

Opportunities And Challenges in Using Generative AI in Educational Assessment

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Abstract — The era of artificial intelligence (AI) has ushered in significant advancements and opportunities across various industries, including education. This research paper provides an in-depth examination of the impact of AI on education, with a specific focus on the application of generative AI, chatbots, analytics, and personalized learning experiences. It investigates the associated limitations, challenges, and concerns, aiming to shed light on the ethical implications, cultural considerations, language proficiency issues, and privacy concerns tied to the use of AI in education. Through an extensive review of recent literature and empirical studies, this paper brings attention to the multifaceted implications of AI integration in education. It explores the potential benefits and risks arising from the utilization of generative AI, chatbots, analytics, and personalized learning experiences. Furthermore, the research paper delves into the roles played by educators, parents, and policymakers in effectively managing the associated risks and maximizing the benefits derived from AI implementation in education.

The findings underscore that AI holds immense potential in enhancing learning efficiency, providing customized educational support, and automating essential activities within higher education. However, the responsible implementation of AI must be underpinned by ethical principles and thoughtful consideration of potential risks and limitations. Consequently, this necessitates a proactive approach to address ethical concerns and establish comprehensive guidelines and policies that safeguard the interests of all stakeholders involved. This chapter proposes future recommendations for research, policy development, and professional development programs to cultivate trust and understanding in the realm of AI in education. By fostering interdisciplinary collaborations and continuously exploring AI's impact on education, stakeholders can navigate the evolving landscape and leverage AI technologies to create transformative educational environments that align with ethical standards and address the concerns raised.

Based on the above conclusions, it was recommended that teachers who teach Mathematics which is not their field of specialization should enroll and earn a certificate in Mathematics., The numeracy materials in Mathematics 7 should be recommended for use by grade 7 learners in the school, in the district and in the division level. Teachers in other areas of discipline should also develop other forms of instructional materials for successful teaching-learning outcomes. Findings of this study should be used by future researchers as springboard for similar investigations in other learning areas

Keywords — *Generative AI in education, Generative AI in schools, AI in education, AI in schools and ChatGPT in education*

I. Introduction

Recent advancements in artificial intelligence (AI) have significantly influenced various sectors, particularly education. Technologies such as generative AI (GenAI), chatbots, learning analytics, and personalized learning systems offer new opportunities to enhance learning efficiency, automate academic tasks, and provide individualized support to learners (Wang et al., 2023; Zhang, 2023). Despite these benefits, the application of AI in education raises substantial concerns related to ethics, data privacy, cultural sensitivity, language proficiency, and academic integrity, underscoring the need for critical and ethical evaluation of AI-driven educational practices (Kooli, 2023; Tanjga, 2023).

AI in education (AIED) has evolved over more than four decades, transitioning from early rule-based and traditional machine learning approaches to advanced systems powered by natural language processing, neural networks, and deep learning (McCalla, 2023; Ouyang & Jiao, 2021). These developments have enabled intelligent tutoring systems, adaptive learning environments, and automated feedback mechanisms that support teaching and learning across diverse educational contexts (Gobert, 2023). Recent breakthroughs in GenAI, particularly those driven by large language models (LLMs), have further expanded AI's potential by enabling real-time personalization and human-like text generation (Hadi et al., 2023).

GenAI has gained increasing attention in educational research due to its capacity to generate content, support personalized instruction, and assist with academic writing and assessment. Studies have examined its integration into instructional design, learning support, and assessment practices, highlighting both its transformative potential and inherent risks (Kasneji et al., 2023; Pardos & Bhandari, 2024). In assessment contexts, GenAI presents opportunities to move beyond one-size-fits-all models toward more culturally responsive, formative, and adaptive approaches that better address diverse learner needs (Bennett, 2023; Sireci, 2020).

However, the personalization of educational assessment through GenAI introduces significant challenges related to fairness, validity, reliability, transparency, and bias. While GenAI can dynamically generate assessment content, adapt language complexity, and provide personalized feedback, concerns persist regarding the interpretability of AI outputs, potential copyright violations, and the risk of reinforcing existing inequities (Bender et al., 2021; Kasneji et al., 2023). These challenges necessitate robust validation processes and human oversight to ensure that AI-enhanced assessments uphold core assessment principles.

Beyond assessment, AI tools—particularly LLM-based applications such as ChatGPT—have become increasingly prevalent in academic research and writing. These tools are now widely used to summarize literature, generate drafts, and assist in identifying research gaps. However, their reliability in scholarly tasks remains inconsistent. The study by Soriano et al. (2024) evaluated six AI tools' accuracy in identifying methodological and theoretical research gaps and providing verifiable sources. The findings revealed notable variability in performance,

with some tools producing credible and accessible references, while others generated unverifiable or incomplete citations, reinforcing the importance of critical human evaluation.

AI has also demonstrated promise in enhancing academic writing proficiency, particularly among English as a Second Language (ESL) learners. In the Philippine context, where academic writing demands have intensified following K–12 educational reforms, AI-assisted writing tools have become increasingly common. The study by Soriano et al. (2024) on the effectiveness of Meta AI among Filipino ESL learners found significant improvements in writing efficiency, coherence, grammatical accuracy, and learner attitudes. These findings suggest that AI-driven feedback can serve as a valuable scaffold in academic writing development when used responsibly.

Taken together, existing research highlights the dual nature of AI in education—as both a powerful support tool and a source of ethical and methodological challenges. While GenAI offers substantial opportunities to enhance assessment personalization, research efficiency, and writing proficiency, its integration must be guided by ethical frameworks, regulatory oversight, and human-centered design principles. This study contributes to the growing body of literature by emphasizing the need for responsible, transparent, and critically informed use of AI technologies to ensure academic rigor, equity, and integrity in educational research and practice.

II. Methodology

Research Design

The researcher will employ the descriptive method of research by utilizing a questionnaire as the main tool in gathering the needed data. As defined by Calmorin, it is descriptive because it aims to provide an accurate description of a situation of an association between variables from which one can then make some statements about a certain group or population. The primary aim in administering this method is to describe the nature of situation as it exists at the time of the study and to explore the causes of the phenomena.

Along this line, the descriptive method of research will be employed in this study to describe the profile of the respondents. Furthermore, the same descriptive method of research will be utilized to opportunities and challenges in using AI in Education.

This study is also developmental as it will develop intervention measures addressing the challenges which will be identified to improve performance.

Sources of Data

The subjects of this study are teachers and heads of the Lyceum Northwestern University Urdaneta Campus.

Distribution of Respondents

N=57

Department	No. of Teachers	No. of Program Heads	Total	%
ELEMENTARY	5	1	6	10.53
JUNIOR HIGH	17	1	18	31.58
SENIOR HIGH	11	1	12	21.05
COLLEGE	16	5	21	36.84
TOTAL			57	100%

Instrumentation and Data Collection

The researcher will use the questionnaire as the major data instrument in this study.

The researcher will adopt a questionnaire of similar researches on the Opportunities and Challenges in using AI which is consisted of (1) The profile of respondents in terms of 1.1 Highest Educational attainment, 1.2 major / minor field of specialization 1.3 years of experience in teaching, 1.4 Relevant seminars/ in-service trainings attended; the frequency counts and corresponding percentage (%) was computed for each of the afforested variables.

Before the conduct of the study the researcher will strictly observe the following standard operating procedures. Secure permit from the Managing Director, and a letter of permission will be sent to the teachers and learners to administer the questionnaires. The researcher will personally administer and retrieve the instrument. Data will be based from the respondents answers and it will be carefully tallied, tabulated, and analyzed.

Tools for Data Analysis

Appropriate statistical tools will be utilized to enable the researcher to come up with the valid and reliable interpretation of the data gathered.

For sub-problem No. 1 on the profile of the respondents, frequency counts and percentages will be used .

$$P = \frac{F}{N} \times 100 \quad ; \quad AWM = \frac{\sum X}{N} \times 100$$

Where:

P = percentage ,AWM= Ave.Wt. Mean
 f = frequency , $\sum X$ =Sum of the mean
 N = no. of cases

For sub-problem No. 2 On the opportunities in using generative artificial intelligence in Educational assessment as perceives by teachers and learners, the average weighted mean and a four-point Likerts scale will be used . as shown below and the descriptive equivalent .

Unit Weight	Equivalent Weighted Points	Interpretation
4	3.25 - 4.00	<i>Strongly Agree</i>
3	2.50 - 3.24	<i>Agree</i>
2	1.75 - 2.49	<i>Disagree</i>
1	1.00 - 1.74	<i>Strongly Disagree</i>

For sub-problem No. 3 significant difference between the perception of teachers and learners,, Z-test will be used .

$$Z = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{SD_1^2 + SD_2^2}{N}}}$$

Where, Z= Z test; \bar{X}_1 = mean of the first; \bar{X}_2 = mean of the second

SD_1^2 = Variance of the first mean; SD_2^2 =variance of the second mean

N = no of population

For sub-problem No. 4 On the challenges faced by the respondents in using AI; the average weighted mean and a five-point Likerts scale will be used . as shown below and the descriptive equivalent

Rating Scale	Point Range	Descriptive Equivalent
5	4.21 – 5.00	Very Serious
4	3.41 - 4.20	Serious
3	2.61 - 3.40	Moderately Serious
2	1.81 – 2.60	Fairly Serious
1	1.00 – 1.80	Not Serious

For sub-problem No. 5 The researcher will develop trainings and policies to address the challenges and improve performance.

Ethical Consideration

As a form data-privacy is concern, all actions pertaining to personal information and identity of all involved in this investigation will be kept confidential. This study investigation assures all will keep all responses concealed. As a result, participants will be advised not to include any personally identifiable information in their questionnaire or test material. Their responses will likewise be kept confidential. To preserve each subject's identity, the researcher will keep their information confidential; all information acquired from the study will be coded. No names or other identifying information will be used while discussing or reporting data. The researcher will securely preserve any files and data gathered. Once the data has been completely analyzed, it will be discarded.

III. Results and Discussion

The result of the research and a summary of the data were provided. To come up with an accurate presentation, analysis and interpretation, data were thoroughly examined.

Table 1
The Respondent’s Personal Profile
N=57

Variables	Categories	F	%
HEI	Bachelor’s Degree	21	36.84
	W/ Master Degree Units	25	43.86
	Master’s Degree	5	8.77
	W/ Doctoral Units	4	7.01
	Doctoral Degree	2	3.51
Position	Faculty/Teacher	49	85.96
	Program Head/ Coordinator	8	14.04
Years in Service	0-5 years	35	61.40
	6-10 years	15	26.32
	11-15 years	5	8.77
	16-20 years	2	3.51
	21 up years	0	0
ICT Competency	Basic	30	52.63
	Intermediate	25	43.86
	Advance	2	3.52
	Expert	0	0
Seminars Attended	District	48	84.21
	Division	6	10.53
	Regional	2	3.51
	National	0	0
	International	1	1.75

The majority of respondents hold at least a bachelor's degree, with a significant portion (43.86%) pursuing or having earned master’s units. However, only a small number have completed advanced degrees—only 8.77% have a master’s degree and 3.51% hold a doctoral degree. This suggests that while many educators are progressing academically, few have reached terminal qualifications. Most of the respondents are Faculty/Teachers (85.96%), with only a small percentage holding administrative or leadership roles such as Program Head/Coordinator

(14.04%). This indicates that the data predominantly reflects the experiences and competencies of teaching personnel. A large majority (61.40%) have been in service for 0–5 years, showing a workforce with many relatively new educators. Only 3.51% have more than 15 years of service, and none have served for over 20 years. This implies a young or recently hired workforce, potentially due to recent recruitment or turnover. Over half of the respondents (52.63%) rated themselves at a basic level of ICT competency, while 43.86% are at the intermediate level. Only a very small fraction (3.52%) rates themselves as having advanced ICT skills, and none claim to be at the expert level. This highlights a need for professional development in ICT to elevate digital teaching capabilities. Seminar participation is heavily concentrated at the district level (84.21%), with minimal exposure to division (10.53%), regional (3.51%), and international (1.75%) events. No participation was recorded in national-level seminars. This points to limited professional development beyond the local level, which may restrict exposure to broader educational trends and innovations.

Table 2
Opportunities in Using Generative AI in Educational Assessment of the teachers
N=57

Statement	Mean	Descriptive Equivalent
1. Generative AI can provide instant access to vast amounts of information quickly.	3.71	Strongly Agree
2. With generative AI, teachers could tailor curricula and performance assessments to individual student needs for personalized learning	3.78	Strongly Agree
3. Teachers might explore using Generative AI to generate content and course materials including lesson plans, quiz questions, sample problems, or writing scenarios.	3.73	Strongly Agree
4. Generative AI can aid diverse learners with different learning abilities, linguistic backgrounds, or accessibility needs	3.75	Strongly Agree
5. With the help of generative AI, it is easier to produce academic resources. Such resources include study materials, question banks, exercises, etc.	3.57	Strongly Agree
6. Using AI assistants, education providers can understand the unique learning styles, strengths, and weaknesses of learners.	3.43	Strongly Agree
7. AI can help you practice, correct your mistakes, and immerse you in realistic dialogues. Based on learners’ proficiency in the language, they can also ask the AI to go hard or soft.	3.49	Strongly Agree
8. Generative AI technologies like text-to-speech, speech-to-text, and automatic captioning can help	3.54	Strongly Agree
9. AI is data analysis, report writing, and even generating hypotheses based on existing knowledge. And the education sector can use this to its advantage.	3.57	Strongly Agree
10. Assist in research tasks including analyzing large datasets, identifying patterns, and generating insights and research directions	3.62	Strongly Agree

Legend:

Mean range	Descriptive Equivalent
3.25-4.00	Strongly Agree
2.50-3.24	Agree
1.75-2.49	Disagree
1.00-1.74	Strongly Disagree

The data presents the mean responses and descriptive equivalents of educators' perceptions regarding the integration of generative AI in education. All ten statements received mean scores between 3.43 and 3.78, falling under the descriptive category "Strongly Agree", indicating a consistently positive attitude toward generative AI's potential in educational settings. High appreciation for AI's utility in personalized learning (Mean = 3.78), content creation (3.73), and support for diverse learners (3.75). Educators see generative AI as a valuable tool for producing academic resources, enhancing accessibility, and adapting to different learning styles. AI is also viewed favourably in research-related tasks, including data analysis and hypothesis generation (Mean = 3.62). Slightly lower (yet still strong) agreement on AI's role in understanding learning preferences and practicing language skills suggests areas for further exploration and training. In summary, educators strongly support the use of generative AI in various academic applications, reflecting openness to innovation and a recognition of AI's potential to enhance teaching, learning, and research practices.

Table 3
SIGNIFICANT DIFFERENCE BETWEEN PERCEPTIONS OF
TEACHERS AND HEADS
N=57

	Teachers	Heads
Mean	3.61836735	3.6375
Known Variance	1	1
Observations	49	8
Hypothesized Mean Difference	1	
Z	-2.6726145	
P(Z<=z) one-tail	0.00376313	
z Critical one-tail	1.64485363	
P(Z<=z) two-tail	0.00752627	
z Critical two-tail	1.95996398	

To determine whether there is a significant difference between the responses of teachers and heads, a z-test for two sample means was conducted at a 0.05 level of significance. The results showed a computed z-value of -2.6726 and a corresponding two-tailed p-value of 0.0075. The critical z-values for a two-tailed test at the 0.05 level are ± 1.9599 . Since the calculated z-value falls outside this range and the p-value is less than 0.05, the null hypothesis is rejected. This indicates that there is a statistically significant difference between the responses of teachers and heads.

Table 4
Challenges Faced by The Teachers in Using Generative Artificial Intelligence in Educational Assessment
N=57

Statement	Mean	Descriptive Equivalent
1. Curricula need to evolve, incorporating digital literacy, critical thinking about AI-generated content, and the ethical use of AI technologies as AI tools become more common.	4.38	Very Serious
2. The use of AI raises questions about the ownership of AI-generated content, particularly in research and creative works, requiring institutions to navigate intellectual property rights	4.50	Very Serious
3. AI-generated content may contain inaccuracies or biases, potentially leading to misinformation	4.36	Very Serious
4. Job displacement necessitates retraining and up skilling employees, focusing on uniquely human skills like ethical judgment and interpersonal communication.	4.35	Very Serious
5. generative AI is the risk of becoming too dependent on this technology	4.42	Very Serious
6. AI models don't really understand the meaning of the language they process. They are just making complex calculations to create accurate content based on the data they have been trained with.	4.33	Very Serious
7. Generative AI promises a more effective, personalized education. But this also could result in a more solitary, isolated education, as students would spend part of their time interacting with a virtual assistant instead of their educators and peers, which could jeopardize their social skills.	4.12	Serious
8. Generative AI increases the risk that students may use it to submit work that is not their own.	4.15	Serious
9. It is easy for AI to create hallucinations or plausible facts , which are completely false content that look convincing.	4.07	Serious
10. The use of AI in higher education may require the collection and analysis of sensitive personal data, such as student's academic performance and behavioral patterns.	4.27	Very Serious

Legend:

Mean range	Descriptive Equivalent
4.21 – 5.00	Very Serious
3.41 - 4.20	Serious
2.61 - 3.40	Moderately Serious
1.81 – 2.60	Fairly Serious
1.00 – 1.80	Not Serious

The data outlines educators' perceptions of the **seriousness of potential challenges and risks** associated with the integration of generative AI in education. The **mean scores range from 4.07 to 4.50**, with the majority falling under the category "**Very Serious**", indicating **strong concern** about the implications of AI use. **Ownership of AI-generated content** and issues around **intellectual property rights** are seen as the most critical concern (Mean = 4.50). High concern is also shown for **overdependence on AI (4.42)** and the **need to evolve curricula** to include digital literacy and ethical AI use (4.38). Respondents view **misinformation, bias, and AI hallucinations** as significant threats (Means = 4.36 and 4.07), emphasizing the risk of **inaccurate AI-generated outputs**. There is a clear recognition of the need to **retrain workers** and promote **uniquely human skills** like ethics and communication (Mean = 4.35). Concerns about **social isolation** in AI-driven

education (4.12) and **academic dishonesty** (4.15) reflect worries about the **social and ethical dimensions** of AI integration. The use of AI involving the **collection of sensitive student data** is also perceived as **very serious** (Mean = 4.27), pointing to privacy and ethical considerations in higher education. Educators perceive the **challenges of generative AI as serious to very serious**, particularly in areas of **intellectual property, overreliance, misinformation, ethical use, job displacement, and data privacy**. While generative AI offers promising educational benefits, the findings underscore the **critical need for safeguards, policy development, and comprehensive digital literacy** to responsibly integrate AI technologies into the educational system.

IV. Conclusion

In view of the findings, the following conclusions were drawn:

1. The Teachers are generally well-qualified and committed to professional growth, with a mix of experienced and newer, tech-savvy individuals. While most have intermediate ICT skills, there is a noticeable gap in advanced digital literacy and specialized training in generative AI.
2. Generative Artificial Intelligence (GenAI) presents promising opportunities in educational assessment, enhancing **efficiency** through automation, enabling **personalization** to meet individual student needs, fostering **creativity** in content creation, and promoting **equity** by supporting diverse learning styles and accessibility.
3. There is a **significant difference** between **teachers'** and **program heads'** perceptions of **Generative AI** in educational assessment. These differences stem from their **roles, expectations, and familiarity with AI tools**. Teachers focus on **practical applications** like efficiency and personalization, while program heads emphasize **strategic implementation** and long-term goals.
4. The teachers face **practical, ethical, technical, and pedagogical** challenges when using **Generative AI** in educational assessment.
5. To address challenges and improve educational assessment with **Generative AI**, targeted **teacher training** on AI literacy, ethical use, and practical applications is crucial. Additionally, **ongoing professional development** and well-defined **institutional policies** will help educators stay updated and effectively integrate GenAI while maintaining academic integrity.

V. Recommendations

Based on the above conclusions, the following recommendations are offered for possible course of action:

1. Implement **comprehensive training programs** focused on **AI literacy**, ethical use of AI, and practical applications in creating assessments, rubrics, and personalized feedback.
2. Establish **micro credentialing programs** and **peer-led communities of practice** to provide **continuous learning** opportunities for teachers.
3. Conduct **technical support, resources, and mentorship** to teachers as they navigate the challenges of integrating GenAI in their teaching practices.
4. Conduct regular meetings and workshops should focus on aligning **strategic goals** with **practical, classroom-based applications** of GenAI.
5. Develop clear **institutional policies** that outline the **ethical use, data privacy, and academic integrity** considerations when implementing GenAI.

TRAINING AND POLICIES

Introduction

The rapid advancement of Generative Artificial Intelligence (GenAI) has opened up transformative opportunities in **educational assessment**, offering the potential to enhance efficiency, personalize learning, foster creativity, and promote equity. However, the integration of GenAI into educational practices presents a set of challenges, ranging from technical issues to ethical concerns. As educators begin to explore the potential of AI-driven tools, there is a growing need for targeted training and well-defined institutional policies to ensure these technologies are used effectively, ethically, and responsibly.

Training in GenAI is essential for empowering teachers with the knowledge and skills necessary to navigate AI tools, design meaningful assessments, and provide personalized feedback to students. As the adoption of AI tools increases, AI literacy becomes a critical competency for educators. However, most teachers possess **only** intermediate ICT skills, with a noticeable gap in advanced digital **literacy** and understanding **of** AI technologies. Without adequate training, there is a risk that teachers may struggle to implement GenAI tools effectively or face difficulties in addressing ethical dilemmas, such as ensuring academic integrity and safeguarding against biases in AI-generated content.

Objectives:

1. Equip teachers with a strong foundation in **Generative AI** technologies, their functions, applications, and potential benefits in **educational assessment**.

2. Develop a framework for teachers to make ethical decisions when integrating AI into the classroom, ensuring fairness and accountability in educational assessments.
3. Develop and implement **clear institutional policies** on the ethical use, **data privacy**, and **academic integrity** related to the use of GenAI in educational assessments.
4. Align the use of AI technologies with **long-term educational goals** to ensure that AI contributes to the overall vision and objectives of the educational institution.

Category	Description	Purpose	Examples
Teacher Training	Professional development for educators on using AI tools in assessment	To equip teachers with the skills to use AI effectively	Workshops on AI-based grading tools, adaptive test creation, and AI ethics
Student Orientation	Guidance for students on appropriate AI use in assessments	To ensure responsible and ethical AI use by students	Guidelines on when AI tools can be used (e.g., for practice, not for cheating)
AI Literacy Programs	Inclusion of AI concepts in curricula	To build awareness and understanding of AI	Courses or modules on how AI works and its implications in education
Ethical Use Policies	Rules governing how AI can be used in assessments	To promote fairness, avoid misuse, and ensure integrity	Code of conduct for AI-assisted assignments, anti-plagiarism rules
Data Privacy Policies	Regulations on the collection and use of student data by AI systems	To protect student privacy and comply with laws	Consent forms, data encryption, GDPR/FERPA compliance
AI Bias Monitoring	Processes to review AI outputs for bias or unfair treatment	To ensure fairness in assessment results	Regular audits of AI grading or feedback patterns
Assessment Standards	Integration of AI within accepted academic evaluation frameworks	To maintain consistency and academic quality	Aligning AI-generated tests with curriculum standards
Feedback Mechanisms	Systems for reporting AI errors or issues in assessments	To continually improve AI systems and maintain trust	Surveys, error reporting tools, teacher reviews of AI feedback

REFERENCES

- [1] Akinwalere, S. N., & Ivanov, V. (2022). Artificial intelligence in higher education: Challenges and opportunities. *Border Crossing*, 12(1), 1–15. <https://doi.org/10.33182/bc.v12i1.2015>
- [2] Bae, S., Dong, Y., & Kwon, O. (2023). The effects of content creator, media richness, and content theme on learning performance: Focusing on ESG management education for Chinese employees. *글로벌경영학회지*, 20(1), 27–50. <https://doi.org/10.38115/asgba.2023.20.1.27>
- [3] Bowles, D. C., & Kruger, J. S. (2023). Generating employable, intelligent graduates in a world with generative AI: Thoughts for educators. *Pedagogy in Health Promotion*, 9(2), 75–77. <https://doi.org/10.1177/23733799231175171>
- [4] Dimitriadou, E., & Lanitis, A. (2023). A critical evaluation, challenges, and future perspectives of using artificial intelligence and emerging technologies in smart classrooms. *Smart Learning Environments*, 10(1). <https://doi.org/10.1186/s40561-023-00231-3>

- [5] Duong, M. T., Rauschecker, A. M., Rudie, J. D., Chen, P. H., Cook, T. S., Bryan, R. N., & Mohan, S. (2019). Artificial intelligence for precision education in radiology. *British Journal of Radiology*, 92(1103), 20190389. <https://doi.org/10.1259/bjr.20190389>
- [6] Hwang, G., & Tu, Y. (2021). Roles and research trends of artificial intelligence in mathematics education: A bibliometric mapping analysis and systematic review. *Mathematics*, 9(6), 584. <https://doi.org/10.3390/math9060584>
- [7] Kooli, C. (2023). Chatbots in education and research: A critical examination of ethical implications and solutions. *Sustainability*, 15(7), 5614. <https://doi.org/10.3390/su15075614>
- [8] Large language models in medical education: Opportunities, challenges, and future directions. (n.d.). *JMIR Preprints*. <https://preprints.jmir.org/preprint/48291>
- [9] Mageira, K., Pittou, D., Papasalouros, A., Kotis, K., Zangogianni, P., & Daradoumis, A. (2022). Educational AI chatbots for content and language integrated learning. *Applied Sciences*, 12(7), 3239. <https://doi.org/10.3390/app12073239>
- [10] Nguyen, A., Ngo, H. N., Hong, Y., Dang, B., & Nguyen, B. T. (2022). Ethical principles for artificial intelligence in education. *Education and Information Technologies*, 28(4), 4221–4241. <https://doi.org/10.1007/s10639-022-11316-w>
- [11] Pavlik, J. V. (2023). Collaborating with ChatGPT: Considering the implications of generative artificial intelligence for journalism and media education. *Journalism & Mass Communication Educator*, 78(1), 84–93. <https://doi.org/10.1177/10776958221149577>
- [12] Soriano, S., Diga, D. A., Belandres, E., Barrozo, J., Sison, E. S. C., & Cinchez, M. R. (2024). Ethical implications of AI in student assessments: A critical examination. *Library Progress International*, 44(3), 3224–3229. <https://bpasjournals.com/library-science/index.php/journal/article/view/989>
- [13] Soriano, S., Obrero, M. M., Rabago, J. B., Pacaldo-Pabalan, A., De Guzman, R. R., & Angulo, L. R. (2024). Evaluating the accuracy of selected AI tools in identifying methodological and theoretical gaps in research literature. *Library Progress International*, 44(3), 132–140. <https://bpasjournals.com/library-science/index.php/journal/article/view/632>
- [14] Soriano, S., Martinez, R. A., Jr., Pabalan, J. L., III, Dulay, M. J. B., Fangon, M. R., Rosales, R. S. T., Nabor-Ferrer, C., & Mathur, A. (2024). Effectiveness of Meta AI in enhancing academic writing proficiency: The case of Filipino ESL learners. *Library Progress International*, 44(3), 18929–18939. <https://bpasjournals.com/library-science/index.php/journal/article/view/785>
- [15] Su, J., & Yang, W. (2023). Unlocking the power of ChatGPT: A framework for applying generative AI in education. *ECNU Review of Education*, 209653112311684. <https://doi.org/10.1177/20965311231168423>
- [16] Tanjga, M. (2023). E-learning and the use of AI: A review of current practices and future directions. *Qeios*. <https://doi.org/10.32388/ap0208>
- [17] Tanveer, M., Hassan, S., & Bhaumik, A. (2020). Academic policy regarding sustainability and artificial intelligence (AI). *Sustainability*, 12(22), 9435. <https://doi.org/10.3390/su12229435>
- [18] Vallis, C., Wilson, S., Gozman, D., & Buchanan, J. (2023). Student perceptions of AI-generated avatars in teaching business ethics: We might not be impressed. *Postdigital Science and Education*. <https://doi.org/10.1007/s42438-023-00407-7>
- [19] Wang, T., Lund, B. D., Marengo, A., Pagano, A., Mannuru, N. R., Teel, Z. A., & Pange, J. (2023). Exploring the potential impact of artificial intelligence (AI) on international students

- in higher education: Generative AI, chatbots, analytics, and international student success. *Applied Sciences*, 13(11), 6716. <https://doi.org/10.3390/app13116716>
- [20] What ChatGPT means for universities: Perceptions of scholars and students. (2023). *Journal of Applied Learning and Teaching*, 6(1). <https://doi.org/10.37074/jalt.2023.6.1.22>
- [21] You, Y., Chen, Y., You, Y., Zhang, Q., & Cao, Q. (2023). Evolutionary game analysis of artificial intelligence such as the Generative Pre-Trained Transformer in future education. *Sustainability*, 15(12), 9355. <https://doi.org/10.3390/su15129355>
- [22] Zhai, X., Neumann, K., & Krajcik, J. (2023). Editorial: AI for tackling STEM education challenges. *Frontiers in Education*, 8. <https://doi.org/10.3389/feduc.2023.1183030>
- [23] Zhang, H., Lee, I., Ali, S., DiPaola, D., Cheng, Y., & Breazeal, C. (2022). Integrating ethics and career futures with technical learning to promote AI literacy for middle school students: An exploratory study. *International Journal of Artificial Intelligence in Education*. <https://doi.org/10.1007/s40593-022-00293-3>
- [24] Zhang, J. (2023). Impact of artificial intelligence on higher education in the perspective of its application of transformation. *Lecture Notes in Education Psychology and Public Media*, Vol. 2, 822-830, 2(1), 822–830. <https://doi.org/10.54254/2753-7048/2/2022483>