation, and text generation (FahadAlam, (2022)). Dialogue systems are another manifestation of AI as a form of language and communication. Chatbots, virtual assistants, and voice-controlled systems are examples of AI-driven dialogue systems. They engage in interactive conversations with users, understanding their queries or commands and providing relevant responses. These systems employ NLP techniques to comprehend and generate language, simulating human-like conversation and enhancing communication between humans and machines (McTear., 2022). Additionally, AI systems employ sentiment analysis to interpret emotions, attitudes, and opinions expressed in text or speech. By analyzing language patterns and using techniques such as natural language understanding and machine learning, AI systems can assess sentiments in customer feedback, social media posts, or other textual data. This analysis enables organizations to gain insights into public opinion, customer satisfaction, or brand perception (Naithani&Raiwani, 2022). Next, AI can be regarded as discourse due to its language-like characteristics and communicative nature. The following were coined based on Biber et al., (2007), definition of a discourse. Here's how AI can be seen as discourse:

Firstly as a language-like structure. AI systems, particularly those involving natural language processing, operate on linguistic structures. They analyse and generate text or speech, following syntactic, semantic, and pragmatic rules akin to human language. AI models learn from large datasets and capture patterns, allowing them to understand and produce language in a manner similar to discourse. Secondly, with a communicative Intent. AI systems are designed to communicate with humans or other systems. They aim to convey information, respond to queries, engage in dialogue, or provide assistance. Through the use of algorithms and data, AI models interpret and generate language to fulfil specific communicative purposes, resembling the communicative intentions present in discourse. Next, concerning ideologies and principles. AI development involves underlying ideologies and principles that guide the construction and operation of these systems. These ideologies include concepts such as fairness, transparency, accountability, and ethical considerations. They shape the design and implementation of AI technologies, reflecting the values and intentions that are integral to discourse. Then, is its interaction and context. AI systems engage in interactions, much like participants in discourse. They process inputs from users, comprehend contextual information, and generate appropriate responses. AI technologies strive to understand and adapt to the context, leveraging the surrounding information to facilitate effective communication, akin to the way discourse participants consider the context during communication. Finally, it's influence and power. Discourse often involves power dynamics, influencing beliefs, opinions, and decisions. Similarly, AI systems have the potential to shape and influence human understanding and behaviour through their language-based interactions. The ideologies and biases embedded in AI technologies can impact the discourse and the subsequent outcomes. To sum up, AI encompasses programming languages for development, machine learning algorithms for pattern recognition, natural language processing techniques for language understanding and generation, and sentiment analysis for interpreting emotions in text or speech. These various components collectively establish AI as a form of language and communication, facilitating interactions between humans and machines and enabling the processing, understanding, and generation of language-like information. Besides, AI exhibits a language-like structure and communicative intent, incorporating underlying ideologies and interacting with context. Furthermore, AI possesses the potential to influence discourse and shape the discourse landscape. Therefore, AI can be perceived as a form of discourse, utilising its own language and communication methods to convey information, engage with users, and contribute to the evolving discourse in society.

Application of AI in Education

AI teaching assistant was first developed for the professor's online Knowledge-Based AI (KBAI) class (Catlin et al., 2019). The introduction of AI teaching assistants signal that the realm of education has begun its new era by incorporating nonhuman agents as tutors, assistants, advisors or teachers, so-called "machine teachers." As Ouyang et al.(2019) notes, "machines increasingly are being designed to teach and to learn through interaction and to be responsive to natural teaching and learning methods employed by their human partners" (p. 487). AI algorithms have the potential to advance eLearning in every field. Tracking data in conjunction with other data gathered through AI can thus provide learners with individualised and appropriate support (Kessler, 2018). Thus, AI has been further applied to the education field and it has shown positive application impacts, leading to teaching transformation. The positive impacts were further enhanced with some common terms related to AI in Education such as adaptive learning, teaching evaluation, virtual classroom, smart campus, and intelligent tutoring robots (Catlin & Blamires, 2019; Carvalho et al., 2021). Teaching is a dynamic profession, all the more so at the present time. The rapid growth of new technology is transforming education, giving rise to new challenges (Costello, 2022). Learning analytics, adaptive learning, calibrated peer review, and automated essay scoring (Catlin et al., 2019) are advanced processes that, provided they are good interfaces, can work well with the teacher thus allowing him or her to concentrate on human attributes such as being caring, creative, and engaging in problem-solving (Majuri et al., 2018). To connect AI technologies with educational and learning theories, Ouyang & Jiao (2021) proposed three paradigms for AI in Education known as AIEd and related it to educational theories. The three paradigms are AI-directed, AI-supported, and AI-empowered. AI-directed represents knowledge models and direct cognitive learning which adheres to the behaviourism theory. AI-supported is used to support learning while learners work as collaborators which adheres to the cognitive and social constructivism theory. Finally, AI-empowered is used to empower learning while learners take agency to learn which adheres to the connectives and complex adaptive system theory (Jennifer et al., (2015). figure 1 below shows the conceptual framework for this study by adapting AIEd. This conceptual framework integrates the AIEd Ouyang & Jiao (2021) with roles of AI and Student's Learning Performance (Kaur, 2021).

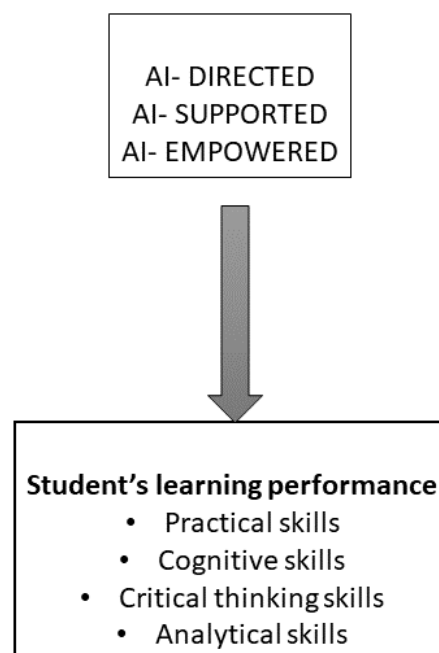


Figure 1: Conceptual Framework

Educational AI-enabled software has had an undeniable impact on the classroom, and the rise of teachable agents is having an impact of its own with students who reach teaching computers as a way to teach themselves (Costello, 2022). Since the tutored students were focused on the task of creating concept maps to answer specific questions, they initially outperformed the two learning-by-teaching groups (Ouyang & Jiao, 2021). Language learning software such as; the conventional graphical user interface (+ speech recognition), for example, monolingual (Rosetta Stone), and for translations (Babbel); Language interface with dialogue function for example Duolingo; Virtual learning environments with pedagogical agent systems, for example, Max are

being applied in the education field. Amidst some of the setbacks of these software, it is still being improved as Educational AI is still in its relative infancy.

Role of AI on Student's Learning Performance

In line with AIED, AI interacts with students in a more autonomous, personalised, and active manner. AI interactions are dynamic rather than static, representing the communication and interactions that take place within the framework of a learning process. Discourse is both an intellectual power that determines how and what people think, particularly once they confront a specific object, and a raw power that permits them to act in accordance. As a result, observing how our culture views AI can help us predict where AI will be in the future and how we will respond to it. Sudarshan (2018), Zilberman (2019), Bhatia (2018), Staff (2020) discussed the roles in which AI can be used in learning. Zilberman (2019), discussed whether it is suitable to implement AI in English learning. The author mentioned adaptive or personalised learning with the help of AI, subconscious training, and positive indirect feedback as benefits of AI in learning. AI has the capacity to accelerate the development of new technologies and innovative approaches. Staff (2020) and Sudarshan (2018) stated the positive outcomes of AI among students is that, they can engage in digital learning through opportunities that are not available in the traditional classrooms and papers. In this article, the author chooses to discuss the issues by making a comparison in learning methodology based on two different systems of mind. By definition, it is stated that System 1 is the subconscious activity of the brain that operates automatically with no sense of spontaneity while System 2 is the conscious activity of the brain that allocates attention toward specific goals and therefore it is slow. Hence, the author argues that personalised learning should incorporate learning methodology based on System 1 which is better than System 2 that employs rote memorization and is proven to be difficult for students.

Subconscious Learning

Subconscious learning is also agreed by Soares (2020) who discussed issues on how neural networks learn through subjective experience. The author decided to explain more about such parallels. He believes everyone can learn language faster than they expect if they frame the process as a supervised learning task. Learning in an environment which is game-based is much encouraged. The author said that, "we need to expose more to the examples of any topics that will make us learn more without consciously trying to" (Soares, 2020, p. 5). The author's purpose or main idea in this article is to automate exposure just as we would do with a machine learning task. In the Tactical Language and Culture Training System (TLCTS), AI offers a variety of roles. TLCTS classes are populated by *virtual humans* that converse with students and it is a combination of gaming and intelligent tutoring. AI approaches are used to mimic virtual humans' decision-making processes and to aid in the development of their behaviour. This allows learners to engage in substantial conversational practise. TLCTS uses AI technology to process learners' speech, engage in discourse, and evaluate and assess learner performance during the authoring process and at run time (Atmowardoyo et al., 2021). Furthermore, it is used to identify prospective impact of artificial technologies within four categories; customize education, content, innovative teaching methods, technology enhanced assessment, communication between student and lecturer (Chassignol et al., 2018). The following figure shows a sample game using TLCTS.



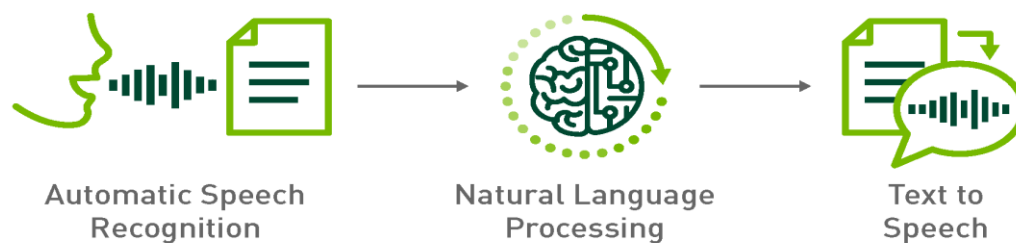
Figure 3: Sample of TLCTS AI games

TLCTS games consist of serious games, interactive learning environments, speech recognition, interactive dialogue and animation control and finally learner modelling assessment. Students would definitely have fun learning as well as gaining knowledge with expediency, efficiency, and at ease. From the Learning and Development (L&D) point of view, Carvalho et al. (2021) stated that AI offers to meet the expectations of the modern learner, as well as it explores limitless new possibilities. For students, AI drives the three E's that are essential for improved learning: expediency, efficiency, and ease of use. The efficacy of AI is determined by how often people use it; the more data the system analyses, the more AI learns about individual learner requirements, transforming the learning platform into a continuous improvement engine that develops with

learners. Rohalevych (2021) discussed the issue of ways to crack AI for language learning to advance eLearning in every field since nowadays students need to study from home or college. The purpose of AI is offered as the platform created with machine intelligence especially for students in education. The author points out that AI can provide instant feedback for students. The author also believes that AI can be adapted to students' needs so that educators may collect loads of student data, interests, skills, etc. These data can pave the path for individualised learning when analysed. She stressed that the development of Google Classroom, Moodle LMS, etc. will take over the function of teachers and become the learner-centred of the new language.

Machine Learning and Language Assessments

Machine learning can play a significant role in developing better assessments for students' speaking skills. Here are some ways in which machine learning can be applied: Automated Speech Recognition (ASR): Machine learning models can be trained on large datasets of spoken language to develop accurate ASR systems. These systems can transcribe and analyse students' spoken responses, providing objective and consistent evaluations of

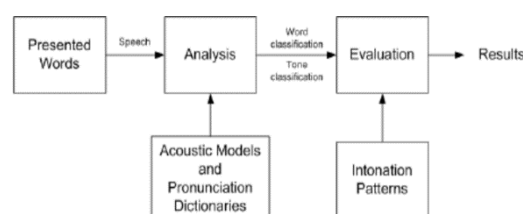


their speaking skills.

Figure 4: adopted from Adriana et al.,(2019).

<https://developer.nvidia.com/blog/how-to-build-domain-specific-automatic-speech-recognition-models-on-gpus/>

Pronunciation Analysis: Machine learning algorithms can be employed to assess students' pronunciation and identify specific areas for improvement. By comparing students' speech patterns to native speakers' pronunciation, these algorithms can provide personalised feedback and suggestions for enhancing pronunciation



skills.

Figure 5: Phone-level pronunciation scoring and assessment for interactive language learning, Speech Communication (Witt & Young, 2000)

Natural Language Processing (NLP): NLP techniques can be used to analyse the content and structure of students' spoken responses. Machine learning models can evaluate factors such as vocabulary usage, grammar, coherence, and fluency, enabling a more comprehensive assessment of speaking proficiency.

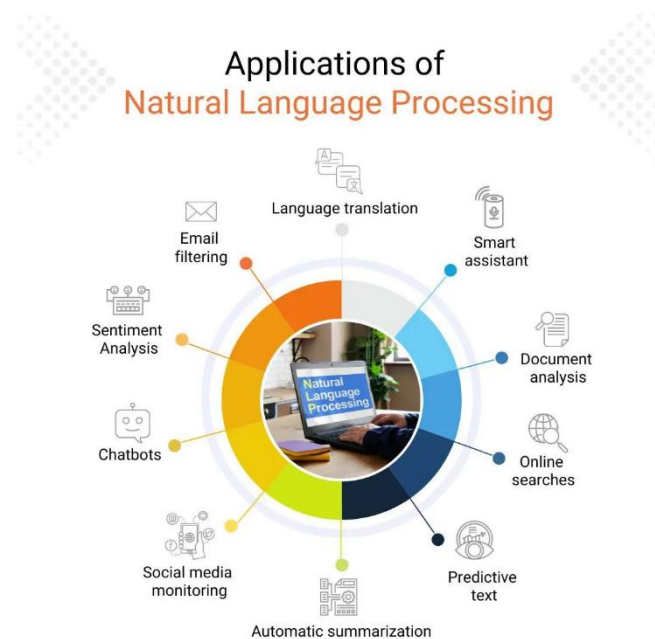


Figure 6: Adopted from FahadAlam (2022), <https://ur1.app/PL91G>

Sentiment and Emotion Analysis: Machine learning algorithms can detect and analyse the sentiment and emotions expressed by students during their speaking assessments. This can provide insights into their level of engagement, confidence, and overall communication effectiveness.

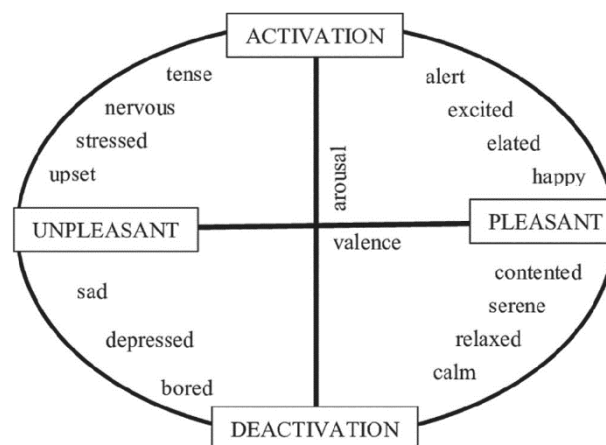


Figure 7: Acheampongetc al., 2021

Co-Author Contribution

The author affirmed that there is no conflict of interest in this article.

Acknowledgement

Special thanks to Muhammad Nazri Bin Muhd Adjunct Professor (AI Practice), Founder/Group CEO MyFinB, Founder/Chairman, Centre for AI Innovation (CEAI), Global and AIV50 for sharing your expertise on this topic.

2. References

- [1] Aminatun, D., &Oktaviani, L. (2019). Memrise: Promoting students' autonomous learning skill through language learning application. *Metathesis: Journal of English Language, Literature, and Teaching*, 3(2), 214-223.
- [2] Acheampong, F. A., Wenyu, C., &Nunoo-Mensah, H. (2020). Text-based emotion detection: Advances, challenges, and opportunities. *Engineering Reports*, 2(7), e12189.

- [3] Atmowardoyo, Weda, Sakkir. (2021). Learning Strategies in English Skills Used By Good Language Learners in Millennial Era: A Positive Case Study in UniversitasNegeri Makassar. Retrieved from <https://doi.org/10.26858/eltww.v8i1.20339>
- [4] Biber, D. (2007). Discourse on the move: Using corpus analysis to describe discourse structure (Vol. 28). John Benjamins Publishing.
- [5] Cabral, J. P., Cowan, B. R., Zibrek, K., and McDonnell, R. (2017). The influence of synthetic voice on the evaluation of a virtual character. In INTERSPEECH (pp. 229-233). doi:10.21437/Interspeech.2017
- [6] Caponetto, I., Earp, J., &Ott, M. (2014, October). Gamification and education: A literature review. In European Conference on Games Based Learning (Vol. 1, p. 50). Academic Conferences International Limited.
- [7] Carlson, G. E., & x. (1998). Signal and linear system analysis (pp. 178-180). Hoboken, NJ: John Wiley.
- [8] Carvalho, C. V., & Coelho, A. (2022). Game-Based Learning, Gamification in Education and Serious Games. Computers, 11(3), 36.
- [9] Costello, R. (2022). Future Directions of Gamification in Education. In Research Anthology on Developments in Gamification and Game-Based Learning (pp. 141-150). IGI Global. education. RPTEL 12, 22.Retrieved from <https://doi.org/10.1186/s41039-017-0062-8>
- [10] Encalada, W. L., & Castillo Sequera, J. L. (2017). Model to implement virtual computing labs via cloud computing services. Symmetry.
- [11] Hajimia, H., Singh, M. K. S., &Rathakrishnan, (2019). M. Analyzing Frequency And Distributional Pattern Of Discourse Markers In The Malaysian Newspaper.
- [12] Hart, S. A. (2016). Precision education initiative: Moving toward personalized education. Mind, Brain, and Education, 10(4), 209-211.
- [13] Hjelm, T. (2021). Discourse analysis. The Routledge handbook of research methods in the study of religion.
- [14] Hwang, G.-J., Xie, H., Wah, B. W., &Gašević, D. (2020). Vision, challenges, roles and research issues of Artificial Intelligence in Education. Computers and Education: Artificial Intelligence, 1, 100001.
- [15] Huang, J., Saleh, S., &Yufei, L. (2021, May 10). A Review on AI in Education Richtmann Publishing,7.Retrievedfrom<https://www.richtmann.org/journal/index.php/ajis/article/view/12463>
- [16] Kamar, E. (2016). Directions in Hybrid Intelligence: Complementing AI Systems with Human Intelligence. In IJCAI (pp. 4070-4073).
- [17] S.M Witt, S.J Young (2000), Phone-level pronunciation scoring and assessment for interactive language learning, Speech Communication, Volume 30, Issues 2â€“3, Pages 95-108, ISSN 0167-6393, [https://doi.org/10.1016/S0167-6393\(99\)00044-8](https://doi.org/10.1016/S0167-6393(99)00044-8).
- [18] Staff, T. (2020, September 16). 10 Roles For AI In Education. teachthought, 4. Retrieved from <https://www.teachthought.com/the-future-of-learning/10-roles-for-artificial-intelligence-in>
- [19] Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., ...&Cristea, A. I. (2019). Analysing gamification elements in educational environments using an existing Gamification taxonomy. Smart Learning Environments, 6(1), 1-14.
- [20] Tyagi, N. (2020). When AI (AI) And Neuroscience Meet. Analytics Steps. Retrieved from <https://www.analyticssteps.com/blogs/when-artificial-intelligence-ai-and-neurosci-ence-meet>.
- [21] Wang, F. H. (2017). An exploration of online behaviour engagement and achievement in flipped classroom supported by learning management system. Computers & Education, 114, 79-91.
- [22] Zilberman, Arkadi (2019), AI: Is It The Best Tool For Learning English? Retrieved from <https://elearningindustry.com/artificial-intelligence-best-tool-learning-english>
- [23] Zhang, L., & Yuan, J. (2021). The Effect of Subconscious on Life and Ethical Behavior. In 2021 4th International Conference on Humanities Education and Social Sciences (ICHESS 2021) (pp. 1007-1011). Atlantis Press.
- [24] Zulaihah, S. &Harida, R. (2017).Autonomous learning strategy of the successful nontraditional students. ELTIN Journal, 5(2), pp. 71-84.