

# The Impact of AI on Modern Education

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**Abstract:** Artificial intelligence (AI) continues to revolutionize the way we work and learn, and its impact on education is unfolding. Recent research sheds light on how AI can best support both teachers and learners. Studies on generative AI and large language models (LLMs) indicate that educators are optimistic about AI's productive role in education<sup>6,2</sup>. Additionally, research in the language learning field has demonstrated that AI is as good as, or even better than, humans at assessing writing skills<sup>1</sup>. To further investigate how AI can facilitate learning in general, a 6-month overseas research project was conducted in the winter of 2023. This project involved interviews with educators at leading educational institutions in America and a quantitative study to better understand how generative AI can be leveraged to optimize teaching and learning.

## Overview of overseas research project

This 6-month overseas research project entailed an in-depth analysis of how AI and speech recognition technology are reshaping education in both America and Japan. Focused interviews with educators and students at high schools and universities were conducted to identify the challenges and opportunities of implementing AI in educational settings. The key objectives of this research project are addressed in the three main sections of this report: (1) general perspectives on the implications of using AI in education, (2) focused research on the implementation of generative AI in language instruction, and (3) an overview of the educational affiliations fostered between KUT and institutions in America. The conclusion of this report discusses future implications of AI in language instruction, specifically aimed at improving the English education initiatives at Kochi University of Technology.

## 1. Teacher perspectives and experiences

The first objective of this project was to investigate attitudes and implications of using AI in education. The primary focus of this component of the research was to assess the perspectives and experiences of both educators and students regarding the use of generative AI within educational contexts. Drawing upon data gathered from interviews conducted with educators and students at several institutions in the United States, I attempted to outline the beliefs, attitudes, and experiences of teachers and learners impacted by the introduction of generative AI tools.

Attitudes towards AI in education: The majority of the educators I interviewed held positive attitudes towards AI and advocated that AI holds promise as a learning tool. At the same time, most advocated for clear rules and policies regarding the use of generative AI at their educational institutions. Most stated that their institutions have already initiated policy reforms to include the acceptable use of generative AI. They

also reported drafting guidance rules for students specifically for AI use in their particular courses.

Another key comment regarding AI was ‘balance.’ Several teachers stressed that they intended to balance the use of AI during the learning process. For example, one teacher allowed learners to use generative AI to suggest topics or rewrite paragraphs, but during exams, students were requested to use only paper and pencil. AI was seen as helpful for generating ideas and offering edits during the writing process, but for the final product, students were required to generate their own ideas.

Educators also believed that AI has the potential to expand access to education, particularly with AI’s ability to offer personalized learning. Therefore, implementing generative AI activities into the curriculum may help reduce educational costs and increase learner engagement.

Educators were also aware of the implications of ignoring the AI revolution. While most believed that AI was not going to replace their jobs, they were aware that professionals better educated about the use of AI would have expanded career opportunities. Likewise, they felt it was paramount that students learn how to use AI tools to boost their future job prospects.

Although the majority of the interviewed educators perceived AI positively, there were also serious concerns. The most significant concern was the unreliability of AI responses. Generative AI has a reputation for giving false and inaccurate information, as well as information that is out of date. Another concern among educators was the ethical use of AI tools, although this issue can be mitigated by drafting acceptable use policies and being aware of the limitations of these AI tools. Finally, concerns were voiced about the readiness of faculty and students. Some teachers and learners have had more exposure to AI tools and are more familiar with their strengths and weaknesses, while others have only used AI at a surface level and do not have a comprehensive grasp of its diverse uses and shortcomings.

Operationalizing generative AI: The interviews conducted as part of this project also shed light on how generative AI is being utilized by educators. The most common use of generative AI by teachers is to assist in developing teaching resources. Readings, visual aids, transcripts, summaries, and quiz items were several of

the more common tasks that teachers accomplished with the assistance of AI chatbots. Teaching materials that often took hours to create could be developed in much shorter periods. More engaging and relevant teaching content could also be developed by simplifying the administrative processes involved in creating instructional materials.

Teachers also felt that AI could effectively be applied to personalized learning experiences. The efficiency of AI tools allows teachers to create a wider range of materials that could better match learners’ levels, preferences, and pace. More importantly, AI could be leveraged to enhance personal assessment and feedback, particularly with large class sizes, to engage students more actively in the learning process. A more efficient learning process allows teachers and students to focus on the learning process rather than solely on the outcomes.

Outside of the classroom, generative AI was also found to be a valuable tool for summarizing, outlining, and semantic searching of research documents, particularly when synthesizing vast amounts of past research data related to a current project. AI can improve research by providing more efficient access to and sorting of large data sets.

Being a language teacher, I was interested in how AI was specifically being leveraged for language learning purposes. The most exciting area where AI is making a difference is with speaking practice. In an EFL context like Japan, language learners typically cannot converse with English speakers in the classroom. With the introduction of AI chatbots and virtual tutors, learners can hone their speaking and listening skills using open-ended speaking tasks. Speaking practice with an AI chatbot can open up new opportunities for learners who would normally have little or no interaction in the target language.

For writing improvement, AI can provide personalized assistance with revisions, translation, and grammar. An AI-based grammar assistant can compile lists of common writing errors by class or by student and then generate customized lessons or quizzes to help students identify and correct these errors in the future. Automated scoring of both speaking and writing has also improved significantly with the widespread introduction of generative AI tools. Automated scoring of language production, guided by AI chatbots, is a

disruptive innovation gaining attention as researchers try to interpret the complexities of AI and automated scoring<sup>4,5</sup>). Automated writing and speech scoring systems are now being used by schools to automatically assess writing and speaking quality by replicating the scoring procedures that human raters employ. With the improved AI tools available to teachers, automated scoring of both speaking and writing has become feasible. AI-enhanced automated scoring systems have been found to generate scores that positively correlate with human graders in writing<sup>3</sup>).

## 2. Generative AI and language instruction

The second objective of this research was to evaluate the effectiveness of generative AI in education. During this overseas research experience, I completed a qualitative project comparing grammar scores generated by human raters against those generated by AI chatbots using 152 EFL student writing samples. This section gives a brief overview of the study, which was published in *TEFL-Praxis*, an international peer-reviewed journal. The study showcases the potential advantages of generative AI through the demonstration of automated essay scoring (AES) in English as a Foreign Language (EFL) settings. The three research questions of the study are stated below.

Research Q1: How similar are AI-generated grammar scores to human-generated grammar scores using the same set of writing samples?

Research Q2: Is the inter-rater reliability between human raters and AI raters similar when scoring the grammar of L2 learners?

Research Q3: How consistent are AI chatbots among themselves at scoring the grammar of student writing?

The 152 writing samples were gathered from Japanese engineering students. Three TEFL-certified English teachers scored each writing sample using a grammar scoring rubric. The writing samples were then fed into three AI chatbots—ChatGPT 3.5, Google Bard (currently rebranded as Gemini), and Microsoft Bing Chat (currently rebranded as Copilot)—using the same grammar scoring rubric to generate grammar scores for the writing samples.

The mean scores of the four human raters and the ChatGPT-generated scores were found to be positively correlated,  $r(152) = .55$ ,  $p < .001$ . Likewise, a positive correlation was observed between the human and Bing

chatbot scores,  $r(152) = .55$ ,  $p < .001$ . These results indicate that both the ChatGPT and Bing chatbots assigned grammar scores comparable to those of the human raters. On the other hand, a weak relationship was observed between the human scores and the Bard chatbot scores,  $r(152) = .26$ .

The full research paper with detailed results can be found at: <https://doi.org/10.5281/zenodo.10402530>.

## 3. Promotion of collaboration between KUT and academic institutions abroad

Collaboration efforts were explored at four universities and two technology companies in America. This collaboration provided valuable insights into how public institutions are capitalizing on current technological trends. This section provides a brief summary of the sites that were visited.

### UCONN, <https://uconn.edu/>

The University of Connecticut, or UCONN, is a leading state institution that encompasses six campuses and 32,000 graduate and undergraduate students. UCONN is actively engaged in cutting-edge research across various fields, including biomedical sciences, engineering, agriculture, and social sciences. I met with faculty members from various departments to discuss the impact of AI on teaching and learning and to explore the possibilities of conducting student exchanges. Similar to other American universities, UCONN has extensive undergraduate exchange programs compared with graduate exchange programs. This is partly because undergraduate students have more time to study abroad. Additionally, the graduate program in science and engineering already has a large international population, reducing the need for international exchanges. Interestingly, the College of Engineering at UCONN has established an International Engineering Program where students can earn both a Bachelor of Science degree in engineering and a Bachelor of Arts degree in a language.

### William & Mary, <https://www.wm.edu/>

William & Mary is a smaller but competitive public university located in Williamsburg, Virginia. Its graduate schools focus on STEM research. William & Mary boasts the second lowest student-to-faculty ratio in the country, at 12 students per instructor. I

interviewed a thriving professor in the biomedical field who is currently coordinating a research project with a Japanese medical university in Tokyo. As with many public universities in America, research funding predominantly comes from government grants, and researchers must continually apply for grants to sustain their work. Additionally, graduate research in science and engineering is mainly at the doctoral level, and international students represent about one-third of these doctoral-level researchers. Therefore, research collaboration is typically conducted at the doctoral level.

**Old Dominion University, <https://www.odu.edu/>**

Old Dominion University (ODU) currently has an exchange agreement with Kochi University of Technology (KUT). In the past, KUT graduate students visited ODU for research collaboration. Undergraduate students at ODU and KUT have also participated in an online language exchange. During this visit, the KUT international relations office organized several meetings with engineering teachers at ODU. As with William & Mary, ODU's science and engineering graduate programs consist mainly of international students at the doctoral level. There is less focus on master-level research in science and engineering. ODU is also focusing on the integration of big data and medical science. Recently, ODU joined forces with Eastern Virginia Medical School to establish a future health sciences center, enhancing research collaboration between the science and engineering and medical science departments.

**University of California San Diego, <https://ucsd.edu/>**

At UCSD, I met with a professor in the School of Medicine to learn more about the joint efforts between the School of Medicine, Computational Science and Engineering, and Bioengineering. Like other research institutions in America, UCSD has identified the advantages of integrating science and engineering with other departments. There was also discussion of student exchanges and research opportunities between KUT and UCSD.

**WJE Associates, Inc., <https://www.wje.com/>**

In New York City, I met the senior vice president of construction at Wiss, Janney, Elstner Associates, Inc.

(WJE). This global company consists of engineers, architects, and materials scientists specializing in the investigation, testing, and design of repairs for buildings and bridges. The engineers gave an overview of their concrete research focusing on corrosion and cracking of concrete and masonry structures. Interestingly, there were several areas of research that overlapped with research being conducted at KUT, particularly regarding the durability of concrete made with municipal solid waste fly ash. Along with research themes, we also discussed their internship program, which is seeking architectural/architectural engineering, civil, or structural engineering students for a summer through fall Co-op at their New York, NY office. Additional information can be found at: <https://www.wje.com/careers/job-opportunities>.

**Ambi Robotics, <https://www.ambirobotics.com/>**

In California, I met with a research scientist at Ambi Robotics, who is working on AI-powered robotic solutions for parcel sortation. The company is a small start-up but has already deployed robots to sort packages at companies such as Pitney Bowes and OSM Worldwide. Ambi Robotics has a robust internship program, and strong communication skills in English are important. Additional internship information can be found at: <https://www.ambirobotics.com/blog/interns-of-ambi-robotics-summer-2023>.

**Implications**

The report concludes with a synopsis of how generative AI can serve as an ally in tackling the challenges posed by growing classroom sizes, with insights into the present landscape and future horizons of AI integration in language courses at Kochi University of Technology. Generative AI presents both opportunities and challenges for educators. Educators and administrators need to draft guidelines that include acceptable and unacceptable uses of generative AI in education. Guidelines should be outlined at both the university-wide and course levels. The formation of an AI working group would be beneficial, along with dialogue between students, teachers, and administrators about how to best adapt to emerging generative AI tools. Learner access to AI must also be evaluated to ensure inclusive learning opportunities for all students. Over time, we can assume students and teachers will

adapt to this disruptive technology as they have with other disruptive technologies in the past, such as the introduction of personal computers, the internet, and mobile devices.

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# AI が現代の教育に与える影響

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要約：人工知能（AI）は、私たちの働き方や学習方法に革命をもたらし続けており、教育への影響も拡大しつつある。最近の研究では、AI が教師と学習者の双方をどのようにサポートするのがベストなのかに光を当てている。生成 AI と大規模言語モデル（LLM）に関する研究は、教育者が教育における AI の生産的役割について楽観的であることを示している<sup>6,2)</sup>。さらに、言語学習分野の研究では、AI がライティングスキルの評価において人間と同等か、それ以上であることが実証されている<sup>1)</sup>。AI が一般的な学習をどのように促進できるかをさらに調査するため、2023 年の冬に 6 ヶ月間の海外調査プロジェクトを実施した。このプロジェクトでは、アメリカの主要な教育機関の教育者へのインタビューと定量的な調査を行い、生成 AI をどのように活用すれば教育と学習を最適化できるかをより深く理解することができた。