British Journal of Teacher Education and Pedagogy
ISSN: 2755-1482
DOI: 10.32996/bjtep
Journal Homepage: www.al-kindipublisher.com/index.php/bjtep

BJTEP
AL-KINDI CENTER FOR RESEARCH AND DEVELOPMENT

| RESEARCH ARTICLE

Evaluating Computer Science Students' Experiences and Motivation Towards Learning Artificial Intelligence

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| ABSTRACT

This study investigates the experiences and motivations of Saudi Arabian computer science students (aged 18 and above) in their pursuit of knowledge in Artificial Intelligence (AI). It employs a cross-sectional design using web-based surveys. Findings indicate that students recognize AI's transformative potential in computer science and express a willingness to embrace it in their careers. However, confidence levels vary regarding using AI tools, understanding healthcare AI, and assessing AI's impact on computer science education. The study emphasizes the significance of intrinsic motivation, experiential learning, and pedagogical strategies like collaborative learning in AI education. Additionally, it underscores the importance of addressing gender and diversity considerations to create inclusive AI learning environments. In conclusion, this research provides valuable insights into computer science students' experiences and motivations in AI education. It offers practical implications for enhancing AI pedagogy, reducing barriers to learning, and promoting diversity and inclusivity in the AI field. Educators can empower students to navigate the dynamic AI landscape effectively by tailoring educational approaches to individual learner needs.

| KEYWORDS

Computer Science Students, Artificial Intelligence (AI) Education, Experiences, Saudi Arabian Students, Educational Curriculum

| ARTICLE INFORMATION

ACCEPTED: 02 November 2023 **PUBLISHED:** 26 November 2023 **DOI:** 10.32996/bjtep.2023.2.3.5

1. Introduction

In the era of digital transformation, Artificial Intelligence (AI) stands out as a cornerstone of technological innovation. From healthcare to finance, AI's applications are vast and transformative. As industries increasingly rely on AI-driven solutions, there is a growing demand for professionals adept in this domain. Consequently, the onus falls on educational institutions to equip computer science students with the requisite AI knowledge and skills. However, the journey of learning AI is not without its challenges. This research delves into the experiences and motivations of computer science students as they navigate the world of

AI education. By understanding their perspectives, the study aims to offer insights that could refine AI pedagogy, making it more engaging and effective.

2. Literature Review

2.1 Motivation for Learning AI

Motivation plays a pivotal role in academic success, especially in complex subjects like AI. Rooted in the self-determination theory, Deci and Ryan (1985) emphasized the importance of autonomy, competence, and relatedness in fostering intrinsic motivation (Deci & Ryan, 2013). In the context of AI, this translates to allowing students the freedom to explore AI concepts, ensuring they feel competent in their understanding, and drawing connections between their learning and real-world applications.

2.2 Experiential Learning and Hands-on Activities

Traditional lecture-based learning often falls short in subjects as dynamic and hands-on as AI. Kolb's experiential learning cycle (1984) posits that learning is most effective when students cycle through concrete experiences, reflective observation, abstract conceptualization, and active experimentation (Kolb, 2014). In AI, this could mean coding simulations, building models, or even real-world problem-solving.

2.3 Effective Pedagogical Strategies

The way AI is taught can significantly influence student engagement and understanding. Collaborative learning, problem-based learning, and the flipped classroom are some pedagogical strategies that have shown promise. Vygotsky's sociocultural theory (1978) underscores the value of social interactions in learning, suggesting that collaboration with peers or guidance from more knowledgeable instructors can enhance comprehension (Vygotsky & Cole, 1978).

2.4 Reducing Challenges and Frustrations

The rapidly evolving nature of AI can be both exciting and daunting. Students often grapple with steep learning curves, which can lead to frustration. Bozkurt and Sharma (2019) highlighted the importance of timely support and feedback in helping students overcome such challenges (Chen et al., 2020). This could be in the form of peer mentoring, workshops, or even adaptive learning technologies.

2.5 Gender and Diversity Considerations

AI, like many tech fields, faces challenges related to gender and diversity. Stereotypes, such as the perception of AI being a male-dominated field, can deter potential learners. Cheryan et al. (2017) emphasized the importance of creating inclusive learning environments that not only challenge these stereotypes but also celebrate diversity (Cheryan et al., 2017).

2.6 Research Objectives

The core aims of this investigation include:

a) Evaluating the experiences of computer science students in AI-centric courses, workshops, or academic projects.
b) Determining the elements that shape students' enthusiasm and involvement in AI studies.
c) Investigating the influence of AI academic exposure on students' professional goals and their view of AI as both an academic and career domain.
d) Offering insights and suggesting strategies to enhance AI pedagogy and elevate the student learning journey.

3. Methodology

This research utilized a cross-sectional design, deploying a web-based survey through Qualtrics® based in Provo, Utah, United States. The survey was designed to be self-administered and anonymous, ensuring the confidentiality of the participants. Access to the collected data was restricted solely to the principal investigator, secured behind a password-protected portal.

Target Population: The primary focus of the study was on Saudi Arabian students aged 18 and above. These students were approached and informed about the study through various social media platforms, ensuring a wide reach and diverse participation.

Questionnaire Design: The survey instrument, which underwent validation by a team of researchers in 2023, comprised 16 items. These items captured demographic details and delved into the perceptions and experiences of computer science students concerning AI education. The structure and content of the questionnaire were meticulously crafted to align with the research objectives (Buabbas et al., 2023).

For the actual process of data gathering, Google Forms was the platform of choice. This tool allowed for efficient categorization of the population based on age, gender, and educational attainment. The determination of the sample size was grounded in statistical considerations, factoring in a 95% confidence level and a 5% margin of error. This calculation took into account the

anticipated population size and the expected rate of response. The recruitment of participants via Google Forms was executed with an emphasis on ensuring a diverse representation across different age brackets, genders, educational backgrounds, and regions.

Ethical considerations were paramount throughout the research process. The study was conducted in strict adherence to established ethical standards, with a primary focus on safeguarding the rights and privacy of the participants. Before participating, all respondents were provided with an informed consent form. This document detailed the study's purpose, emphasized the voluntary nature of participation, and assured respondents of the confidentiality of their responses and the anonymization protocols in place for data storage. Such rigorous measures were instituted to guarantee the anonymity of participants and the integrity of the data throughout the duration of the research.

4. Results and Discussion

In our research, we approached 432 individuals, out of which only three opted out of participation. The pie chart below illustrates the gender distribution of the respondents: 43% were males, while 57% were females.

The subsequent bar chart provides insights into the educational background of the participants. A significant 70% of them were pursuing their undergraduate studies, 20% were engaged in postgraduate programs, and a mere 10% had already completed their graduation.

Fig 1 Gender Distribution

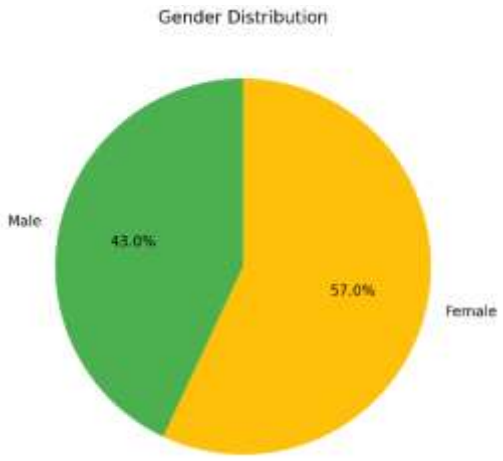

Fig 2 Educational Level

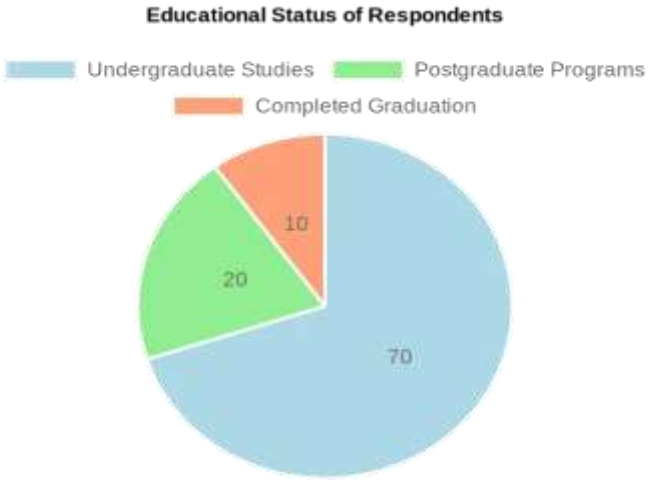

Table 1 items' Mean stan Std. Error of Mean and Std. Deviation

	Mean	Std. Error of Mean	Std. Deviation
Item1	1.01	.008	.120
Item2	4.41	.060	.858
Item3	3.78	.073	1.052
Item4	3.74	.067	.969
Item5	3.64	.067	.972
Item6	3.30	.073	1.048
Item7	4.20	.065	.940
Item 8	4.18	.069	.994
Item9	3.84	.073	1.049
Item10	3.79	068	.980
Item11	3.78	.071	1.031
Item12	4.14	.063	914
Item13	4.11	.064	.916
Item14	2.00	.056	.814

The table below offers a detailed breakdown of computer science students' views on the integration of artificial intelligence (AI) within educational settings:

A predominant segment (57.2%) firmly believes AI will supersede certain specializations in computer science during their lifetime, while 33.2% concur to a degree. A majority, 52.9%, concur with their understanding of AI's foundational principles, with 18.3% expressing strong agreement. Conversely, 10.1% remain neutral, and 13.0% express disagreement.

A notable 42.8% strongly feel that AI education will be advantageous for their career trajectory, with 43.8% in agreement. A minority, 3.4%, strongly disagree. On the proposition of universal AI education for computer science students, 44.7% strongly agree, while 38.9% agree. A smaller segment, 4.3%, strongly disagree.

27.9% express strong confidence in their ability to use AI tools upon graduation, with 43.8% in agreement. However, 17.8% remain neutral. Over half, 51.4%, agree they will grasp the methods used in healthcare AI, with 21.2% expressing strong agreement. Close to half, 48.6%, feel they will be equipped with the knowledge to work in AI, with 23.1% expressing strong agreement. 37.5% strongly feel AI will positively impact computer science education, with 48.1% in agreement.

35.1% strongly believe that AI systems will simplify their learning process, with 50.5% in agreement. 27.9% are very inclined to use AI in their education, 48.6% show willingness, but 18.8% are hesitant.

In essence, the data suggests a predominantly positive outlook toward AI's role in education among computer science students. However, there's a palpable undercurrent of reservations and uncertainties, highlighting the need for a nuanced approach to AI's educational integration.

Table 2 Respondents' Responses

Survey Question	SD	D	N	A	SA	Total Responses
1. AI will replace some specialties in computer science during my lifetime	2.40%	1.40%	5.80%	33.20%	57.20%	432
2. AI will replace some specialties in computer science during my lifetime	4.80%	7.20%	17.80%	45.20%	25.00%	432
3. I understand basic AI principles	2.90%	10.10%	15.90%	52.90%	18.30%	432
4. *I am comfortable with AI terminologies*	3.80%	6.70%	27.90%	44.20%	17.30%	432
5. I understand AI limitations (Set 2)	6.30%	16.80%	26.40%	41.80%	8.70%	432
6. AI teaching will benefit my career	3.40%	2.90%	7.20%	43.80%	42.80%	432
7. All computer science students should receive AI teaching	4.30%	1.90%	10.10%	38.90%	44.70%	432
8. I will be confident using AI tools at the end of my Computer science degree	4.80%	5.80%	17.80%	43.80%	27.90%	432
9. I will have a better understanding of methods used to assess healthcare AI	3.40%	8.20%	15.90%	51.40%	21.20%	432
10. I will possess the knowledge needed to work with AI in routine technical practice	4.30%	8.20%	15.90%	48.60%	23.10%	432
11. AI systems would have a positive impact on computer science education	2.90%	3.40%	8.20%	48.10%	37.50%	432
12. Incorporating AI systems into computer science education would ease your learning process	2.40%	5.30%	6.70%	50.50%	35.10%	432

Based on the willingness item, as seen in the below bar graph, we found that the majority of the respondents are willing to use AI in their education.

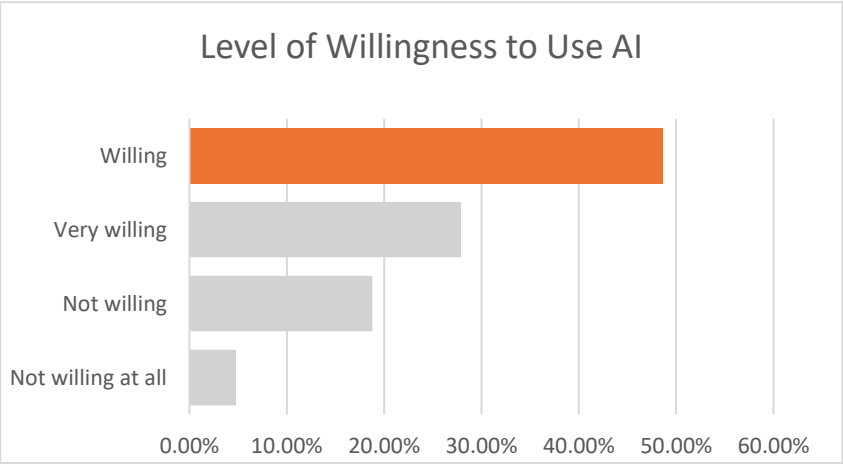

Fig 3 Level of Willingness to Use AI in Computer Science Education

This study contributes to existing knowledge by providing insight into the complex interplay of factors affecting computer science students' experiences and motivations for studying artificial intelligence (AI). Our analysis aligns with several key themes identified

in literature reviews while offering nuanced perspectives into student perspectives within their education environment. For instance, many studies indicated that Saudi Arabia's population and professionals are strongly accepting and utilizing technology (A. Alhur, 2022, 2023; A. Alhur, Alhur, & Alhur, 2023; A. Alhur, Alhur, Baawadh, et al., 2023; A. A. Alhur, 2021, 2023a, 2023b; ALHUR, 2023; A. A. Alhur & Alhur, 2023; A. Alhur & Alhur, 2022). Moreover, a recent study demonstrated that the majority of Saudi Individuals are willing to use telemental health-based IA for their mental healthcare (A. A. Alhur, Alhur, Aldhafeeri, et al., 2023).

Consistent with Deci and Ryan (1985), our findings underscore the significance of intrinsic motivation in AI education. Students who perceive more autonomy when exploring AI concepts, as well as opportunities to build competence and establish real-world connections, exhibit higher levels of motivation than those without such freedom or opportunities (Deci & Ryan, 2013; Kolb, 2014). Our observations confirm the literature's emphasis on creating an environment that nurtures curiosity, mastery, and a sense of purpose that drives student engagement in AI education (Deci & Ryan, 2013)

Literature has highlighted the power of experiential learning and hands-on activities to strengthen students' understanding and motivation within AI education (Kolb, 2014). Our study backs this up by showing that those engaging in real-world projects, coding exercises, or simulations demonstrate a deeper comprehension of AI concepts while increasing motivation compared to students who participate only in theoretical exercises. This supports Kolb's (1984) experiential learning cycle as it affirms active experimentation as a vital component for internalizing complex AI principles (Koob & Funk, 2002).

Our study provides practical implications that adhere to Vygotsky's sociocultural theory (1978) by endorsing collaborative learning, problem-based learning, and flipped classrooms within AI education (Vygotsky, 1978). These methods foster peer learning, critical thinking skills development, and real-world applications, as well as align with the literature's emphasis on social interactions and guided learning (Koob & Funk, 2002; Lee, 2021).

Cheryan et al.'s research (2017) highlights the significance of gender and diversity considerations within AI education, thus echoing our own findings (Yates & Plagnol, 2022). Fostering inclusive learning environments that recognize diverse contributions while emphasizing AI's societal impacts may help reduce stereotypes while drawing more students towards AI fields.

Bozkurt and Sharma (2019) demonstrated that timely support and feedback were crucial in helping students overcome challenges related to AI's complex nature (Sharma et al., 2019). Our study agrees with this view, emphasizing the necessity of scaffolding student learning experiences so as to mitigate frustration and foster perseverance. Furthermore, this research opens up avenues for future investigation of how AI education affects career decisions, as well as the effectiveness of AI-powered teaching tools on improving learning processes.

This research contributes to existing literature by offering more granular insight into computer science students' experiences and motivations when learning AI. Our findings corroborate and expand upon established theories and concepts, providing educators, institutions, and policymakers with actionable insight to tailor effective AI education that equips students with the skills necessary to thrive in an ever-evolving AI landscape.

5. Conclusion

The study provided valuable insight into the attitudes and perceptions of computer science students regarding the incorporation of artificial intelligence (AI) into their education. The results highlighted various opinions among participants as well as both potential advantages and challenges associated with AI education.

The findings of this research demonstrate the significance of addressing students' uncertainties and reservations related to AI principles, limitations, and engagement with AI technologies. While many students express positive attitudes about the potential benefits of AI for their careers, tailored educational approaches must also be employed to build understanding and confidence gaps among this demographic. Our results illustrate the significance of developing an AI curriculum that not only imparts technical knowledge but also emphasizes its broader ramifications on society, ethics, and industries. Such an approach would equip students with a holistic understanding of AI, allowing them to become responsible professionals within an ever-evolving technological environment.

Additionally, this study highlights the necessity of promoting diversity and inclusivity within AI education. Addressing gender and diversity considerations is paramount to breaking down stereotypes that prevent certain groups from pursuing AI-related education. By creating an inclusive learning environment, educational institutions can foster participation from students of all backgrounds, leading to an equitable AI workforce.

Overall, the research findings provide a foundation for refining AI education strategies, curriculum design, and pedagogical approaches. By tailoring educational methods to individual learner needs, educators can assist students in overcoming any uncertainties or challenges and foster increased interest and enthusiasm in AI education. With AI continuing its evolution forward, adapting educational practices based on this insight will foster the creation of skilled computer science professionals equipped to shape its future development.

The study, while comprehensive, has some limitations that should be considered when interpreting the results. Firstly, the geographical focus on Saudi Arabian students may not fully encapsulate the diverse range of experiences and perceptions of computer science students globally, as cultural and regional differences can significantly influence attitudes toward AI education. Secondly, the sample size and demographics of the participants, with 432 individuals approached, may not be fully representative of the broader population of computer science students, and factors such as gender distribution and educational background could have influenced the outcomes. Additionally, the data collection method, which utilized Google Forms, may have restricted the depth and richness of the data gathered. In-person interviews or focus groups could potentially provide more nuanced insights into the experiences and perceptions of students in AI-centric courses and projects.

Funding: This research received no external funding.
Conflicts of Interest: "The authors declare no conflict of interest.
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