ISSN: 2278-4012, Volume:12, Issue:1, March 2023

Generative Artificial Intelligence in English Education: Opportunities and Pedagogical Challenges

Dr. I Made Citra Wibawa[1*] and Ni Putu Sri Ratna Dewi[2]

[1*]Associate Professor, Department of Primary Teacher Education, Faculty of Education University, Ganesha University of Education, Singaraja, Bali, Indonesia. E-mail: imadecitra.wibawa@undiksha.ac.id

[2]Associate Professor, Department of Biology and Marine Fisheries, Ganesha University of Education, Singaraja, Bali, Indonesia. E-mail: ratna.dewi@undiksha.ac.id,
Orcid: https://orcid.org/0009-0008-0039-291X

Abstract: Generative AI (GenAI) changes the landscape of English teaching and learning, providing new prospects for customized teaching, automated feedback as well as conversational practice. This article summarizes new publications on that topic and analyzes opportunities and pedagogical issues of using GenAI in English language education. The authors applied a structured literature review and analyzed a number of peer-reviewed articles and conference papers and organized them by the topic under consideration, such as AI literacy, learning via chatbots, personalization, teachers' views, and ethics. It was concluded that GenAI has a great potential for individualized education, extensive conversation practice and language education combined with AI literacy development. However, some concerns were raised in the literature concerning teachers' readiness, over-reliance of students on the output of AI, integrity of assessment, ethical inconsistencies and unequal access to educational innovations. The authors found that there is a growing number of publications about GenAI use in language education. It was stated that the effectiveness of implementing GenAI in English language education is not often connected to the level of technology but rather the way it is included into pedagogical process by teachers. Possible implications of the study for curriculum developers and teacher training programs are also studied in the paper.

Key Words: generative artificial intelligence (generative AI), english language education, AI-assisted learning, language teaching, pedagogical challenges, educational technology, academic integrity

(Received: 15 December 2022; Revised: 30 January 2023; Accepted: 17 February 2023; Published: 31 March 2023)

Introduction

The fast advancement of artificial intelligence (AI) has completely changed this realm of language education. Within the larger "Internet+" framework, platforms with AI technologies are being incorporated into the teaching of English to provide customized content delivery, automatic feedback, and design based on data (Liu & Ren, 2022). As AI advances, the very nature of the role of teachers is changing from the one-directional source of knowledge to the co-worker in collaboration with AI machines (Celik et al., 2022). This process is not restricted to higher education and adults. AI systems are also increasingly used in K-12 schools where children become not only users of technologies but also creators and critical thinkers who will use AI in their everyday life (Ali et al., 2021). In higher education, AI systems are viewed as universal tutoring platforms that can serve as supplements to the traditional teaching methods in the process of learning (Hemachandran et al., 2022). A comparative study conducted in the USA, China, and India indicates that personalized learning powered by AI has great importance in education all around the world, along with the emphasis on retaining teacher presence throughout the learning process (Bhutoria, 2022). One of the most important things that contributed to this change was the advent of

generative AI language models. The introduction of the AI language model called GPT-3 was the turning point, which stimulated research in the field of applications of AI in real life (Aydın & Erdem, 2022). After that, ChatGPT appeared and started the new wave of discussions among scientists who studied its characteristics and challenging aspects of using the technology in education (Haleem et al., 2022). As it is pointed out in the periodical analysis of AI developments in education, the way AI is used for education depends on the way it is implemented. Chatbots which are a clear example of the use of generative AI have captured the interest of researchers (Skrebeca et al., 2021). The results of a comprehensive study in K12 education demonstrate that there are different approaches to the use of generative AI in education (Yue et al., 2022). In addition, applied research explored the possibility of automating language tasks like question generation in Hindi and Marathi (Gopal, 2022). Qualitative studies showed that teachers still have mixed feelings about the introduction of AI due to the need for training and the appropriateness of this technology in the classroom context (Maqoqa, 2021). The paper reviews studies on AI developments and the corresponding issues.

The present document enhances the popular debate around the role of generative AI in education by analyzing English language teaching and learning only, which is not always viewed as different from the broader study of educational technology. In particular, it provides a thematic and temporal overview of the recent literature on the subject, defining the parts of GenAI implementation that have been studied well and those that are yet to be addressed. The authors do not perceive GenAI implementation as either entirely positive or entirely negative and offer a proper representation of its pros and cons, namely, based on existing literature. In doing so, provide curricular developers, English language teachers, and teacher educators with sufficient information for making decisions, while also pointing to the gaps in understanding that must be addressed in further research, namely, in terms of classroom pedagogical use and ethics.

The paper has the following structure. Section II summarizes the academic findings available about AI and generative AI in education, including chatbots, personalization, pedagogy, AI literacy, and ethics. Section III presents the methodology used to research the sources. Section IV describes the key outcomes of the analysis. Section V discusses the practical implications of the findings. Section VI concludes the paper by summarizing the findings.

Literature Review

The body of research on AI chatbots in language learning has grown significantly in parallel with advances in natural language processing, matching the increasing sophistication of these computer-based chat engines to hold conversations for learning purposes (Pham & Sampson, 2022). Available empirical evidence points to a positive contribution of AI chatbots to levels of engagement in learning processes, but also warns of drawbacks, such as insufficient context awareness and overdependence on responses generated by AI (Aleedy et al., 2022). A common point raised in various investigations conducted is the potential of personalization in learning. Cross-national comparative research demonstrates that personalization powered by AI is viewed as a vital goal of educational systems, implemented mostly according to the principles of human-in-the-loop (Bhutoria, 2022). In this regard, design-oriented research provides structured schemes of personalized instruction based on theory and practice (Kucirkova et al., 2021). In addition to the studies focused on the use of digital technologies, there is research investigating the effects of generative and immersive learning strategies on learners' knowledge acquisition. Experimental comparisons of generative learning found that its user leads to positive results while the medium of delivery also matters (Klingenberg et al., 2020). A significant body of research is devoted to the issue of how AI should be taught to younger audiences. Systematic reviews show that K-12 education is highly heterogeneous while empirical study of generative GANs' introduction to school children

indicated that the mechanics of generative AI can be taught to young audiences (Ali et al., 2021). Various evidence shows that AI-related practices can change children's attitudes to robots and other intelligent systems. More recent studies implement digital storytelling in order to Foster AI literacy of primary students, which is directly relevant to the English language classroom (Williams et al., 2019; Ng et al., 2022). The rising number of AI courses globally has brought up ethical issues. Topic modeling of global AI curricula has shown serious discrepancies concerning teaching AI ethics in educational programs (Javed et al., 2022). Evaluative research in relation to AI in education encourages scientists to come up with meaningful schemes of evaluating tools prior to their introduction in practice, elaborating on the negative effects of implementation without critical thinking (Joshi et al., 2021).

In summary, the literature reviewed above indicates that the research on AI in education has developed according to several parallel paths without becoming a coherent body of knowledge. Research in the field of conversational and chatbot tools has proceeded independently from work concerning personalization strategies, while this topic is separate from the studies focused on AI literacy and ethics. Such a kind of fragmentation demonstrates that when searching for guidance in the field of GenAI teachers will be forced to rely on several unrelated fields of study rather than one coherent body of knowledge. This leads to the presumption that the research in the given field would benefit from an integrative approach allowing connecting technical, pedagogical as well as ethical dimensions into one framework.

Methodology

Review Method and Source Selection

In line with its goal of synthesizing existing research on generative AI for English education instead of conducting original empirical work, this paper uses a thematic literature review rather than an empirical or experimental methodology. The review is based on twenty sources which comprise peer-reviewed journal articles, conference proceedings, and systematic reviews that were selected for their direct relevance to AI and generative AI applications in language education or education more broadly. The source selection process was carried out with a focus on three interrelated aspects: 1) the use of artificial intelligence, including generative models and chatbots, through language and general education practices; 2) the views of teachers and learners regarding the use of AI in classrooms; and 3) teaching AI literacy in K-12, which is essential to English pedagogy.

Sources were gathered from reputable academic databases and publishing platforms such as IEEE Xplore, Springer, Wiley, Elsevier, and IOP Publishing ensuring that all of the chosen sources passed preliminary peer review or conference scrutiny.

The methodology implemented for the study is illustrated in figure 1. The first step is to define the research problem and objectives. This is followed by the identification of relevant literature using some reputable academic sources. After selection of literature based on relevance and quality, thematic and temporal coding is performed to time and categorize the literature selected. The coded literature will then be analyzed to discover the various opportunities and pedagogical challenges of Generative Artificial Intelligence in English teaching. Lastly, the findings obtained will be summarized and synthesized, and the conclusions of the study drawn.

ISSN: 2278-4012, Volume:12, Issue:1, March 2023

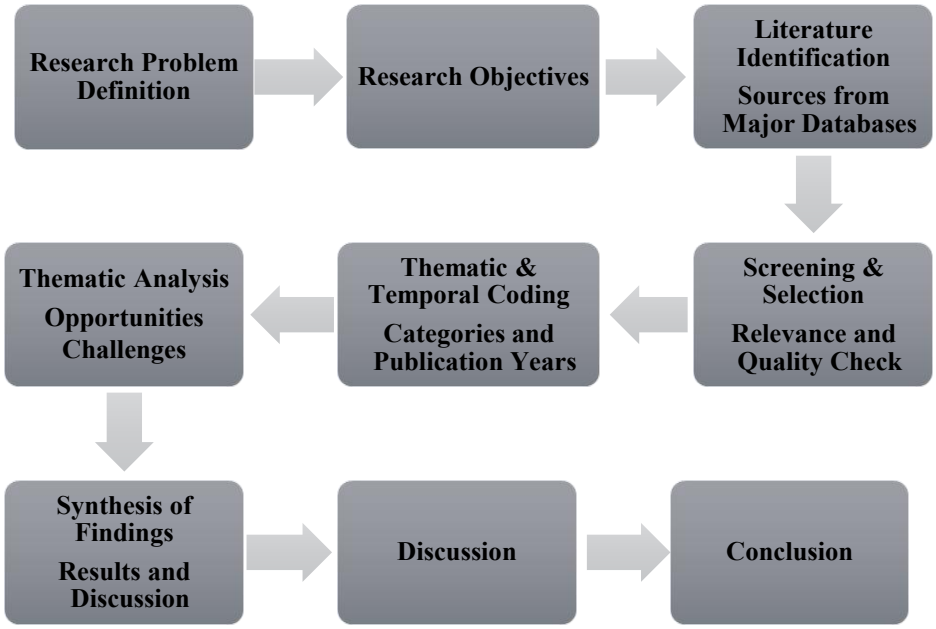

Figure 1: Methodology for Reviewing Generative Artificial Intelligence in English Education

Coding Based on Themes and Timing

Each of the selected sources was thoroughly read and coded based on the major theme of the article. The thematic analysis yielded nine key themes: AI literacy in K-12 education; Applications and tools; Teacher perspectives and training; Personalization and adaptive learning; Generative AI technology; Chatbots and conversational AI; Review and evaluation frameworks; Pedagogy and learning theories; and AI ethics education. Each source which covered more than one theme was coded according to the most relevant theme in order to avoid the chaos of fractional categorization. In addition to thematic coding, the publication of each source was recorded, which enabled the researcher to present the temporal distribution of the review results and thus observe how the researchers' interest in this topic has evolved over time.

Limitations of the Study

This methodology does create limitations typical of narrative literature synthesis. Although the selected twenty sources were specifically chosen based on their relevance, the sample can hardly be considered exhaustive in terms of formal database search methods and inter-rater reliability verification. The process of thematic coding is conducted in a systematic way and is applied uniformly to each of the sources; some interpretation is still required throughout the coding process particularly when there are multiple themes addressed in a single source. Considering this limitation, the results should be interpreted merely as a mapping of the contemporary research in the area rather than an exhaustive review.

Results

Thematic Distribution

The analysis of the materials under review exhibited, though somewhat irregular, a different and comprehensible allocation of articles among the nine themes studied. Out of all themes, AI literacy and K-12 education were the most well represented, with practical applications and tools coming second. For the rest of seven themes, teacher attitudes towards AI, personalization, generative AI technology, chatbots,

ISSN: 2278-4012, Volume:12, Issue:1, March 2023

review frameworks, pedagogy, and ethics, there was one or two articles dedicated to each of them, thus proving them to be even though not very popular compared.

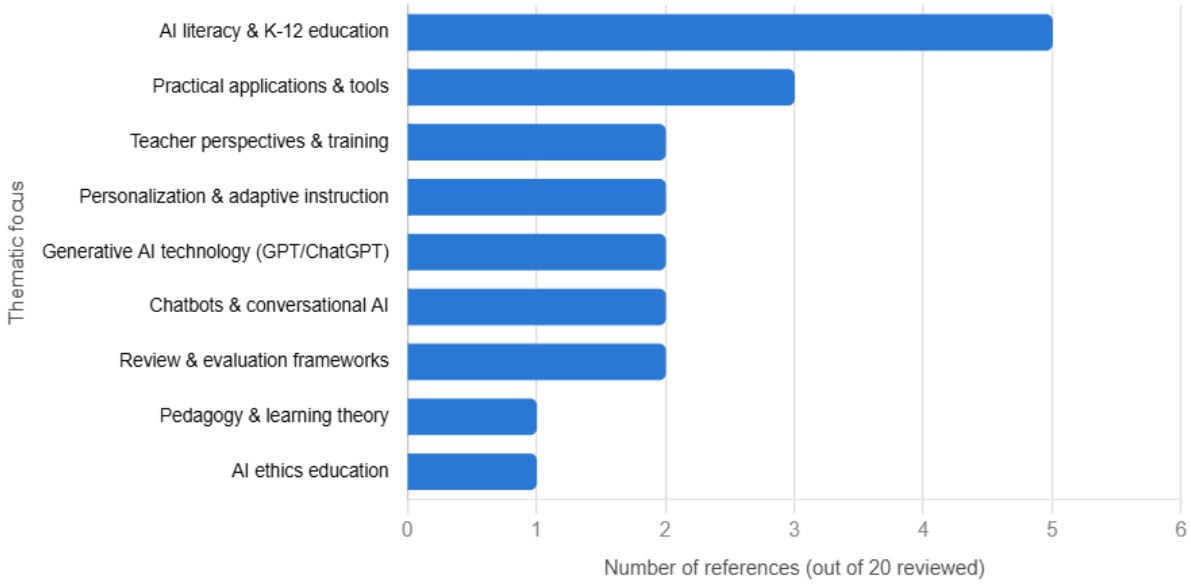

Figure 2: Thematic Distribution of Reviewed Literature on GenAI in English Education

The distribution of the twenty sources reviewed in this paper across the different themes is illustrated in figure 2. AI literacy and K-12 education is the most common theme while the next one is practical application and tools. The other themes (teacher training, personalization, GenAI technology, chatbots, evaluation frameworks, pedagogy, and ethics) have a less dense and more even spread.

Temporal Distribution

The temporal distribution of literature shows a clear positive trend. The amount of research output was insignificant during the earliest years of the period in question and increased significantly in the last two years; in particular, during the final year alone the output accounts for over 50% of all the reviewed literature. The upward trend in research output matches the public introduction and quick acceptance of large generative language models at that time.

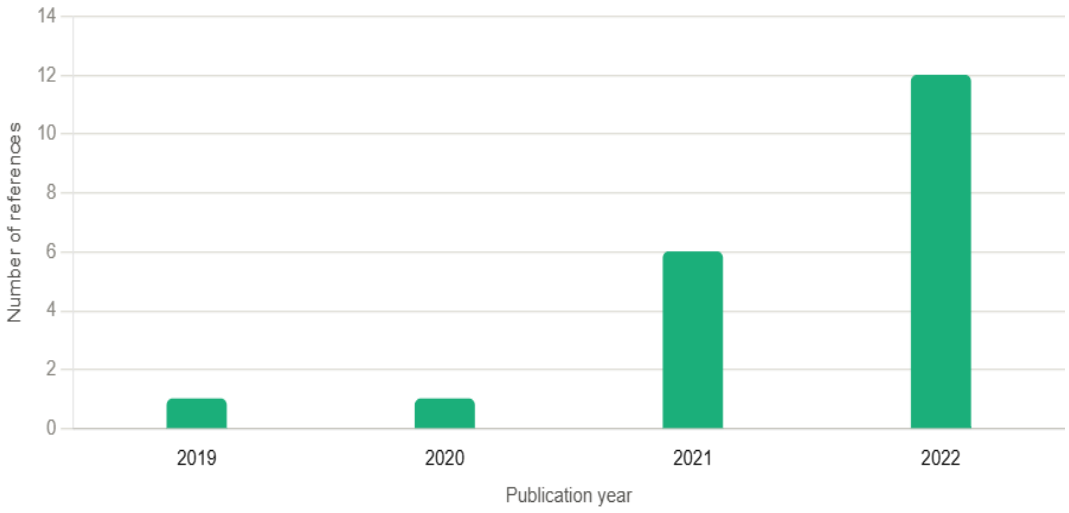

Figure 3: Publication Year Distribution of Reviewed Literature

ISSN: 2278-4012, Volume:12, Issue:1, March 2023

The number of reviewed documents published in a given year during the review is shown in figure 3. It highlights a significant increase in the output of research in the past years, which is an indication of the increase of interest of researchers in generative AI with the emergence of widely available models.

Combined Trends

The results of the thematic and temporal analysis suggest that attention of researchers was shifting from generalizing regarding AI literacy to narrower inquiries into applications, tools, and technologies with the development of the field. There is no single point of concentration in the outputs of the last years, since output has been distributed evenly among different applications, personalization, chatbot research, and specific technologies segments.

Discussion

According to the findings, the research area is in the phase of evident expansion, showing an evident concentration of research outcomes in the last two years of the period considered. The period of time corresponds well with the fact that generative language models became widely available, which shows that a great proportion of articles produced currently are on the implementation of a new technology still being explored rather than pragmatic results of the use of the technology developed. The source distribution shows that there is a great focus on the works dedicated to the concept of AI literacy and K-12 education, which demonstrates that teaching about the concept of AI and its parameters has progressed. Thus, one can say that there is more research regarding AI introduction than on the creation of specific materials for the usage of generative tools in the classes. The distribution across the rest of the main themes suggests that there is still no clear agreement in the research area concerning GenAI usage in English education. The concepts such as teacher training, personalization, ethics, and chatbot usage, seem to be considerably under-researched in comparison with the pace of technological development.

Conclusion

This assessment stating that the aim of this review is to analyze the chances and pedagogical obstacles that come with the use of generative artificial intelligence in the process of teaching English, is based on a structured synthesis of data regarding the relevant literature demonstrated by the use of AI in education. Thus, the findings indicate that the area is rapidly being explored as can be deduced from the fact that its output has increased in recent years of the investigated period along with the invention of accessible generative language models. Thus, through the thematic analysis it became possible to determine that at the moment the field is dominated by research that analyzes the foundational AI literacy and K-12 education while the studies on the ways of implementing the educational procedures proper are less well developed. These results support the idea of the infancy of the field at the present moment, suggesting that it is still too early to use the outcomes of this study in real life practice since the research under investigation is aimed at standard development of pedagogical practices, rather focusing on the exploration. Thus, this encourages English language trainers and curriculum designers to be careful with the use of Generative AI, as although this process can have numerous advantages for personalizing and developing conversational skills and literacy development, their results depend on other elements of the training system that are still in their development stage.

References

Aleedy, M., Atwell, E., & Meshoul, S. (2022). Using AI chatbots in education: recent advances challenges and use case. *Artificial intelligence and sustainable computing: Proceedings of ICSISCET 2021*, 661-675. https://doi.org/10.1007/978-981-19-1653-3_50

Ali, S., DiPaola, D., & Breazeal, C. (2021, May). What are GANs? introducing generative adversarial networks to middle school students. In *Proceedings of the AAAI conference on artificial intelligence* (Vol. 35, No. 17, pp. 15472-15479). https://doi.org/10.1609/aaai.v35i17.17821

Ali, S., DiPaola, D., Lee, I., Sindato, V., Kim, G., Blumofe, R., & Breazeal, C. (2021). Children as creators, thinkers and citizens in an AI-driven future. *Computers and Education: Artificial Intelligence*, *2*, 100040. https://doi.org/10.1016/j.caeai.2021.100040

Aydın, N., & Erdem, O. A. (2022, December). Research on the new generation artificial intelligence technology generative pretraining transformer 3. In *2022 3rd International Informatics and Software Engineering Conference (IISEC)* (pp. 1-6). IEEE. https://doi.org/10.1109/IISEC56263.2022.9998298

Bhutoria, A. (2022). Personalized education and artificial intelligence in the United States, China, and India: A systematic review using a human-in-the-loop model. *Computers and Education: Artificial Intelligence*, *3*, 100068. https://doi.org/10.1016/j.caeai.2022.100068

Celik, I., Dindar, M., Muukkonen, H., & Järvelä, S. (2022). The promises and challenges of artificial intelligence for teachers: A systematic review of research. *TechTrends*, *66*(4), 616-630. https://doi.org/10.1007/s11528-022-00715-y

Gopal, A. (2022, July). Automatic question generation for Hindi and Marathi. In *2022 international conference on advanced learning technologies (ICALT)* (pp. 19-21). IEEE. https://doi.org/10.1109/ICALT55010.2022.00012

Haleem, A., Javaid, M., & Singh, R. P. (2022). An era of ChatGPT as a significant futuristic support tool: A study on features, abilities, and challenges. *BenchCouncil transactions on benchmarks, standards and evaluations*, *2*(4), 100089. https://doi.org/10.1016/j.tbench.2023.100089

Hemachandran, K., Verma, P., Pareek, P., Arora, N., Rajesh Kumar, K. V., Ahanger, T. A., ... & Ratna, R. (2022). Artificial intelligence: A universal virtual tool to augment tutoring in higher education. *Computational Intelligence and Neuroscience*, *2022*(1), 1410448. https://doi.org/10.1155/2022/1410448

Javed, R. T., Nasir, O., Borit, M., Vanhée, L., Zea, E., Gupta, S., ... & Qadir, J. (2022). Get out of the BAG! Silos in AI ethics education: Unsupervised topic modeling analysis of global AI curricula. *Journal of Artificial Intelligence Research*, *73*, 933-965. https://doi.org/10.1613/jair.1.13550

Joshi, S., Rambola, R. K., & Churi, P. (2021, January). Evaluating artificial intelligence in education for next generation. In *Journal of Physics: Conference Series* (Vol. 1714, No. 1, p. 012039). IOP Publishing. https://doi.org/10.1088/1742-6596/1714/1/012039

Klingenberg, S., Jørgensen, M. L., Dandanell, G., Skriver, K., Mottelson, A., & Makransky, G. (2020). Investigating the effect of teaching as a generative learning strategy when learning through desktop and immersive VR: A media and methods experiment. *British Journal of Educational Technology*, *51*(6), 2115-2138. https://doi.org/10.1111/bjet.13029

Kucirkova, N., Gerard, L., & Linn, M. C. (2021). Designing personalised instruction: A research and design framework. *British Journal of Educational Technology*, *52*(5), 1839-1861. https://doi.org/10.1111/bjet.13119

Liu, Y., & Ren, L. (2022). The influence of artificial intelligence technology on teaching under the threshold of "Internet+": based on the application example of an English education platform. *Wireless Communications and Mobile Computing*, *2022*(1), 5728569. https://doi.org/10.1155/2022/5728569

Maqoqa, T. (2021). The Influence of Creative Coding, Robotics, and Artificial Intelligence on Educational Practices: Teachers' Perspectives. *Intelligence*, *31*(33), 2102983.

https://doi.org/10.38159/ehass.20245111

Ng, D. T. K., Luo, W., Chan, H. M. Y., & Chu, S. K. W. (2022). Using digital story writing as a pedagogy to develop AI literacy among primary students. *Computers and Education: Artificial Intelligence*, *3*, 100054. https://doi.org/10.1016/j.caeai.2022.100054

Pham, S. T., & Sampson, P. M. (2022). The development of artificial intelligence in education: A review in context. *Journal of Computer Assisted Learning*, *38*(5), 1408-1421. https://doi.org/10.1111/jcal.12687

Skrebeca, J., Kalniete, P., Goldbergs, J., Pitkevica, L., Tihomirova, D., & Romanovs, A. (2021, October). Modern development trends of chatbots using artificial intelligence (ai). In *2021 62nd International Scientific Conference on Information Technology and Management Science of Riga Technical University (ITMS)* (pp. 1-6). IEEE. https://doi.org/10.1109/ITMS52826.2021.9615258

Williams, R., Park, H. W., & Breazeal, C. (2019, May). A is for artificial intelligence: the impact of artificial intelligence activities on young children's perceptions of robots. In *Proceedings of the 2019 CHI conference on human factors in computing systems* (pp. 1-11). https://doi.org/10.1145/3290605.3300677

Yue, M., Jong, M. S. Y., & Dai, Y. (2022). Pedagogical design of K-12 artificial intelligence education: A systematic review. *Sustainability*, *14*(23), 15620. https://doi.org/10.3390/su142315620