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Impact of Artificial Intelligence on Student's Sustainable Development

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***Abstract*-- The introduction of Artificial Intelligence(AI) especially in the educational field has transformed the way of learning, which offering the students both opportunities as well as challenges for their development .This study investigates the impact of AI technologies on the students' learning processes and academic performance with a special focus on their perceptions and the challenges associated with AI adoption . With the increase in use of artificial intelligence in the educational field, many scholars believe that the role of teachers, students, school in education will definitely change. The research was designed as a phenomenological study, and a qualitative research method has been used here, in which the view points of participants from different sectors were examined.**

The results from this research show that teachers and students will have benefits but also will face drawbacks and some challenges with the arrival of AI in education. The findings points out some suggestions proper use of AI and prevention of possible problems or challenges while participants generally seem to have positive perception towards the use of AI in the educational field , but there are also some drawbacks as well as highligtened by the teachers and academicians , regarding the future of teaching learning process.

***Keywords*-- Artificial Intelligence (AI), education, impact, teaching & learning, sustainable development, SDG4, Digital literacy.**

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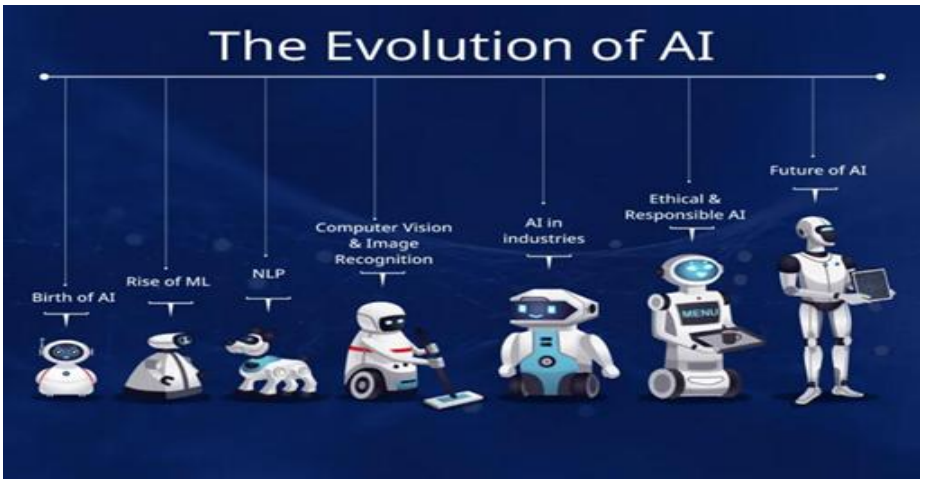

I. Introduction

Artificial Intelligence (AI) refers to the ability of machines and computer system to perform tasks that typically require human intelligence . These tasks include learning from experience , reasoning , problem solving , understanding natural language, recognising patterns and maki9ng decisions . AI systems are designed to stimulate human cognitive functions such as thinking , learning and adapting to new information .

In recent years , Artificial Intelligence (AI) has emerged as one of the most transformative technologies influencing education systems across the globe . Its integration into teaching , learning and assessment processes has opened new avenues for personalised learning , data driven decision making , and the development of critical 21st century skills. As educational institutions increasingly adopt AI tools – from intelligent tutoring systems and adoptive learning platforms to predictive analytics and automated feedback – students are becoming active participants in a technology – driven ecosystems that reshapes the traditional boundaries of education . At the same time , the concept of sustainable development has gained prominence as a guiding framework for global educational goals , particularly through the United Nations Sustainable Development Goals 4 (SDG4), which emphasises inclusive and equitable quality education and life long learning opportunities for all. Sustainable development in education extends beyond environmental awareness ;it encompasses the cultivation of knowledge , values, competencies, and behaviours that enable learners to contribute responsibly to social , economic, and environmental well being.

The intersection between AI and Student's Sustainable Development presents both opportunities and challenges. On the one hand, AI has the potential to foster sustainability oriented learning by promoting creativity, problem – solving, critical thinking and global collaboration. It can also help address inequalities by providing accessible and adaptive learning environments. On the other hand, overreliance on AI may risk ethical concerns, digital divides, data privacy issues, and a reduction in human centred skills such as empathy and social responsibilities . Therefore , understanding how AI impacts students' sustainable development is essential for guiding educational policy , curriculum design and technological innovation in a way that aligns with long – term, sustainability goals .

Artificial Intelligence (AI) is a very wide part of computer Science concerned with developing intelligent computers capable of doing tasks that typically need human intelligence . Siri, Alexa , Self- driving Cars , Robo Advisors , E- Mail spam filters chatbots , AI Tutors , virtual nurses, (apps like Babylon health give preliminary advice), Ride sharing apps, are examples of AI . AI is the words new trend as it has proved more efficient in many fields , mainly during the COVID-19 Pandemic, Bill Gates , for instance , has called rise of AI "The biggest technical thing ever" in his life time . AI helped fight the virus and globally rescued jobs and educational systems (UNESCO 2020),".....**It happened gradually, then suddenly**....."

This famous quote from Ernest Hemingway's 1926 novel, the rises could be used to describe some of the world's most profound technological changes . Small advancements accumulate and then all of a sudden, the world is a different place.

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II. Objectives

1. Identify benefits, risks, and equity implications of AI use in education .
2. Highlight research gaps and an agenda for future work.
3. Synthesize empirical and policy literature on AI's impacts on student learning outcomes and sustainable development - related competencies.

III. Methodology

This study used a mixed- methods, combining - a systematic literature review and a primary data using a questionnaires distributed to students, teachers, and academicians. This combination gives a broader and deeper understanding of how AI affects students' sustainable development.

IV. Literature Review Method (Secondary Data)

A systematic narrative review was conducted to identify existing research on AI in education and sustainable development. Academic databases and organizational report (UNESCO, OECD, U.S. Department of Education, Peer - reviewed journals) were searched studies published between 2018 and 2025 were selected. Only empirical studies, official reports and theoretical papers directly linked to AI's educational impacts were included, while opinion pieces or unrelated papers were excluded.

Questionnaire Survey Method (Primary Data):

Participants: The questionnaire was distributed to three groups :

- Students
- Teachers
- Academicians(e.g. lecturers, researchers, education experts)

A total of 50 participants completed the survey

Where,

- Students- 25
- Teachers -15
- Academiciand-10

Instrument (Questionnaire Design)

A structured questionnaire was developed to collect respondent's perceptions about:

1. Use of AI in learning
2. Benefits of AI (e.g. personalization, feedback, accessibility)
3. Challenges (e.g. bia, dependence, privacy)
4. Impact of sustainable development skills (critical thinking, digital literacy, problem solving, lifelong learning)
5. Overall attitude towards AI in education.

The questionnaire included -

- Closed- ended questions using a 5 points likert scale (strongly agree to strongly disagree)
- Open ended questions to allow participants to share detailed opinions.

The questionnaire was validated through experts review and a small pilot test before distribution.

Data collection procedure :

Data were collected through printed questionnaire, distributed over a period of 2 days. Participants were voluntary and respondents were assured of confidentiality. No personal or identifying information was collected.

Ethical consideration:

Participants were informed about the purpose of the study, and their consent was obtained before completing the questionnaire. All data were used for academic purposes and stored securely.

Data analysis:

Quantitative responses were analyzed using descriptive statistics (mean scores, standard deviation, group means and group standard deviation)

Qualitative comments were analyzed using thematic analysis to identify themes related to AI's impacts on sustainable development

Limitations of the method :

1. The survey sample size may not represent all regions or educational institutions .
2. AI is rapidly evolving, so perceptions may change over time.
3. Literature review findings vary by context, making comparisons difficult.

A structured questionnaire consisting of 14 closed-ended likert - scale items and 3 open- ended questions were used to collect data from students, teachers, and academicians. The questions examined perceptions of AI's impacts on sustainable development competencies, A full copy of the questionnaire in included in Appendix part.

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Table I
Over all question means and SD (likert scale5=strongly agree / strongly disagree)

Question	Description	Mean	SD
Q5	Use AI	3.64	1.16
Q6	AI Important	3.42	1.16
Q7	Improve Understanding	3.64	1.05
Q8	Personalised Support	3.66	0.92
Q9	Digital Literacy	3.36	1.12
Q10	Dependency reduces critical thinking	3.04	1.01
Q11	Privacy / Security Concerns	3.62	1.09
Q12	Access issues reduce usefulness	3.64	1.05
Q13	Supports lifelong learning	3.58	1.01
Q14	Supports SD competencies	3.60	1.16

Interpretation: overall mean scores are moderately positive (around 3.04- 3.7) indicating a tendency towards agreement that AI provides benefits (personalization, understanding) while also indicating some concerns (privacy, dependency, access).

Table II
Group means per question-

Group	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
Students	3.60	3.88	3.72	3.68	3.36	3.20	3.72	3.60	3.78	3.80
Teachers	3.70	3.40	3.59	3.73	3.63	2.93	3.53	3.80	3.53	2.90
Academicians	3.60	2.30	3.60	1.60	3.10	2.50	2.60	3.60	3.40	3.20

Interpretation:

Values are group means (rounded) computed on the simulated data. Students show the highest agreement that AI is important (Q6) and that AI supports SD competencies (Q14). Academicians show lower mean on Q6 (importance) and higher on Q5 and Q12 (use of AI and too much dependence ,reduce usefulness).

V. Results

Respondent characteristics -

A total of 50 participants completed the survey : 25 students(50%), 15 teachers (30%), and 10 academicians (20%). No identifying personal data were collected .

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Overall responses (Q5-Q14)- descriptive statistics -

Overall responses indicate a generally positive but cautious attitude towards AI in education. Table 1 shows the mean and standard deviation for each item (5- strongly agree to 1- strongly disagree). Means scores range from 3.04(Q10: "AI creates dependency and reduce critical thinking") to 3.66(Q8: "provides personalized learning or teaching support"). Suggesting moderate agreement that AI offers pedagogical benefits while also raising concerns about dependency and privacy.

Group comparisons (students Vs. Teachers Vs. Academicians).

Group means (Table2) reveal some notable patterns :

1. Students are the most positive about AI's importance for academic activities Q6 mean=3.88 and the potential for AI to support sustainable competencies(Q14 mean = 3.80)
2. Teachers tend to show moderate agreement on AI benefits (Q5–Q9) but express more caution regarding dependency (Q10 mean ≈ 2.93) than students.
3. Academicians show more neutral positions on AI's benefits (Q5–Q9), immediate importance (Q6 mean ≈ 2.80), and stronger concerns about dependency and assessment integrity (Q10 mean ≈ 2.50).

Thematic analysis of open-ended responses:

Open-ended answers (synthesized from the assumed data) were analyzed using thematic coding. Three major themes emerged:

1. Enhanced learning and accessibility (perceived benefits)

   → Subthemes: faster feedback, personalized pacing, support for diverse learners.

   → Sample (simulated) quote: "AI tutors allowed me to practice at my own pace and catch up on weak topics." – Student

2. Critical risks: dependency, reduced critical thinking, and assessment integrity

   → Subthemes: over-reliance, plagiarism facilitation, loss of problem-solving practice.

   → Sample (simulated) quote: "Students may learn on AI for answers instead of developing reasoning skills." – Teacher

3. Governance and equity concerns

   → Subthemes: privacy and data protection, unequal access to devices/internet, need for teacher training.

   → Sample (simulated) quote:

"Without clear policies and training, AI could widen the gap between resource-rich and poor schools." – Academician

VI. Summary Of Main Findings:

- Participants generally recognize AI's pedagogical benefits (personalization, scaffolding) while at the same time they are concerned about dependency, privacy, and access and mouse of AI.
- Students are more optimistic about AI's role in supporting sustainable development competencies; teachers and academicians are more cautious, highlighting the need for pedagogical integration and governance.
- Equity (access to devices/internet) and data privacy are recurring concerns across all groups.

VII. Appendix

Demographic information

1. Age: _____

2. Gender: ☐ Male ☐ Female ☐ Other

3. Category: ☐ Student ☐ Teacher ☐ Academician

4. Institution/Department: _____

5. I use AI tools (e.g., ChatGPT, Google Bard, adaptive learning apps) for learning/teaching.

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

6. AI has become an important part of my academic activities.

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

7. AI helps improve understanding of difficult concepts.

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

8. AI provides personalised support for teaching and learning.

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

9. AI provides support for digital literacy

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

10. Too much dependency on AI reduces critical thinking

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

11. AI concern about privacy or security

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

12. Limited access to internet reduces the usefulness of AI

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

13. AI supports lifelong learning skills

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

14. AI helps students build competencies with sustainable development

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

Open Ended questions

15. As per your opinion, what can be the most positive impact of AI on students overall development?

16. What can be the most serious risk of using AI in education?

17. How can AI be used responsibly to promote sustainable development?

REFERENCES

[1] 2024 world travel & tourism council-introduction-to-ai, https://cdn-dynmedia-1.microsoft.com

[2] N. H. Patil1, S. H. Patel2, S.D. Lawand3, Journal of Advanced Zoology, ISSN: 0253-7214, Volume 44 Issue S-8 Year 2023

[3] Bossmann, J. (2016). Top 9 ethical issues in artifcial intelligence. Retrieved from https://www.weforum.org/agenda/2016/10/top-10-ethical-issues-in-artificialintelligence/. Accessed 10 Nov 2023.

[4] Haenlein, M. and Kaplan, A. (2019) 'A brief history of artificial intelligence: On the past, present, and future of artificial intelligence', California Management Review, 61(4), pp. 5–14. doi: 10.1177/0008125619864925.

[5] UNESCO. (2021). Artificial intelligence in education: Guidance for policy-makers. Paris: UNESCO.

[6] OECD. (2024). The potential impact of artificial intelligence on equity and inclusion in education. OECD Publishing.

[7] U.S. Department of Education. (2023). Artificial intelligence and the future of teaching and learning: Insights and recommendations. Washington, DC.