The Necessity of Integrating Artificial Intelligence Literacy into School Curricula

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Abstract

The significance of this study stems from examining the need to integrate Artificial Intelligence (AI) literacy into school curricula. It explored students' knowledge about the use of AI, its challenges, and its contribution to students' academic outcome. Combining both quantitative and qualitative methods, the study was guided by four questions: "To what extent do students know how to use AI tools?", "How do students use the data generated by AI tools", "How effective do students believe AI is in enhancing their academic performance?", and "To what extent do students trust AI-generated information?". In order to collect data, a semi-structured survey questionnaire was answered by one hundred ninety-seven (197) Lebanese secondary students. Their responses revealed that most of them needed help in using AI, they adapted the information produced by AI, they believed that AI enhanced their academic performance, they were aware of the inaccuracy of information AI sometimes provide, and they preferred to have a school subject on AI literacy. The findings echoed Noam Chomsky's and Geoffrey Hinton's call for awareness about the challenges and threats AI could pose. Accordingly, the study incorporated implications and recommendations.

Keywords

Artificial Intelligence, AI literacy, AI limitations, AI challenges, students' academic performance

Résumé

L'importance de cette étude est marquée par l'exploration de la nécessité d'intégrer la littératie en Intelligence Artificielle (IA)dans les programmes scolaires. Elle examine les connaissances qu'ont les étudiants de l'utilisation de l'IA, ses défis et son impact sur leurs performances académiques. Guidée par quatre questions, l'étude a suivi une approche combinant à la fois des méthodes qualitatives et quantitatives : « Dans quelle mesure les étudiants savent-ils utiliser les outils de l'IA? », «Comment les étudiants utilisent-ils les données générées par les outils de l'IA? », « Les étudiants pensent-ils que l'IA contribue à améliorer leurs résultats scolaires? » et « Dans quelle mesure les étudiants font-ils confiance aux informations générées par l'IA? ». Pour la collecte de données, un questionnaire d'enquête semi-structuré a été répondu par cent quatre-vingt-dix-sept (197) élèves de l'enseignement secondaire au Liban. Leurs réponses ont révélé plusieurs constatations : la plupart d'entre eux avaient besoin d'assistance pour utiliser l'IA; ils adaptaient les informations générées par l'IA, croyaient que l'IA améliorait leurs performances, étaient conscients de l'inexactitude occasionnelle des informations fournies par l'IA et exprimaient une préférence pour l'intégrer dans les programmes scolaires. Les résultats reflètent les préoccupations exprimées par Noam Chomsky et Geoffrey Hinton sur la nécessité de sensibiliser le public aux défis et aux menaces posés par l'IA. L'étude a ainsi intégré des implications et des recommandations.

Mots-clés

Intelligence Artificielle, maîtrise de l'IA, limites de l'IA, défis de l'IA, performances académiques des étudiants.

مستخلص

تكمن أهميّة هذه الدّراسة في كونها تتناول موضوع الذّكاء الاصطناعي ومدى الحاجة إلى إدراج مادّة لكيفيّة استخدامه في المناهج المدرسيّة. بحثت الدّراسة معرفة التّلاميذ في كيفيّة استعماله، تحدّياته، وما إذا كان يساهم في تحسين نتائجهم الأكاديميّة. اعتمد هذا العمل التّحليل الكمّي والنّوعي للإجابة على أسئلة الدّراسة الأربعة: "إلى أيّ مدى يملك التّلاميذ المعرفة في كيفيّة استخدام أدوات الذّكاء الاصطناعي؟"، "كيف يستخدم التّلاميذ المعلومات الّتي توفّرها أدوات الذّكاء الاصطناعي؟"، "كيف ينظر التّلاميذ إلى مدى فعاليّة الذّكاء الاصطناعي في تحسين أدائهم الأكاديمي؟"، "إلى أيّ مدى يثق التّلاميذ بالمعلومات الّتي تقدّمها أدوات الذّكاء الاصطناعي؟". جُمعت البيانات من خلال أسئلة استبيان أجاب عنها 197 تلميذًا لبنانيًا في المرحلة الثّانويّة. أظهرت نتائج الاستبيان أنّ معظم التّلاميذ يحتاجون

إلى مـساعدة فـي استخدام أدوات الـذّكـاء الاصطنـاعـي، أنّهم استعملـوا بـتصرّف الـمعلـومـات الّتي قدّمتها هذه الـتكنـولـوجيـا، أنّهم رأوا أنّها حسّنت أداءهم الأكـاديـميّ، أنّهم كـانـوا مدركـين انّها تقدّم معلـومـات غير دقـيقـة أحيانًا، وأنّهم فضّلوا تـوفّر مـأدة مـدرسيّة عن كيفـيّة استخدامها. كمـا أظهرت الـنّتائج تـوافقها مع آراء نـعوم تـشومسكي وجفـري هنتن فيمـا خمّ نشر الـوعي حول الـتّحديـات والـمخاطر الّتي يسبّبها الـذّكـاء الاصطنـاعي. وتـضمّنت الـدّراسة دلالات الـنّتائئ والـتّوصيات.

كلمات مفتاحيّة

الـذّكـاء الاصطنـاعـي، تـعليم الـذّكـاء الاصطنـاعـي، محدوديّة الـذّكـاء الاصطنـاعـي، تـحدّيـات الـذّكـاء الاصطنـاعـي، أداء الـتّلميذ الأكـاديـمي

1. Introduction

1.1. Overview

The huge burst of Artificial Intelligence (AI) is expected to continue and reach new peaks in 2024 and the coming years (Greta, 2024). The year 2023 has witnessed an increasing presence and adoption of AI tools (Oxford University Press, 2023). Nevertheless, an established framework for proficiency in navigating AI technology is still missing (O'Dea & O'Dea, 2023), thus, leading scholars to call for integrating AI literacy into school and college syllabi as it may become of the same significance as other subjects (Young, 2024). Considering AI literacy an integral part in the teaching and learning process has become a reality because education relies on technology which should always be driven by education (Oxford University Press, 2023).

It is necessary that students understand how AI collects data and processes information. This helps them correct the misconception that AI is a super power that provides absolute truth (Klein, 2023). It is also essential for students to have sufficient knowledge about AI as it can create future job opportunities that were not available before (Misha, 2024). Accordingly, there is a need to embed AI literacy in school curricula since AI has become a significant aspect of education and work domains. Hence, this study explored how Lebanese tenth, eleventh, and twelfth graders viewed, perceived, and utilized AI tools. Its findings were examined in the light of Chomsky's and Hinton's views on AI.

1.2. Statement of the Problem

Although AI can motivate students to engage in school tasks, and it can address challenges they may face in their education (Basualto, Parhizkar, Wortman, & McCallum, 2024), in general, there is a lack of awareness about the drawbacks of using its tools. Students may take the information provided by AI for granted, and they tend to copy what AI generates. However, considering AI literacy as a subject in schools has not been taken seriously yet.

1.3. Significance of the Study

AI has hugely developed, revolutionizing aspects of life (Melo, 2023). Since using AI tools has become one of the most ubiquitous and required technological skills (Ng, Leung, Chu, & Qiao, 2021) and a reality in education, it is necessary to throw light on students' knowledge about AI and their attitudes towards it. Eventually, this contributes to providing a clear view about students' relation with AI and the gaps that exist in this relation, which helps in setting plans for designing subjects that teach students how to wisely use AI and adapt to the new technological era.

1.4. Questions of the Study

The target of this work is to answer the following questions:

Q_1 To what extent do students know how to use AI tools?

Q_2 How do students use AI-generated data?

Q_3 How effective do students believe AI is in enhancing their academic performance?

Q_4 To what extent do students trust AI-generated data?

1.5. Rationale of the Study

As the future of societies seems to be molded by AI (Stewart, 2024), and education is no exception, exploring students' knowledge about AI became the target of this study. It aimed to delve into students' attitudes towards the accuracy of AI-produced data because sometimes AI generates hallucinations (Riaz, 2023), and to examine whether students believed that AI had a positive impact on their academic results. Accordingly, this work attempted to provide answers to the four

research questions in order to investigate whether there is a necessity to include AI literacy in school curricula.

1.6. Review of Literature

1.6.1. The Emergence and Definition of AI

AI appeared in the 1950s as a scientific discipline (Polychroniou, 2023). From the 1970s, it started to support education (Casal-Otero et al., 2023). Its rise has been hugely affecting the world, changing life in many ways (Hamilton & Swanton, 2023).

AI has been defined in different ways. In 1955, the term 'Artificial Intelligence' was coined and defined by emeritus Stanford Professor John McCarthy as "the science and engineering of making intelligent machines" (Manning, 2020). High-Level Expert Group on Artificial Intelligence (AI HLEG) of the European Commission (EC) (2019) has defined AI as "systems that display intelligent behavior by analyzing their environment and taking actions – with some degree of autonomy – to achieve specific goals" (p.1). Hamilton and Swanton (2023) have also defined AI as allowing "machines to execute tasks that have traditionally required human cognition. AI-powered programs and devices can make decisions, solve problems, understand and mimic natural language and learn from unstructured data" (para.3).

1.6.2. Noam Chomsky's View on AI

Noam Chomsky has shown the dark side of AI. According to him, "Current work with Large Language Models (LLMs)…provides tools for disinformation, defamation, and misleading the uninformed. The threats are enhanced when they are combined with artificial images and replication of voice" (Polychroniou, 2023, para.9) which has led many researchers to call for suspending AI development. Despite the fact that AI engineering products can be very useful, Chomsky argues that AI can be also harmful. Cheating reinforcement, racism, bias, and absence of laws that should direct the use of AI are among the threats entailed by AI, and they are concerns to many scholars (Nwanji, 2024).

Although prominent figures and practitioners have called for government regulations to control the threats posed by AI systems, Chomsky doubts that such regulations can combat the threats. To him, the only solution that can effectively face AI ideological systems is to educate people how to

think critically, encourage them to deliberate, and practice intellectual self-defense (Mirfakhraie, 2023).

1.6.3. Geoffrey Hinton

Geffrey Hinton, another famous figure who has greatly contributed to the revolutionary development of AI, calls for setting laws to guarantee the ethical use of AI (Pelley, Chasan, Weisz, & Flickinger, 2023). Considered 'the Godfather of AI', yet, retired from Google in 2023, Hinton warns that AI has its hazardous consequences due to bias and fake news it presents. He emphasizes that while people have to be aware about using AI, the decision to further develop it should be carefully made (Pelley, Chasan, Weisz, & Flickinger, 2023).

Hinton expresses his fear that AI will become too powerful in the future and it will threaten humanity (Ryan, 2024). To him, AI can become superior to human intelligence and cause serious threats like ending routine jobs, spreading misinformation, generating fake pictures, videos, voices, and risking the human existence. What he suggests is keeping AI under control because if it develops and becomes able to autonomously set its goals, the result could be disastrous.

1.6.4. Artificial Intelligence Literacy

- Definition

AI literacy is "a set of competencies that enables individuals to critically evaluate AI technologies; communicate and collaborate effectively with AI; and use AI as a tool online, at home, and in the workplace" (Long & Magerko, 2020, p. 2). Another definition is that "AI literacy encompasses AI competencies that the general population should possess and accordingly focuses mainly on learners without a computer science background (non-experts)" (Laupichler et al., 2022, para.2).

- Ng, Leung, Chu, and Qiao's Framework of AI Literacy

Teachers as well as students need competencies that help them 'critically understand' how to utilize AI tools and identify their limitations as these technologies are rapidly becoming wide-spread (McMinn, 2023). Ng et al. (2021) have proposed a four-aspect framework to promote AI literacy. The four aspects are as follows:

1. Know and understand AI: Know the basic functions of AI and how to use AI applications.
2. Use and apply AI: Applying AI knowledge, concepts and applications in different scenarios.
3. Evaluate and create AI: Higher-order thinking skills (e.g., evaluate, appraise, predict, design) with AI applications.
4. AI ethics: Human-centered considerations (e.g., fairness, accountability, transparency, ethics, safety).

2. Methodology

2.1. Research Design

In order to answer the questions of the study, this work adopted a descriptive mixed-methods approach (Creswell & Clark, 2018) that collected and analyzed data quantitatively and qualitatively.

2.2. Data Collection

The students' responses to a semi-structured Google Form survey questionnaire (Pew Research Center, 2023; Williams, 2023; Startquestion, 2023) were the generated data. The survey asked questions about the frequency of students' use of AI tools, AI proper use, its credibility, the students' concerns about it, its impact on their academic results, and their opinion about the idea of having an AI literacy school subject.

2.3. Participants

The students who answered the questionnaire were one hundred ninety-seven (197) out of two hundred ninety-two (292) that was the total number of Lebanese students in one of the secondary schools, who received the questitionnaire. They were tenth, eleventh, and twelfth graders.

2.4. Instruments

2.4.1. Students' Survey

The survey consisted of eleven (11) questions of three types: multiple choice, Likert scale, and open-ended (Pew Research Center, 2023).

2.4.2. Chomsky's Argument about AI

Chomsky's opinion about the dangers of AI was considered in relation with the study findings.

2.4.3. Hinton's View on AI

The findings were also dissected in the light of Hinton's view on the potentials of AI and the drawbacks of using it.

3. Results

The analysis sought to find answers to the questions of the study from the students'responses to the questionnaire.

3.1. Students' Survey Findings

Question 1.

The responses to the first question: 'In which class are you?', showed that the percentages of grade 10 and grade 12 students who took part in the survey were the same (35%), yet, higher than that of eleventh graders (30%).

Figure 1. Students' Classes

Question 2.

In responding to the second question: 'How often do you use AI tools for school assignments?', more than half of the students (55%) reported that they 'Sometimes' used AI which was higher

than double the percentage of those who chose 'Rarely' (25%). Only fourteen per cent (14%) used AI tools 'Frequently'. However, six per cent (6%) responded that they 'Never' used them.

Figure 2. Frequency of Using AI

How often do you use AI tools for your assignments?

1. Frequently	14%
2. Sometimes	55%
3. Rarely	25%
4. Never	6%
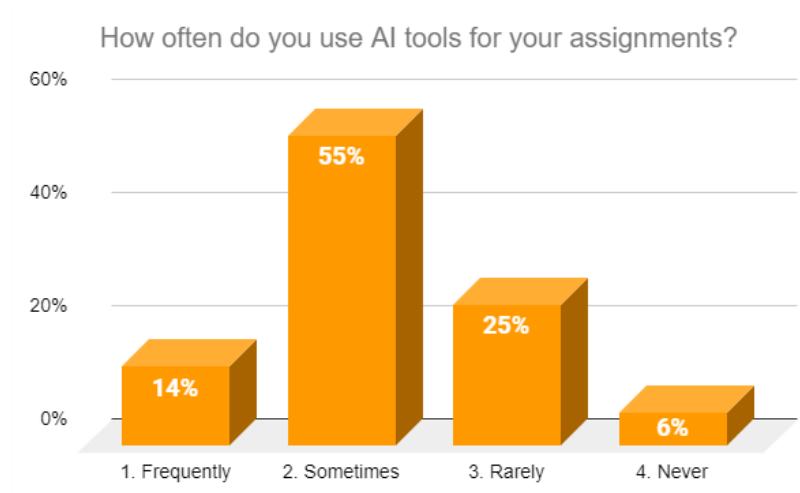
Question 3

The question: 'Do you need help in using AI properly?' led to different answers. Forty-two per cent (42%) of the students responded 'To a certain extent' while thirty-nine per cent (39%) of them answered 'No'. The lowest percentage (19 %) opted for 'Yes'.

Figure 3. Assistance in Using AI

Do you need help in using AI tools properly?

Yes	19%
No	39%
To a certain extent	42%
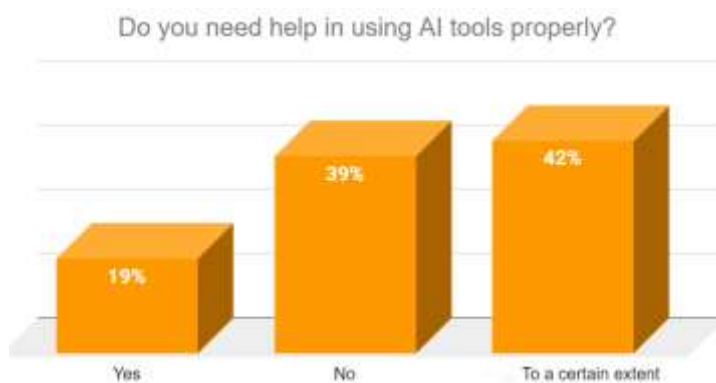
Question 4.

Responding to the question: 'Do you think AI tools might provide wrong answers?' showed that sixty-six per cent (66%) of the students were aware that AI tools might produce wrong information while thirty-four per cent (34%) of them believed that AI tools always provide correct data.

Figure 4. AI Credibility

Do you think AI tools might provide wrong answers?

34%
66%

● No ● Yes
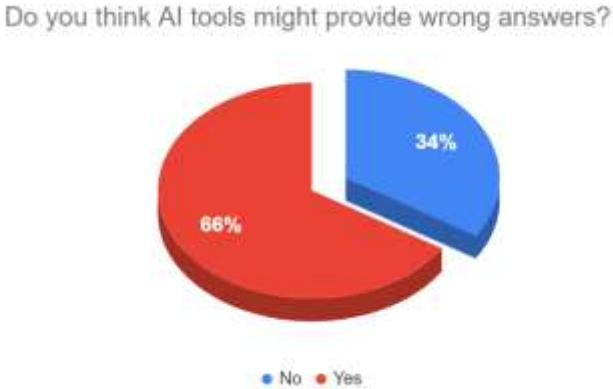
Question 5.

The students' answers to the question: 'On a scale of 1 to 5, how comfortable are you when using AI tools in doing your assignments?' revealed that only three per cent (3%) felt uncomfortable, twelve per cent (12%) were 'Slightly comfortable', almost half of them (49%) were 'Moderately comfortable', twenty-seven per cent (27%) felt 'Very comfortable' whereas nine per cent (9%) answered 'Extremely comfortable'.

Figure 5. Attitude towards Using AI

How comfortable are you when using AI tools?

5. Extremely comfortable	9%
4. Very comfortable	27%
3. Moderately comfortable	49%
2. Slightly comfortable	12%
1. Uncomfortable	3%

0%   10%   20%   30%   40%   50%
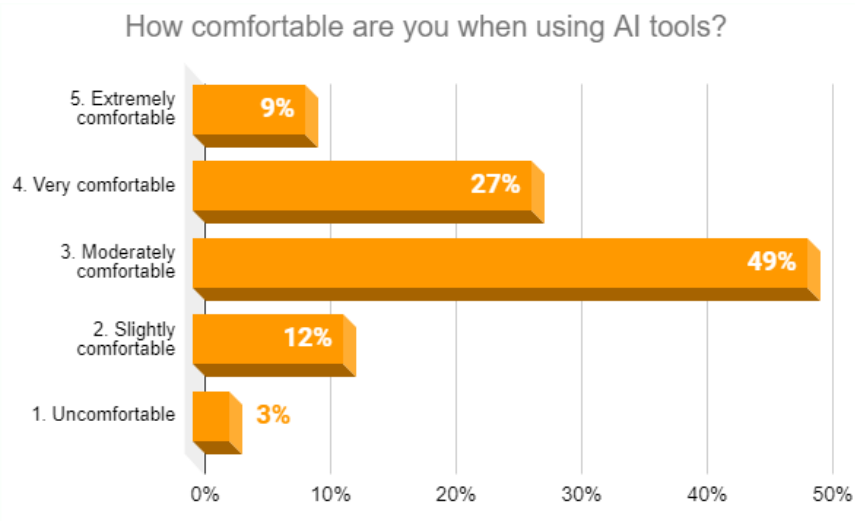
Question 6.

The students gave different answers to the question: 'On a scale of 1 to 5, how effective is the use of AI tools in improving your academic results?'. The highest percentage (42%) went for 'Moderately effective' while the lowest percentage (10%) believed that AI tools were 'Not effective at all' in improving their academic performance. 'Very effective' was the answer of twenty-three per cent (23%) of them, fourteen per cent (14%) chose 'Slightly effective', however, eleven per cent (11%) opted for 'Extremely effective'.

Figure 6. AI Effectiveness
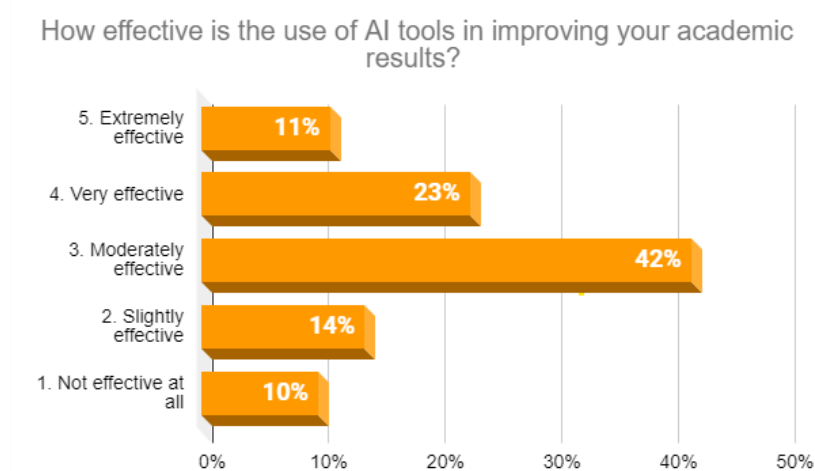
Question 7.

'No' was the answer of more than three quarters of the students (76%) to the question: 'Do you use the information provided by AI tools without doing any modification?'. Nevertheless, the answer of twenty-four per cent (24%) of them was 'Yes', hence, using AI-generated information without any adjustment.

Figure 7. Modifying AI data

Do you use AI-generated information without doing any modifications?

24% Yes
76% No
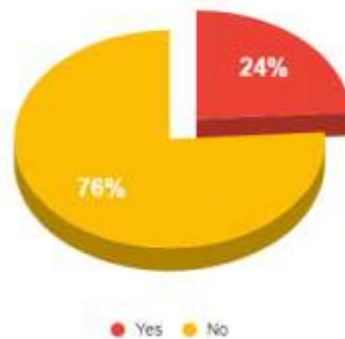
Question 8.

The students' responses to the question: 'Do you use AI tools in doing your assignments and claim that the work is yours?' showed that twenty-seven per cent (27%) went for 'Yes' while the rest (73%) replied 'No'.

Figure 8. Plagiarism in Using AI

Do you use AI tools in doing your assignment and claim that it is completely your work?
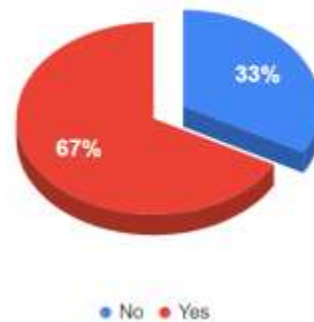
27% Yes
73% No
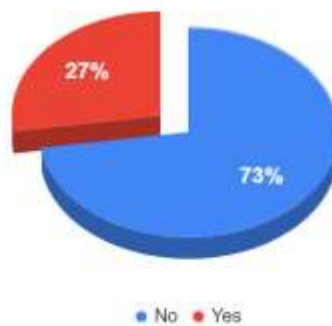
Question 9.

Replying to the question: 'Do you believe that you use AI tools in a correct way?', sixty-seven per cent (67%) of the students believed that they used AI tools properly whereas thirty-three per cent (33%) answered 'No'.

Figure 9. Using AI Properly

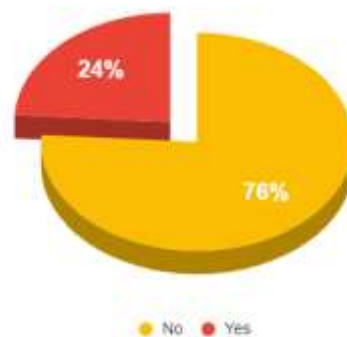Do you believe that you use AI tools in a correct way?

33%

67%

● No   ● Yes

Question 10.

Answering the question: 'Do you have concerns about using AI?', seventy-six per cent (76%) of the students showed that they had no concerns. On the other hand, twenty-four per cent (24%) reflected their worries about using AI.

Figure 10. Concerns about AI

Do you have concerns about using AI?

24%

76%

● No   ● Yes

The following were the reported concerns:
- getting wrong answers
- making students lazy and less responsible
- weakening the thinking abilities
- supporting bad thoughts
- making students uncomfortable because the ideas are not theirs
- invading personal data

- leading to students' nervousness because of the lack of trust in the provided information
- causing issues with teachers
- being more dangerous than nuclear bombs as Elon Musk said
- controlling the human mind
- creating a gap between AI-aided assignment grades and exam grades
- hurting others
- being unable to understand all the generated ideas
- being unable to build essential skills
- encouraging plagiarism

Question 11.

In their response to the question: 'Do you prefer to have a school subject on how to correctly use AI in your studies? Why?', eighty-eight per cent (88%) of the students preferred to have a subject on AI literacy while the rest (12%) did not find it necessary.

Figure 11. AI Literacy

Do you prefer to have a subject about how to correctly use AI?

12%

88%

● Yes ● No
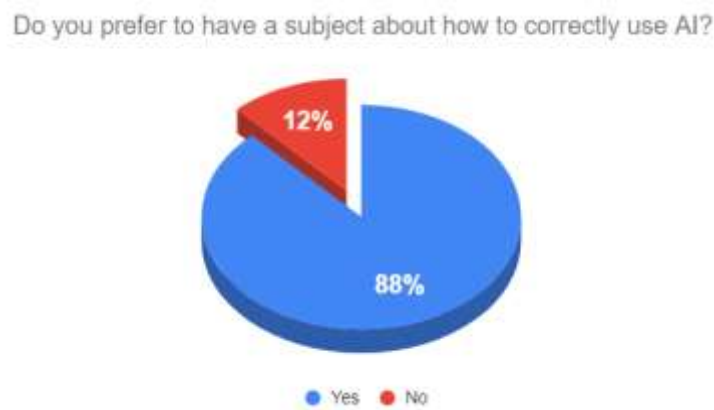
Below were reasons stated by students explaining why they preferred to have a school subject on AI literacy:

- to save time and gain knowledge
- to avoid doing mistakes
- to know how to use AI correctly, safely, and comfortably
- to improve academic results and succeed
- to spread awareness among students who use AI in a wrong way

- to develop life in the future

- to stay updated with the latest development in AI and other domains

- to know AI limits

- to be aware because AI may take over

- to develop technological skills for education and future work

- to adapt to the AI era

- to avoid laziness, deterioration of human intelligence, and getting lost

The following were reasons why students believed an AI literacy subject was unnecessary:

- AI being unnecessary

- being harmful

- making students dependent

- leading to human intelligence deterioration

- being easy to use

- destroying humanity

- dominating students' minds

- underestimating human identity, thoughts, and life

4. Discussion

4.1. Analysis in the Light of Chomsky's Argument about AI

The high percentage of students (94%) using AI with different frequencies though, the unawareness of thirty-four per cent (34%) of them that AI sometimes leads to disinformation, the claim of twenty-seven per cent (27%) that AI-generated information was completely theirs, and the reply of thirty-three per cent (33%) that they did not use AI tools correctly justify Chomsky's concerns about AI. Moreover, the caution of twenty-four per cent (24%) of the students about AI providing wrong answers, making students dependent, harming others, being dangerous, and controlling the human mind resonate with Chomsky's warning that AI can be harmful, defamatory, and misleading (Polychroniou, 2023).

4.2. Analysis in Reference to Hinton's View on the Power of AI

Hinton calls for establishing laws that guarantee the ethical use of AI tools (Pelley, Chasan, Weisz, & Flickinger, 2023). His worries about AI use, its rapid development, and its threat have their match in the students' replies. In addition to the students' percentages mentioned in analyzing the findings in reference to Chomsky's view, which also provide evidence that confirms Hinton's concerns, sixty-six per cent (66%) of the students were aware that AI may generate wrong data, and thirty-three per cent (33%) of them reported that they did not know how to properly use AI. Moreover, twenty-four per cent (24%) had concerns pertaining to privacy issues and controlling the human mind. Eighty-eight per cent (88%) believed that they needed to learn how to wisely use AI to avoid its perils, to recognize the limits of using it, and to spread awareness about its drawbacks, all of which are echoed in Hinton's thoughts.

4.3. Answering the Questions of the Study

The analysis provided answers to the four study questions. The answer to the first question: 'To what extent do students know how to use AI tools?' showed that nineteen per cent (19%) of the surveyed students believed they needed help in using AI correctly, and forty-two per cent (42%) needed help 'To a certain extent'. Both percentages were elicited by responding to the survey question 3. Answering the survey question 5, forty-nine per cent (49%) of the students felt 'Moderately comfortable' when using AI, twelve per cent (12%) felt 'Uncomfortable', three per cent (3%) opted for 'Very uncomfortable' whereas twenty-seven (27%) answered 'Very comfortable', and nine per cent (9%) chose 'Extremely comfortable'. Replying to the survey question 9, thirty-three per cent (33%) of the students reported that they did not use AI tools properly, and in their response to the survey question 11, eighty-eight per cent (88%) of them preferred to have a school subject on how to adequately use AI.

The analysis also brought about answers to the second question of the study: 'How do students use AI-generated data?'. In their response to the survey question 7, twenty-four per cent (24%) of the students revealed that they used AI-generated information without any modification, whereas seventy-six per cent (76%) adapted it. Answering the survey question 8, twenty-seven per cent (27%) of them attributed the AI-generated assignment to themselves while seventy-three per cent (73%) did not do that.

Furthermore, the study findings answered the third question of the study: 'How effective do students believe AI is in enhancing their academic performance?'. Students' responses to the

survey question 6 varied. Ten per cent (10%) of them viewed it as 'Not effective at all', fourteen per cent (14%) believed it was 'Slightly effective', forty-two per cent (42%) selected 'Moderately effective', twenty-three per cent (23%) answered 'Very effective', and eleven per cent (11%) replied 'Extremely effective'.

Finally, the students' responses to the survey question 4 answered the fourth question: 'To what extent do students trust AI-generated data?'. Thirty-four per cent (34%) of them showed their full trust in all AI-generated information. However, sixty-six per cent (66%) reported that AI tools might generate wrong data.

5. Conclusion

In summary, this work threw light on how knowledgeable students are about the use of AI and their attitudes towards it. The findings demonstrated that the overwhelming majority of the surveyed students used AI tools, more than one-third of them were unconscious about the fact that AI-generated data might sometimes be wrong, more than one-third did not know how to correctly use its tools, approximately one-quarter of them were cautious in using them, and the vast majority favored having an AI literacy school subject to acquire the skills that enable them to properly utilize AI.

5.1. Implications and Contribution

The findings imply that it is indispensable for students to acquire AI skills as AI has become a reality in the education field. Instead of resisting its existence that cannot be avoided, adapting to AI age becomes the solution to adequately embrace it. The students' worries, feeling of being threatened, discomfort, lack of skills, and misconception about the use and credibility of AI tools are the result of unawareness about this field.

Thus, including AI literacy in school curricula can be a good step towards reducing the false practices in using this technology. The four aspects of AI literacy: know and understand AI, use and apply AI, evaluate and create AI, and AI ethics, proposed by Ng et al. (2021) can be set as a basis to promote AI literacy because AI is developing rapidly in the domain of education as well as in businesses, which will most probably make its utilization a top priority skill.

However, this cannot be achieved unless school teachers acquire AI competences and ensure their students gain them too. By arming students with critical thinking skills to evaluate AI-generated

data as suggested by Chomsky (Mirfakhraie, 2023), and by keeping AI under human control through regulations that guarantee AI ethical development as Hinton (Pelley, Chasan, Weisz, & Flickinger, 2023) states, AI disadvantages and threats are likely to be minimized, and AI is likely to become a huge boost to a safe world development.

Building upon the previous points, this study can be considered a contribution to AI and education research field as it helps better understand students' knowledge about AI, presents a basic framework for AI literacy, and is likely to bridge the gap between AI rapid development and students' knowledge that is still lagging behind this unstoppable technological enhancement.

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