Educators' Perceptions on Artificial Intelligence in Higher Education: Insights from the Jordanian Higher Education

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Abstract*—This paper investigates educators' perceptions of the application of Artificial Intelligence in Higher Education (AIHEd) and its benefits and concerns within the Jordanian higher education. Like in other contexts, the adoption of Artificial Intelligence (AI) in the Jordanian higher education brought many benefits and a variety of concerns. Due to the lack of regulations and clear policies to cope with such new technologies, the increasing prevalence of these concerns has a negative impact on academic integrity. We used a sequential exploratory mixed approach to accomplish our study, which is guided by the Technology Acceptance Model (TAM), which helps in analysing the adoption of AI in higher education. Our approach involves conducting interviews with university educators from three different Jordanian universities. Interviews were done to identify educators' thoughts regarding the responsibility of universities to adopt new AI technologies, what motivates them to use AI tools and services in their daily work, whether using AI in higher education institutions is legitimate, and the concerns associated with implementing such technologies into practice. Thus, the paper tries to portray the acceptable benefits and concerns of using AI in Jordanian higher education institutions. After conducting a thematic analysis on 18 interviews with educators, we identified 10 corresponding benefit themes and 8 corresponding concern themes that resulted from the coding and theme-building process. The average rate of educators' responses to the themes of benefits and concerns is then determined by distributing a questionnaire to 145 higher education educators to generalise the results. Although our findings offer valuable insights, further investigation in wider contexts may be necessary to ensure the representativeness and generalisability of the findings. Through the themes that the study outlined, we concluded that although AI can transform the way students learn and educators work, there are still several issues that need to be resolved by researchers and teachers who work with associated application systems. Such issues require greater emphasis on appropriately and logically handling related ethical dilemmas. These concerns also highlight the importance of developing the necessary strategies and skills for responsible AIHEd. Using a mixed approach helped us to develop a strong understanding of the current state of AIHEd in the Jordanian context.

***Keywords*—Artificial Intelligence (AI), higher education, educators, perceptions, developing countries, Artificial Intelligence in Higher Education (AIHEd)**

I. Introduction

Artificial Intelligence (AI) has gained huge popularity around the world. It has been extensively employed in a variety of fields, including economics, healthcare, and education. While Artificial Intelligence in Higher Education (AIHEd) is not new, it gained popularity among students and educators worldwide with the launch of ChatGPT [1]. A lot of interest has been shown in education with the release of GPT-4, a massive language model developed by OpenAI. Both students and teachers have been paying particular attention to this innovation.

Employing AI in education is still a challenging subject despite the significant advantages it may bring to education because of the lack of established ethical guidelines and the range of concerns educators have. In other words, even though AI has enormous benefits, its use in higher education additionally presents new risks, ethical dilemmas, and obstacles. It has many problems and poses crucial questions regarding the reliability of evaluation procedures, as well as challenges with academic integrity, particularly with regard to plagiarism and honesty [2], where contract cheating, plagiarism, and illegal assistance—particularly during examinations, classwork, and homework—can be easily facilitated by tools like generative AI. Traditional approaches to guaranteeing authenticity in student work become ineffective.

Many researchers are focusing on creating ethical AI models that guarantee justice and fairness along with reducing bias in educational applications. To analyse global AI ethics policies, the authors in reference [3] investigated the ethical challenges of AIHEd and found that stakeholders are required to make an effort to address such ethical challenges to ensure responsible AI deployment in higher education. Others explored the pedagogical and ethical consequences and implications of using AI for teaching and learning in higher education institutions. Many researchers also focused on investigating the benefits and challenges of AI in higher education, such as [4–6]; a number of these studies focused on the students' perspectives, and most of them were carried out outside of Jordan, where the results are not necessarily applicable to the Jordanian higher education. After conducting a thorough search, the authors found that few studies look at the benefits and concerns of AI in higher education from the perspective of educators in the context of Jordanian higher education.

The benefits and concerns of using AI in higher education institutions are the focus of this paper since this is one of the most common problems today and because university educators deal with it daily when teaching students. Thus, the main driving force behind this research and its added value is the scarcity of studies on the use of AI applications by

university students worldwide, particularly in Jordan. We anticipate that the study's findings will provide an overview of the state of the art for utilizing AI in Jordanian higher education, which will be advantageous to both Jordanian universities and universities in low- and middle-income nations, where the use of AI technologies and applications in higher education is still in its early stages. Here, we want to concentrate on the substantial benefits and significant concerns faced by educators in higher education, with a particular focus on the importance of establishing ethical guidelines for the use of AI in educational settings. This is accomplished by carefully examining previous research on the subject, discussing the findings of those studies, and gaining insights into the thoughts of educators on the subject at hand.

The survey of the literature showed not many studies addressing the advantages and drawbacks of AI in the context of Jordanian higher education from educators' point of view [7, 8]. Specifically, there is a lack of research on the benefits, concerns, and risks educators face in identifying the optimal level of AI integration among students. Whether AI applications might pose a threat or an opportunity to the way universities currently teach is one of the most crucial concerns that these institutions need to address immediately. In this case, educators play a crucial role, so it is essential to comprehend their viewpoints to respond to the question at hand. This study is aimed at educators who can offer insightful and detailed feedback on the benefits and drawbacks of utilising AIHEd within the Jordanian context.

Even though AI has many benefits for learners, educators, policymakers, and education in general, there are some risks and challenges that educators must consider when deciding how much AI is appropriate for students at higher education institutions. Hence, it is important to address the following questions:

1) What are the primary benefits of AIHEd institutions in Jordan as perceived and acceptable by educators?
2) What are the primary concerns encountered by educators when students utilise AI?
3) What direction can be given on how to take advantage of opportunities and get beyond concerns to support higher education institutions?

The Technology Acceptance Model (TAM), which offers a widely used and organised framework for comprehending the factors influencing educators' adoption of AI technologies in higher education, provides a basis for this research. Because it is directly related to our research, we decided to employ the perceived usefulness component from the TAM. Although there are other significant TAM components, such as ease of use, our study concentrates on the advantages and challenges that offer a partial application of TAM, leaving other components out of the scope of our study. Furthermore, with the emergence of AI technologies like ChatGPT and GPT-4, educational technology has experienced major transformation, and long-standing challenges associated with higher education are also addressed by these innovations, like the creation of individualised learning experiences, increased accessibility for a diverse student body, and a wider range of teacher resources. This research aims to examine these tools' capacity to bridge gaps that have persisted despite earlier developments by placing them within broader debates on technology in education. Thus, this study contributes to extending the literature on the use of AI in higher education in the Jordanian context. It also provides recommendations for the Jordanian higher education institutions regarding the use of AI in these institutions.

The subsequent sections of this work are organised as follows: Section II provides research background and related research on the advantages and difficulties associated with the implementation of AI within institutions of higher education. The research approach and design are outlined in Section III. The subsequent sections encompass the presentation of the results, the discussion of the results, the conclusion and future work, and the constraints of the study, correspondingly.

II. Literature Review

A. Artificial Intelligence and Its Major Domains

According to reference [9], AI refers to those machines that carry out cognitive functions, particularly learning and problem-solving, that are typically associated with human minds. This broad definition covers all AI applications and technologies, and as we are focusing on the advantages and challenges of employing such technologies in higher education, it is not technology-specific.

The field of AI has been the subject of research for more than six decades, during which it has demonstrated notable advancements in both theoretical exploration and practical implementations [10–12]. Moreover, AI has become pervasive across all domains and is widely recognised as a fundamental competency for the future. According to projection, the AI industry is anticipated to reach a value of $190.61 billion by the year 2025 [13]. This growth is expected to occur at a Compound Annual Growth Rate (CAGR) exceeding 36% over the period spanning from 2018 to 2025 [13].

The term AI is frequently employed to denote the endeavour of developing machines capable of performing tasks exclusive to human beings. AI is a machine's intelligence that acts or thinks like a person and can be taught to solve specific problems. It is a mix of methods called machine learning and deep learning. AI models are trained with huge amounts of data and can make smart decisions on their own [14–16].

AI encompasses the capacity of a machine to imitate or emulate intelligent human activities, including the abilities to analyse, exercise judgment, and make decisions. AI has been used in almost every field and is often seen as a key skill for the future.

The area of AI, which grew out of computer science and has been the subject of philosophical debates, has made a lot of progress and grown a lot in the last few decades. AI applications have become increasingly prevalent across various domains in society. These domains include but are not limited to e-commerce, education, navigation, robotics, human resources, healthcare, agriculture, and social media platforms such as Instagram, Facebook, and Twitter. While in e-commerce, AI is utilised for personalised shopping experiences and fraud prevention. In education, AI aids in administrative tasks, content creation, and personalised

learning [17]. Navigation systems employ AI algorithms to enhance route planning and optimization. Robotics benefit from AI technologies to improve automation and efficiency [18]. Human resource management leverages AI for various tasks [19]. Healthcare applications of AI encompass a wide range of areas, while agriculture benefits from AI-driven solutions for improved crop management and yield optimisation [20]. Lastly, social media platforms utilise AI algorithms to enhance user experience and engagement [21]. These examples illustrate the diverse and extensive utilization of AI applications in contemporary society [22–24].

AI in education was defined by reference [25] as the ability of computing systems to learn, adapt, synthesise, self-correct, and use data for complex processing tasks. The application of AI in the field of education aims to enhance learning outcomes and provide assistance to educators in the development of more effective educational methodologies. AI consult-ants have the potential to assist educational institutions in utilizing technology through several means, such as automated assignment grading [5, 26] and personalised curricula [17].

AI can significantly alter the landscape of education [27], shifting its emphasis from rote memorization to a pedagogical approach that facilitates the realization of students' whole capabilities and acquisition of essential skills through personalised learning experience. With the advancement of AI technology, educators are increasingly able to utilise AI tools in their classrooms, facilitating the provision of personalised learning experiences [28]. By harnessing the capabilities of AI-based technology, higher educational institutions have the potential to access novel prospects for their students, teachers, and staff members [29].

There are many different types of domains that could benefit from the implementation of AI technology. This technology has the potential to enhance overall efficiency and automate procedures. Furthermore, as will be demonstrated in the following section (2.3), AI has the potential to be advantageous to the field of higher education.

B. Benefits of Artificial Intelligence in Higher Education Institutions

Human behaviour has a major impact on the higher education sector, and AI is currently making its way into the teaching profession. Gradually introducing AI into higher education has helped increase higher education institutions productivity and shift their attention from office-based or administrative work to student-centered activities [30]. Even though reference [30] emphasised the advantages of ChatGPTs, the study lacks genuine data and relies mostly on secondary sources, which results in several data limitations. This could decrease the validity and dependability of its findings. Applying such findings to Jordanian higher education is dangerous since their application may be impacted by a variety of circumstances, such as internet availability and ethical considerations. further research that uses both quantitative and primary data collection method is required. It is necessary to investigate regional challenges and offer recommendations that are appropriate for Jordanian higher education.

Students in institutions of higher education can derive benefits from AI and achieve a more beneficial educational experience. AI grants students a higher degree of control over their educational experience by providing a personalised learning environment [31] for each individual student and adapting the materials to the student's unique skill set as well as their individual requirements [32, 33], AI offers further advantages to students, including adaptive learning tools; tools that measure attention, empathy, and emotion; virtual assistant chatbots; tools for automatic writing evaluation; personalised learning platforms; intelligent language learning apps; and personalised content curation platforms and all of this has the potential to provide improved learning experience and flexibility in managing students' time and experience [34]. The authors in reference [34] introduce an innovative framework for personalised and adaptable learning in higher education—an intelligent assistant powered by AI. To develop an interactive and engaging learning platform that improves student learning through personalised paths adaptive material, and round-the-clock assistance, the AIIA system makes use of modern AI and Natural Language Processing (NLP) capabilities. Features like quizzes, flashcards, and Learning Management System (LMS) connectivity are all included in the framework. The approaches are theoretically good; however, they mostly concentrate on the latest AI technologies without addressing how they may be used in areas with limited resources. The study's lack of exploration of region-specific issues makes it challenging to apply to Jordan. More research on specific requirements, infrastructural limitations, and curriculum alignment is required to make the system practical in Jordan.

Through the automation of repetitive tasks and the provision of specific recommendations, AI has the potential to allocate more time for educators to concentrate on strategic decision-making and fostering meaningful interactions with students. Educators can utilise AI-generated data of students' interests and learning objectives to enhance students' sense of worth and assistance, hence enabling them to implement specific measures aimed at enhancing their dedication to the subjects being studied. Other advantages of AI include web-scraping tools; intelligent scheduling and course planning; solutions or automatic assignment grading; classroom management tools; curriculum design tools; and student progress analytics platforms [35]. Although reference [35] highlighted many advantages for ChatGPT and guaranteed the transition from learning via AI to learning with AI, the paper's shortcoming is that it concentrates on ChatGPT's capabilities without addressing the challenges and concerns that it brought along. Additionally, because the article did not concentrate on a particular context, its application to other contexts—specifically, the Jordanian context—is questionable. As a result, it lacks tailored recommendations that are specific to each context.

Thus, AI enables decision-making processes for management in higher education institutions. Moreover, decision-makers gain access to data-supported assessments of many perspectives like student performance, enrolment trends, and curricular opportunities. Accordingly, this enables them to make more informed decisions in a timelier manner, ultimately leading to improved outcomes [36]. By streamlining a wide range of school administration and administrative activities, AI enhances the efficiency of

educational institutions, leading to optimised resource allocation [37].

Furthermore, by implementing AI to automate laborious administrative responsibilities, educational institutions can effectively decrease staff turnover. This reduction in turnover is attributed to the fact that educators can allocate their time and efforts towards more engaging activities, hence increasing their likelihood of remaining in their teaching positions [38]. AI offers further advantages to higher education institutes, including admission management platforms; emotional support chatbots; resource planning systems; dropout prediction tools; enrolment management and forecasting tools; and campus safety and security tools [39].

C. Concerns, Challenges, and Opportunities of AI in Higher Education

ChatGPT and other AI technologies are criticised for generating false information, for having biases in their data training, and for ethical concerns related to data privacy [40, 41]. Thus, discussions of AI in education have revealed significant ethical concerns [42] such as trust in AI technology and generated information.

Additionally, Smolansky *et al.* [1] carried out a survey study to find out how educators and students felt about the influence of generative AI tools on the development and implementation of online exams, they found plenty of problems with academic integrity as a result of ChatGPT's availability. Although their study offers valuable insights into assessment practices, it does not really address Jordan's specific challenges. The study is widely relevant since it highlights the need for reforms that achieve a balance between innovation and ethical concerns. However, because the study is still ongoing, we may anticipate further data and analysis that will improve and broaden the existing findings.

Ensuring Equity for AI in education was discussed by Pedro *et al.* [41] who highlighted the issue of social divides with the development of AI and the importance of establishing good circumstances for implementing new strategies for benefitting from AI in education.

Teacher preparation for an AI-powered education was mentioned by reference [41], they also added that developments of AI should enable improving the quality of data in educational system management.

To conclude, there is scarcity of context-specific literature on AI, Jordanian higher education suffers a serious gap in knowledge. The lack of government and universities regulations, the variety of cultural perspectives on AI, and the state of the technology infrastructure can all have significant consequences on how it is accepted and adopted. Studies conducted in Western communities, for example, make the assumption everyone has access to advanced technology, which may not be the case in Jordan. These circumstances highlight how crucial localised research is to ensure that its findings are applicable and useful to Jordanian educators and policymakers.

III. Research Approach and Design

The primary objective of this study is to address a significant research gap of studying the benefits and concerns of AIHEd within the Jordanian context by providing a thorough analysis of the current state of AI implementation in higher education institutions in Jordan. The study focuses on the main benefits and the crucial concerns and possible risks that educators encounter while investing AI for teaching and learning in higher education institutions. This analysis is conducted from educators' perspectives, thereby ensuring a comprehensive understanding of the subject matter.

The study is conducted in two distinct phases, the initial phase of the study utilises a qualitative research methodology, specifically employing semi-structured interviews with key stakeholders in the field of higher education in Jordan, namely educators and policy-makers. The objective of this phase is to facilitate a comprehensive understanding and investigation of the primary potential advantages and issues associated with the use of AI in higher education in Jordan. Additionally, it aims to contribute to the development of a survey instrument that will be employed in the subsequent phase of this research. The second phase of the study employs a quantitative research approach, utilizing a questionnaire to obtain data that can be generalised to the entire population.

Using various approaches for the investigation has the potential to produce valuable outcomes, and the research design that encompasses such approaches can be reused by other researchers to study the same topic in other contexts. By employing a diverse range of sources and methodologies throughout the research process, it is possible to leverage the advantages of each data collection method while mitigating the drawbacks of any particular approach. This approach ultimately improves the quality and reliability of the data obtained [43–45]. The research employed a sequential exploratory mixed method de-sign, involving the collection and analysis of qualitative data in the initial phase, followed by the collection and analysis of quantitative data in the subsequent phase. These two phases took place at distinct temporal intervals, as seen in Fig. 1.

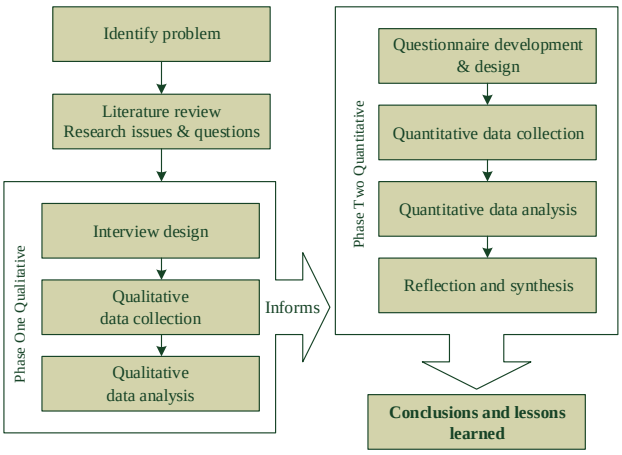

Fig. 1. Sequential exploratory mixed method design.

A. Phase One: Qualitative Research Approach Using Semi-Structured Interviews

Open-closed questions about demographic information and open-ended questions about the main benefits and concerns of using AI in higher education in Jordan were divided into two parts of the semi-structured interview.

A descriptive design utilizing a cross-section study with two open-ended questions: What are the primary benefits of

AI in higher education institutions in Jordan as perceived by educators? What are the primary concerns encountered by educators when students utilise AI? were asked. Descriptive analysis was used to examine the demographic data, and summative thematic analysis was used to examine the two open-ended questions. The findings from the qualitative phase served as a basis for the quantitative phase of the study. Additionally, we ensured sure there was a clear connection between the questionnaire parts and the themes that emerged from the interviews. To confirm the validity and reliability of the questionnaire, we then carried out a pilot test with a group of experienced educators. Following that, we utilised their feedback to improve the questions, make sure the topics were appropriately explained, and make sure the questions were understandable. This method increased the study's overall rigour and guaranteed and enhanced the alignment between the qualitative and quantitative phases.

1) Phase one participants

A total of 18 participants, who are educators from four faculties (IT, Business, Architecture, Engineering), are participating in this study. The interviewed educators are employed in various industries such as business administration, information technology, business technology, digital marketing, finance, accounting, e-commerce, and business analytics. To ensure the validity of the information acquired, we chose participants for the qualitative phase from experienced faculty members from a variety of fields. Because these people are qualified to offer knowledgeable opinions on the advantages and difficulties of integrating AI into Jordanian higher education, this expert sampling strategy may reduce selection bias. Focussing on educators' experience guarantees that the data is appropriate and directly related to the study aims, even though it may reduce the diversity of viewpoints. This strategy aligns with our objective of gaining a thorough understanding of AI's significance to teaching and learning in Jordanian higher education from the viewpoint of professionals.

The interviews were conducted between July-September of 2024. The interviewees were contacted before the interview, and all interviews were performed in person. The average duration of each interview was 30 minutes. The interviews were not recorded; instead, written notes and comments were made during the interview process.

During each interview session, the interviewees were requested to address the structured questions outlined in the initial part of the interview. Subsequently, the educators were prompted to provide their responses to the open-ended questions mentioned in section A. The primary objective of utilizing these two open-ended questions was to effectively gather the perspectives of educators without imposing any constraints. This was done to develop targeted questionnaire items for the phase two of this research (see Fig. 1).

Due to ethical concerns and the educators' clear unwillingness to let us record the interviews, we took care of them in an effort to gain their cooperation and gain their trust. The reliability of our results may be questionable; therefore, we took many procedures to address this, including cooperating with educators to revise the transcripts following the interview.

2) Thematic analysis using inductive approach

When using qualitative data sources like interview transcripts or social media profiles thematic analysis is a useful research tool used to examine people's viewpoints, views, knowledge, experiences, or beliefs [46]. The thematic analysis offers considerable flexibility in data interpretation, enabling researchers to effectively handle extensive datasets by categorizing them into overarching themes [47]. By using an inductive approach to thematic analysis, the data can be used to find the respondents' main themes [48]. A thematic analysis was performed utilizing an inductive approach, which involved the subsequent steps:

Regarding standard deviation, Table S1 in supplementary shows that our themes demonstrate excellent consistency with less standard deviation variation. Our codes, however, exhibit more variety. The statistics remain valid and indicate that the participants had a consensus on theme topics.

Firstly, the educators' answers to the open question were written down, to gain insight of all the information gathered before looking at each item individually. Following this, notes were taken from the text. Secondly, coding the data. Coding involves the process of identifying and categorizing certain pieces of text, typically phrases or sentences, by assigning concise labels or "codes" to represent their content. A manual process was employed to extract and code text from the interviewees, as indicated in Fig. 2.

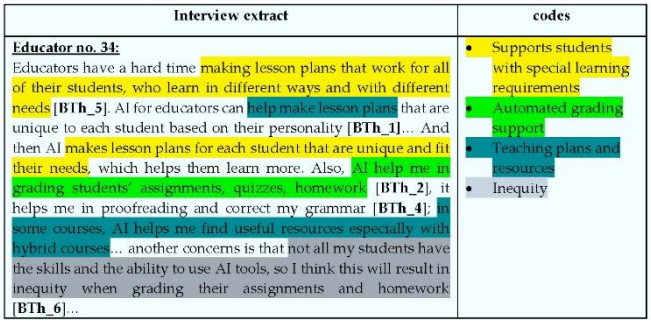

Fig. 2. Interview extract and coding.

Additionally, "Taguette" an open-source application designed for analysing high-quality data, was utilised. This free software facilitates the examination of qualitative data, including open-ended interview questions. A screenshot of "Taguette" featuring the processed response file and several evolved tags is presented in Fig. 3.

We started the analysis in "Taguette" with open coding, in which two coders reviewed the interview transcripts in "Taguette" systematically to generate initial codes. "Taguette" is utilised for organizing, tagging, and categorizing the data efficiently. Then refinement of these codes through axial coding to identify relationships and recurring patterns is done. Finally, we employed selective coding to build themes that encapsulated the core ideas from the data. To minimise coder bias, Taguette's collaborative features are used for comparing and discussing coding differences and resolving inconsistencies. We decided that we reached data saturation when no new codes or themes emerged after coding the final interviews. To ensure transparency we maintained an audit trail of coding decisions and theme development within Taguette.

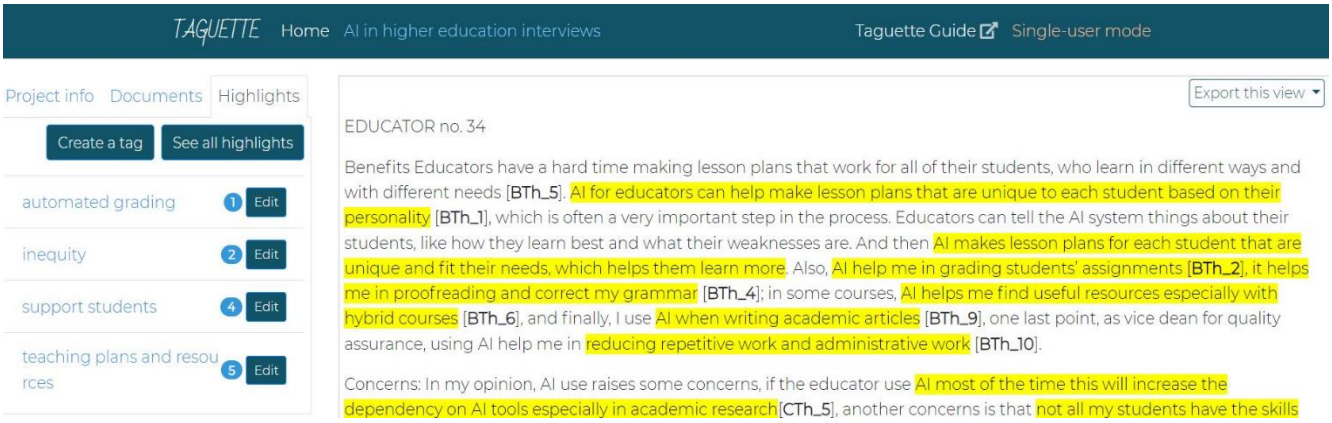

Fig. 3. A screenshot of "Taguette".

B. Phase Two: Quantitative Research Approach Using Structured-questionnaire

After completing phase one (semi-structured interview), the data were exported to Excel for further analysis. The mental step of theme building is to find codes that are related and put them together into themes. The part on results gave us information about the changed codes and new schemes that were made. After this step, we were able to generate the questionnaire.

The use of an open question allowed educators to express their ideas without restriction, and the thematic analysis that followed tried to classify these thoughts into patterns (themes and codes). Then, the questionnaire was built to see if these patterns can be generalised. To allow for all educators to score each item, the questionnaire that includes these patterns and has been evaluated through a pilot test procedure is delivered back to educators. This will allow a quantitative evaluation of the benefits and concerns of AI.

1) Phase two participants

A questionnaire was developed and comprising of two sections was designed, part 1: consisted of 10 benefit themes, containing 48 items, while part two consisted of 8 concern themes, containing 36 items. The questionnaire was subsequently distributed to (145) educators in four faculties, the percentage of usable questionnaires were (77.9%), as indicated in Table 1.

Table 1. Statistics of the distributed questionnaire

Faculty	Number of distributed questionnaires	Number of incomplete questionnaires	Number of usable questionnaires	Percentage of usable questionnaires (%)
IT	25	2	19	76.0
Business	60	3	55	91.7
Engineering	40	6	28	70.0
Architecture	20	5	11	55.0
Total/average	145	16	113	77.9

Each item required the educators to indicate their level of agreement with a given statement using a 5-Point Likert Scale (strongly agree, agree, not sure, disagree, strongly disagree). As the questionnaire items were derived from the thematic analysis, they will be outlined in the results section.

Because it might not accurately represent all educators in Jordan, relying solely on the responses of 145 educators from various Jordanian universities may indicate a sample size issue. To guarantee the transparency of our findings, we provide the participants' demographic information. We still need to use more representative samples in the future to generalise these findings, though.

2) Analysis of educators' responses to the questionnaire

Educators' responses to the questionnaire were evaluated using frequency analysis. To assess the pertinence of each item in the questionnaire, an average rate (AR) was awarded, ranging from 1 (strongly disagree) to 5 (strongly agree). AR for each item is calculated as: AR = (1 × f1 + 2 × f2 + 3 × f3 + 4 × f4 + 5 × f5)/No. of respondents, where f1, f2, f3, f4, and f5 are the relative frequencies of using the rates strongly agree, agree, not sure, disagree, strongly disagree, respectively. For example, in AI benefit 1 (Personalised Lesson Plans) the theme (AI helps in content creation), the Average Rate (AR) for this item was calculated as follows: out of the 113 respondents, 3 strongly disagreed, 5 disagreed, 9 were not sure, 79 agreed, and 17 strongly agreed, therefore, the average rate for this item was 3.9%.

The survey comprised a total of 84 questions, with 10 focusing on benefits themes and 48 addressing specific benefit items. Additionally, there were 8 concerns themes and 36 questions pertaining to concerns items.

IV. Results

This section comprises two parts: part 1 presents the outcomes of phase one, which employed a qualitative research approach through semi-structured interviews. Part 2, on the other hand, presents the results of phase two of this research, which utilised a quantitative research approach through a structured questionnaire.

Our results show that there is a great chance for university students to learn in a personalized and interactive environment. AI in particular can help with these two problems. Students can benefit from customized learning experiences due to AI that is provided with and trained on massive data. At the same time, educators can find out how new students learn in different ways and provide them advice on how to modify their teaching strategies to suit those needs.

This groundbreaking research provides important insights and viewpoints on Jordanian higher education in the AI era. During these turbulent periods, the higher education sector has suffered considerably. The spread of the pandemic has caused enrolment and financial problems for colleges and universities, which are still challenging to address in certain areas around the world. To preserve their existence and enhance the everyday lives of its students, multiple colleges, universities, and other institutions continually try to be

creative. The following subsections show our results and their analysis.

A. Phase One Results: Thematic Analysis of Educators' Responses

This section provides an answer to the first research question:

What are the primary benefits of AI in higher education institutions in Jordan as perceived and acceptable by educators?

The responses to the open question are summarised in Table 2. The statistics presented include the quantity of educators who were interviewed and participated in the responses, as well as the word count of each response. While certain educators offered concise remarks, others supplied elaborate replies. The average length of an interview was 200 words.

Table 2. Summary of interview and response statistics

Metric	Value
number of universities	3
Number of educators interviewed	18
Number of educators responded	18
Average number of words per interview	200
Average time of each interview	30 min
Number of words in longest interview	262
Number of words in shortest interview	97

Table 3 presents an overview of the pertinent variables associated with the conducted thematic analysis employing an inductive approach. Through the examination of responses provided by educators, a total of 84 codes were identified. Among these codes, 48 were indicative of positive attitudes towards AI benefits, while 36 comments were categorised as expressing concerns. The coding process yielded 10 initial themes of the benefits of AI, and 8 themes related to concerns.

Table 3. Overview of codes and themes statistics

Metric	Value
Number of coded comments	84
Number of benefit items	48
Number of concern items	36
Number of benefit themes	10
Number of concern themes	8

1) Benefits themes

Table 4 shows the 48 initial codes and 10 corresponding benefit themes that resulted from the coding and theme-building process. The names of benefit themes were coded as (BTh_1 to BTh_10). BTh_1: 'Personalised Lesson Plans' includes 5 initial codes, BTh_2: 'Assessment and Grading' includes 5 initial codes, BTh_3: 'Group Discussions' includes 7 initial codes, BTh_4: 'Proofreading and Grammar Checks' includes 3 initial codes, BTh_5: 'Special Learning Requirements' includes 4 initial codes, BTh_6: 'Teaching Plans and Resources' includes 7 initial codes, BTh_7: 'Professional Communication' includes 5 initial codes, BTh_8: 'Creative Thinking' includes 5 initial codes, BTh_9: 'Research and Development' includes 5 initial codes, and BTh_10: 'Other benefits of AI' includes 2 initial codes.

2) Themes and codes of artificial intelligence concerns

This section answers the second research question:

What are the primary concerns encountered by educators when students utilise AI?

Table 5 shows the 36 initial codes and 8 corresponding concern themes that resulted from the coding and theme-building process. The names of concern themes were coded as (CTh_1 to CTh_8). CTh_1: 'Ethical issues concern' includes 5 initial codes, CTh_2: 'Bias concern' includes 2 initial codes, CTh_3: 'Privacy concerns' include 9 initial codes, CTh_4: 'Social and academic connection concerns' includes 4 initial codes, CTh_5: 'Dependency on AI tools' includes 4 initial codes, CTh_6: 'Inequity concern' include 5 initial codes, CTh_7: 'Legislation concern' includes 3 initial codes, CTh_8: 'Other concerns' includes 4 initial codes.

B. Phase Two Results: Analysis of Educators' Responses to the Questionnaire

The findings from the second phase—the quantitative phase—are shown in this section. It displays the responses about the benefits first, followed by the responses about the concerns that arise. This extends and generalise the answers of the first and the second research questions.

1) Educators' responses to the benefit theme

From the results of Analysis of Educators' Responses to the Questionnaire we can conclude the following:

The average rate of educators' responses to the benefit themes is depicted in Fig. 4, arranged in descending order.

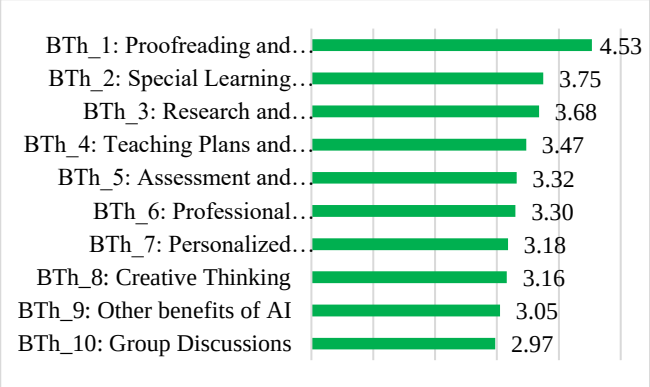

Fig. 4. The average rate of educators' responses for the benefit themes.

For BTh_1: Proofreading and Grammar Checks, 90.6% of the respondents agreed that AI enhances students' written work, and helps in proofreading and grammar check, and it examines and fix grammatical, punctuation, spelling, and syntax issues in their written documents, including lesson plans, resources, and email correspondence as shown in Fig. 5.

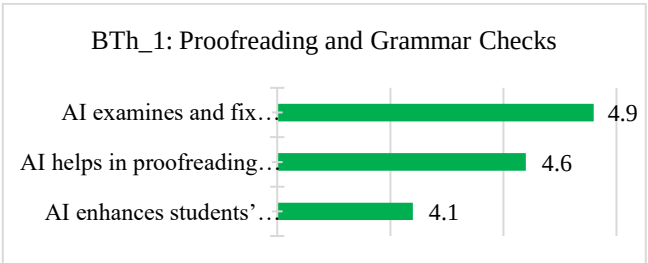

Fig. 5. The average rate of educators' responses for the BTh_1: proofreading and grammar checks.

For BTh_2: Special Learning Requirements, 75% of the respondents agreed that AI expands and explores context to understand students' documents with special needs; can translate any information into languages; supports students with special learning needs, learning materials and feedback; and supports student progress analytics, Fig. 6.

Table 4. Initial benefit codes and themes

Theme code		Item code
BTh_1 Personalised Lesson Plans	BTh_1-C1	AI is capable of creating customised lesson plans based on individual student profiles.
	BTh_1-C2	AI may be used to build customised lesson plans that take into account the unique needs of each student.
	BTh_1-C3	AI helps in content creation
	BTh_1-C4	AI enhances personalised learning
	BTh_1-C5	AI enhances personalised curricula
BTh_2 Assessment and Grading	BTh_2-C1	AI can automate grading support
	BTh_2-C2	AI offers immediate assessments and feedback
	BTh_2-C3	Using AI, students can correct their errors and improve their conception making teaching process easier
	BTh_2-C4	AI promotes a more effective learning environment
	BTh_2-C5	AI employs automated assignment grading
BTh_3 Group Discussions	BTh_3-C1	AI enables creative ways of group discussions
	BTh_3-C2	AI enhances student collaboration
	BTh_3-C3	AI supports classroom management
	BTh_3-C4	AI develops critical thinking abilities
	BTh_3-C5	Using of AI enhances the peer learning experience and group conversations.
	BTh_3-C6	AI gives teachers stimulating discussion topics
	BTh_3-C7	AI monitors the discussion's progress
BTh_4 Proofreading and Grammar Checks	BTh_4-C1	AI helps in proofreading and grammar checks
	BTh_4-C2	AI enhances students' written work
	BTh_4-C3	AI checks and corrects spelling, grammar, punctuation, and syntax errors in student writing, including lesson plans, materials, and email correspondence.
BTh_5 Special Learning Requirements	BTh_5-C1	AI supports students with special learning needs, learning materials and feedback
	BTh_5-C2	AI can translate any information into languages
	BTh_5-C3	AI expands and explores context to understand students' documents with special needs
	BTh_5-C4	AI supports student progress analytics
BTh_6 Teaching Plans and Resources	BTh_6-C1	AI aids in pedagogical planning and in finding teaching plans and resources
	BTh_6-C2	AI help in finding necessary materials and helpful resources
	BTh_6-C3	AI facilitates access to the most recent educational resources
	BTh_6-C4	AI makes it easier to find training materials
	BTh_6-C5	AI helps teachers find useful educational materials
	BTh_6-C6	AI provides interactive teaching tools
	BTh_6-C7	AI recommends educational tools such as: educational games, simulations, movies, animations, quizzes, presentations
BTh_7 Professional Communication	BTh_7-C1	AI helps in planning and directing professional communication
	BTh_7-C2	AI efficiently helps teachers in communicating with parents, and students by producing personalised communications.
	BTh_7-C3	AI supports writing assistant
	BTh_7-C4	AI can evaluate student progress
	BTh_7-C5	AI can generate automatic feedback reports
BTh_8 Creative Thinking	BTh_8-C1	AI can assist to increase students' interest and to engage students in creative thinking
	BTh_8-C2	AI can be used by educators in education to motivate engaging discussions and encourage students to analyze a topic from different viewpoints.
	BTh_8-C3	AI helps the development of critical thinking skills and increase the ability to generate creative responses
	BTh_8-C4	AI in education can be used by educators to provide conversation topics and open-ended questions.
	BTh_8-C5	AI can support students to increase their ability to analyze and solve problems
BTh_9 Research and Development	BTh_9-C1	AI aids in research and development
	BTh_9-C2	AI can be used by educators as a helpful research assistant
	BTh_9-C3	Educators can use AI in formulating research topics, assessing sources
	BTh_9-C4	Educators can use AI to strengthen their research skills
	BTh_9-C5	AI may free up educators to focus on scientific research and community service.
BTh_10 Other benefits of AI	BTh_10-C1	AI reduces administrative work
	BTh_10-C2	AI can automate and reduce repetitive tasks

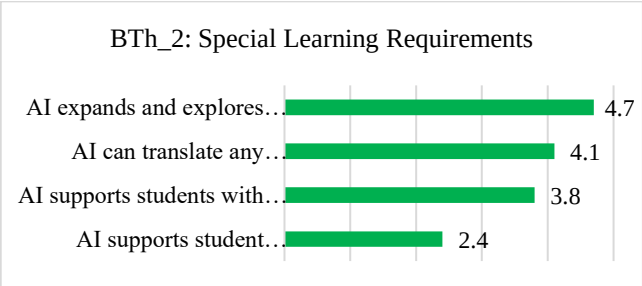

Fig. 6. The average rate of educators' responses for the BTh_2: special learning requirements.

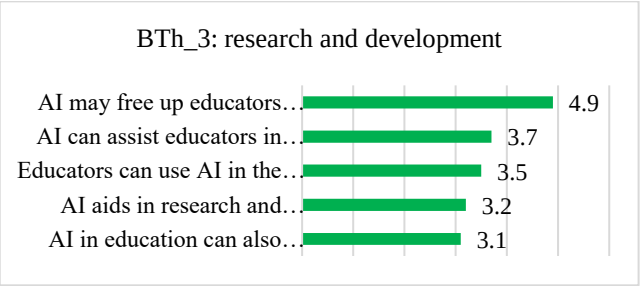

Fig. 7. The average rate of educators' responses for the BTh_3: research and development.

Table 5. Initial codes and 8 corresponding concern themes

Theme code		Item code
CTh_1 Ethical issues concerns	CTh_1-C1	students cheat more when they use artificial intelligence.
	CTh_1-C2	when students use AI, it will make plagiarism a bigger problem.
	CTh_1-C3	the trust between educators and students will decline with the use of AI
	CTh_1-C4	students might use AI to solve homework problems, and generate essays
	CTh_1-C5	students might use AI in take home exams and quizzes

CTh_2 Bias concerns	CTh_2-C1	artificial intelligence algorithms use data to make suggestions. If the data has biases, the suggestions will also be biased
	CTh_2-C2	AI algorithms may make suggestions that are biased towards a certain ethnic group, gender, or socioeconomic group.
CTh_3 Privacy concerns	CTh_3-C1	teachers' conversations with AI tools could be recorded and analyzed, which would be a breach of their privacy.
	CTh_3_C2	teachers' personally identifiable information might be stored and analysed
	CTh_3-C3	the information of educators might not be kept secret if the AI system is public
	CTh_3-C4	personal health records might not be kept secret when interacting with AI systems
	CTh_3-C5	sensitive details and personal information about students might not be kept secret when interacting with AI systems
	CTh_3-C6	privacy concerns about financial information of both educators and students
	CTh_3-C7	privacy concerns about academic performance of both educators and students
	CTh_3-C8	privacy concerns about personal information of students' parents
	CTh_3-C9	privacy concerns about research and development
CTh_4 Social and academic connection concerns	CTh_4-C1	less interaction between students and educators will result from the use of AI systems
	CTh_4-C2	less interaction between students and classmates will result from the use of AI systems.
	CTh_4-C3	the use of AI systems will lead to less communication between educators and students' families
	CTh_4-C4	the use of AI systems will lead to less communication between educators and colleagues
CTh_5 Dependency on AI tools	CTh_5-C1	educators might become over reliance on AI in teaching and learning
	CTh_5-C2	educators might become over reliance on AI in research and development
	CTh_5-C3	students might become over reliance on AI
	CTh_5-C4	too much use of AI will make students less able to think critically
CTh_6 Inequity concerns	CTh_6-C1	the use of AI tools is not a skill that all educators have
	CTh_6-C2	there will be inequity in academic performance because not all educators from different faculties are skilled in the use of AI tools
	CTh_6-C3	there will be inequity in research and development because not all educators from different faculties are skilled in the use of AI tools
	CTh_6-C4	there will be inequity in academic achievement because not all students are skilled in the use of AI tools
	CTh_6-C5	there will be inequity in academic achievement because not all students have access to the internet or computers
CTh_7 Legislation concerns	CTh_7-C1	there is no legislation from the Ministry of Higher Education that addresses AI in teaching and learning
	CTh_7-C2	there is no legislation from the Ministry of Higher Education that addresses AI in academic research or development
	CTh_7-C3	there is no legislation from the Ministry of Higher Education that addresses AI use in homework, quizzes, take-home exams
CTh_8 Other concerns	CTh_8-C1	AI inaccurate (Unreliability of AI tools)
	CTh_8-C2	can replace educators' job
	CTh_8-C3	use of AI needs background in computer skills
	CTh_8-C4	AI cannot explain its results or feedback

For BTh_3: Research and Development, 73.6% of the respondents agreed that AI explores context to understands documents with special needs, it can translate information into languages, and it supports students' progress analytics, Fig. 7.

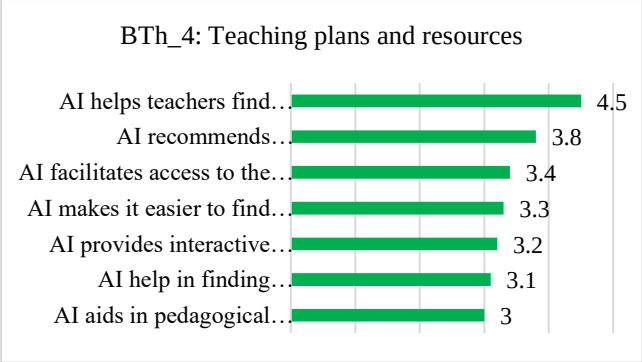

Fig. 8. The average rate of educators' responses for the BTh_4: teaching plans and resources.

For BTh_4: Teaching Plans and Resources, 69.4% of the respondents agreed that AI helps teachers find useful educational materials, recommends educational tools such as: educational games, simulations, movies, animations, quizzes, presentations, facilitates access to the most recent educational resources, makes it easier to find training materials, provides interactive teaching tools, helps in finding necessary materials and helpful resources, and aids in pedagogical planning and in finding teaching plans and resources, Fig. 8 illustrates the details.

For BTh_5: Assessment and Grading, 66.4%% of the respondents agreed that AI can automate grading support, offers immediate assessments and feedback, promotes a more effective learning environment, employs automated assignment grading, enables students to rectify their mistakes and swiftly improve their comprehension making teaching easier, Fig. 9 shows the details.

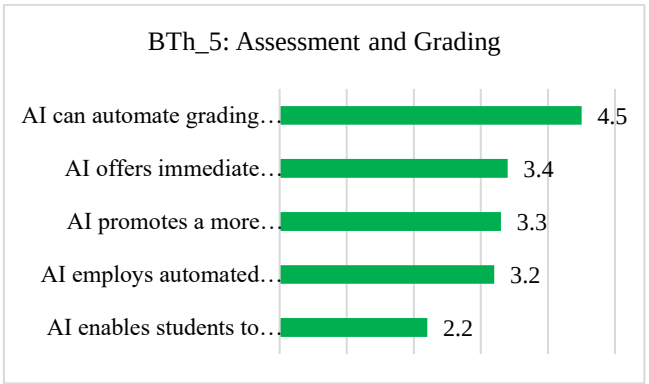

Fig. 9. The average rate of educators' responses for the BTh_5: assessment and grading.

For BTh_6: Professional Communication, 66.0% of the respondents agreed that AI supports writing assistant, can evaluate student progress, can generate automatic feedback reports, helps in planning and directing professional communication, supports teachers effectively to

communicate with parents, colleagues, and students by generating customised messages, this is demonstrated in Fig. 10.

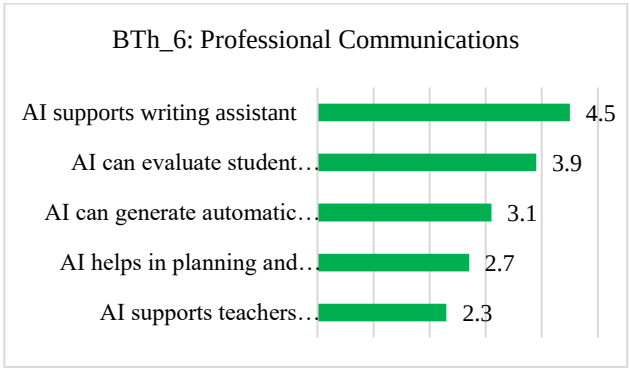

Fig. 10. The average rate of educators' responses for the BTh_6: professional communication.

For BTh_7: Personalised lesson plans, 63.6% of the respondents agreed that AI helps in content creation, enhances personalised curricula, helps create individualised lesson plans based on unique student profiles, enhances personalised learning, creates personalised lesson plans that reflect the particular requirements of each student, Fig. 11 demonstrates the details.

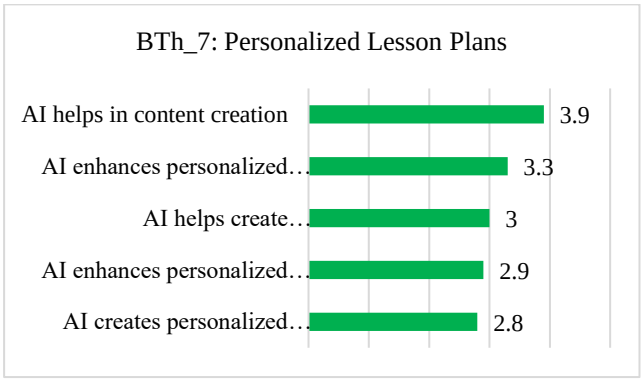

Fig. 11. The average rate of educators' responses for the BTh_7: personalised lesson plans.

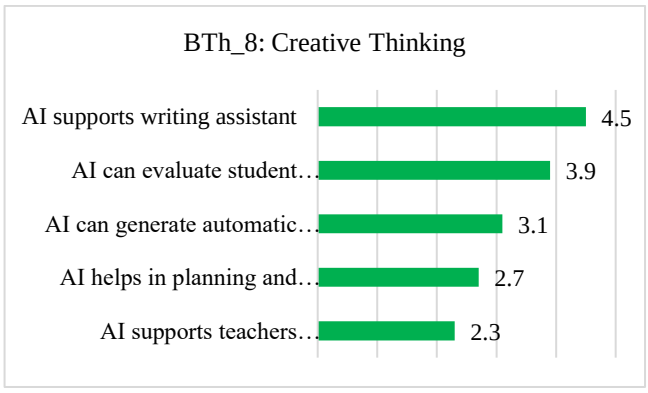

Fig. 12. The average rate of educators' responses for the BTh_8: creative thinking.

For BTh_8: Creative thinking, 63.2% of the respondents agreed that AI can utilise education to produce open-ended questions, discussion topics, supports students to improve their ability to analyze and solve problems, can assist to increase students' interest and to engage students in creative thinking, educators can use AI in education to spark interesting conversations and push students to consider a topic from a variety of perspectives, and it encourages students to think critically and respond creatively, as in Fig. 12.

For BTh_9: Other benefits of AI, 61.0% of the respondents agreed that AI can automate and reduce repetitive tasks, also it reduces administrative work, as shown in Fig. 13.

For BTh_10: Group Discussions, 59.4% of the respondents agreed that AI supports classroom management, enhances student collaboration, gives teachers stimulating discussion topics, supports peer learning experience are all greatly enhanced by group discussions, monitors the discussion's progress, enables creative ways of group discussions, and develops critical thinking abilities, Fig. 14 illustrates this.

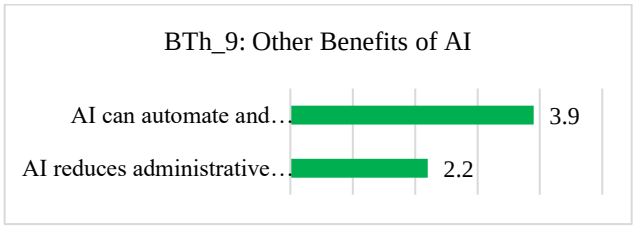

Fig. 13. The average rate of educators' responses for the BTh_9: other benefits of AI.

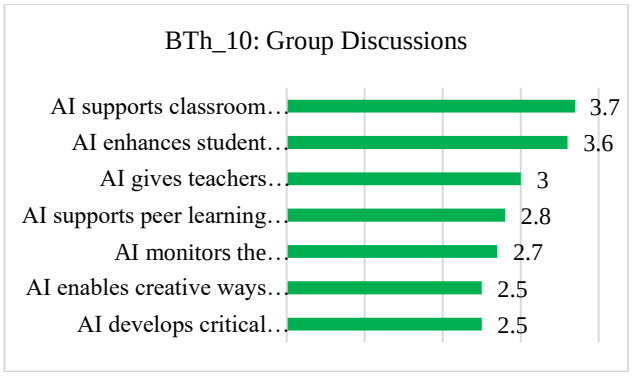

Fig. 14. The average rate of educators' responses for the BTh_10: group discussions.

2) Educators' responses to the concerns theme

The average rate of educators' responses for the concerns items/codes is depicted in Fig. 15, arranged in ascending order. From these results we can conclude the following:

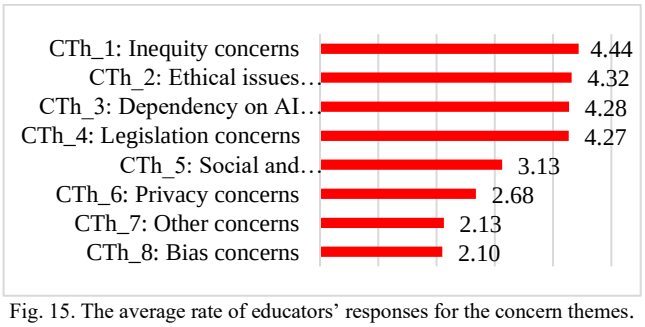

Fig. 15. The average rate of educators' responses for the concern themes.

For CTh_1: Inequity concerns, 88.8% of the respondents agreed that the use of AI tools is not a skill that all educators have, there will be inequity in academic performance because not all educators from different faculties are skilled in the use of AI tools, there will be inequity in academic achievement because not all students are skilled in the use of AI tools, there will be inequity in research and development because not all educators from different faculties are skilled in the use of AI

tools, and there will be inequity in academic achievement because not all students have access to the internet or computers, see Fig. 16.

For CTh_2: Ethical issues concerns, 86.4% of the respondents agreed that students will cheat more if they use AI, students might use AI to solve homework problems, and generate essays, students might use AI in take home exams and quizzes, when students use AI, it will make plagiarism a bigger problem, and the trust between educators and students will decline with the use of AI, see Fig. 17.

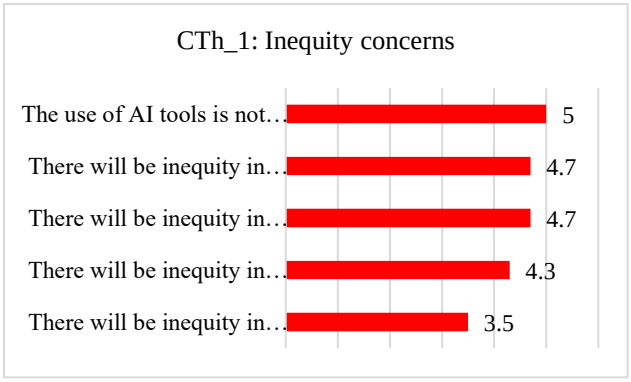

Fig. 16. The average rate of educators' responses for the CTh_1: inequity concerns.

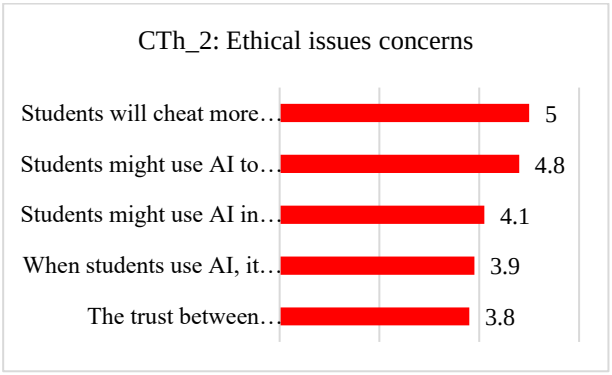

Fig. 17. The average rate of educators' responses for the CTh_2: ethical issues concerns.

For CTh_3: Dependency on AI tools, 85.6% of the respondents agreed that educators might become over reliance on AI in research and development, students might become over reliance on AI, too much use of AI will make students less able to think critically, educators might become over reliance on AI in teaching and learning, see Fig. 18.

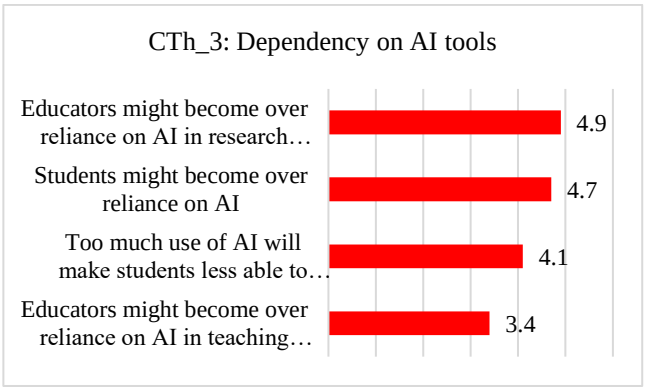

Fig. 18. The average rate of educators' responses for the CTh_3: dependency on AI tools.

For CTh_4: Legislation concerns, 85.4% of the respondents agreed that there is no legislation from the ministry of higher education that addresses AI in teaching and learning, there is no legislation from the Ministry of Higher Education that addresses AI in academic research or development, and there is no legislation from the ministry of higher education that addresses AI use in homework, quizzes, take-home exams, see Fig. 19.

For CTh_5: Social and academic connection concerns, 62.6% of the respondents agreed that less interaction between students and educators will result from the use of AI, the use of AI will lead to less communication between educators and colleagues, less interaction between students and classmates will result from the use of AI, also, the use of AI will lead to less communication between educators and students' families, see Fig. 20.

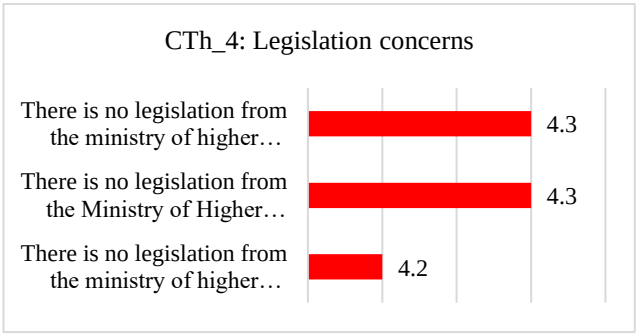

Fig. 19. The average rate of educators' responses for the CTh_4: legislation concerns.

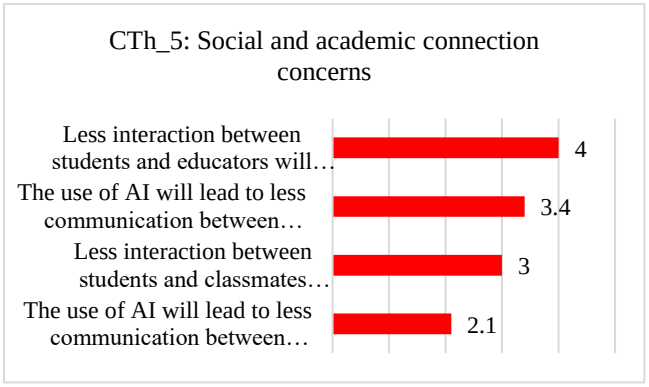

Fig. 20. The average rate of educators' responses for the CTh_5: social and academic connection concerns.

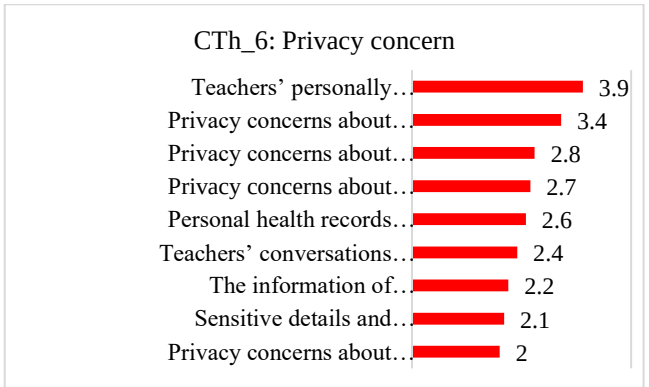

Fig. 21. The average rate of educators' responses for the CTh_6: privacy concerns.

For CTh_6: Privacy concerns, 53.6% of the respondents agreed that teachers' personally identifiable information might be stored and analysed using AI, privacy concerns

about research and development, concerns about academic performance of both educators and students, concerns about personal information of students' parents, personal health records might not be kept secret when interacting with AI systems, teachers' conversations with AI tools could be recorded and analysed, which would be a breach of their privacy, the information of educators might not be kept secret if the AI system is public, sensitive details and personal information about students might not be kept secret when interacting with AI systems, and privacy concerns about financial information of both educators and students, see Fig. 21.

For CTh_7: Other concerns, 42.6% of the respondents agreed that AI inaccurate (Unreliability of AI tools), it can replace educators' job, AI cannot explain its results or feedback, and the use of AI needs background in computer skills, see Fig. 22.

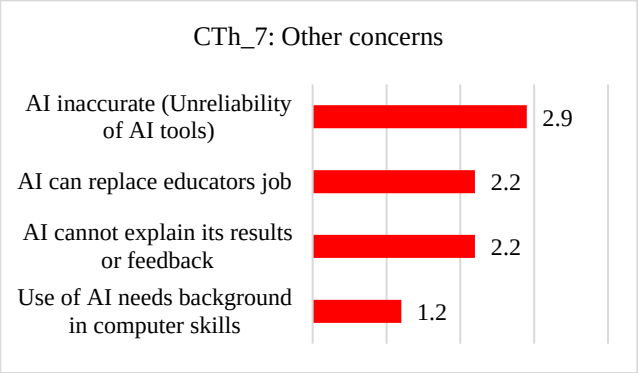

Fig. 22. The average rate of educators' responses for the CTh_7: other concerns.

For CTh_8: Bias concerns, 42.0% of the respondents agreed that AI algorithms may make suggestions that are biased towards a certain ethnic group, gender, or socioeconomic group, and AI algorithms use data to make suggestions. If the data has biases, the suggestions will also be biased, see Fig. 23.

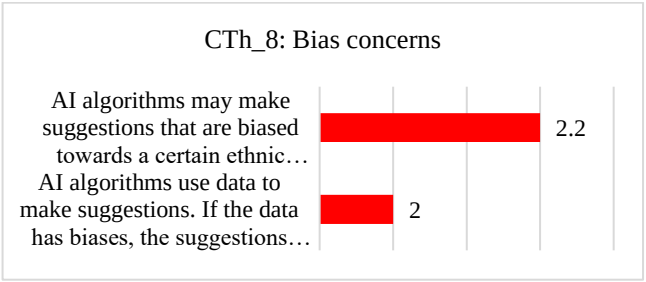

Fig. 23. The average rate of educators' responses for the CTh_8: bias concerns.

V. Discussion

AI in higher education has brought about an unexpected change in teaching strategies. Furthermore, it raised a lot of concerns in addition to many benefits. This study shows that educators at Jordanian universities are informed of both the benefits and concerns when employing AI in educational settings. It also demonstrates our readiness to take advantage of AI's application in higher education. After classifying the benefits that educators expressed using the benefits theme, ten benefits were found.

One of the most significant benefits that educators mentioned during the interviews was grammar checks. The quantitative phase revealed that 90.6% of respondents believed that the technology helps students' written work by finding and fixing grammatical and spelling mistakes. These results are consistent with those of reference [49], who also found the same advantages to consider. Writing and grammar issues are significant concerns for students in Jordan, and many educators believe that using AI to help with writing and grammar may provide significant benefits. This has created an opportunity for students to shift their attention from writing and language skills to understanding and analysis.

Another key benefit is creating customised plans for lessons, where 63.6% of the respondents agreed that AI has the potential to help in developing personalised lesson plans. Educators who believe AI enables tailored learning experiences that adapt to the needs of each student have reported this trend. It assesses students' learning preferences, areas of strength, and areas of weakness to give pedagogical scheduling and personalised lesson plans and this result aligns with the findings of [17, 31, 49–53] A wide range of students benefit from having tailored lesson plans that are flexible enough to accommodate their individual needs and distinctive points of view. This might help students achieve higher academic achievement and increase their level of involvement.

Assessment and grading are another key benefit, where AI improves the capacity to generate automated evaluation reports and provide prompt responses on assessments. Our survey showed that 66.4%% of the respondents agreed that AI can automate and support the grading process. This aligns with the results of reference [40]; as suggested in reference [1], this input might aid in the creation of intervention plans, the modification of teaching strategies, and the guidance and support required for each student to maintain their independence and academic integrity. This is also similar to the results of reference [26] who found an agreement between the computer classification and human graders of 94.6% to 98.2% was obtained when postgraduate medical student essays were graded using the open-source Java software LightSIDE which could potentially save money and time by eliminating the need to hire numerous human assessors for extensive assessments [5].

Regarding the theme of the benefits of group discussions, the majority of interviewees stated that AI makes it possible to organise conversations in creative ways that improve student engagement and classroom management. According to the results of our study, 59.4% of those surveyed agreed that AI enhances critical thinking skills and enables innovative group discussions. This is the same result as references [53, 54] and this promotes the development of critical thinking skills and facilitates peer learning by creating discussion topics and tracking the direction of conversations.

Educators also reported that AI can support students with special needs for learning by offering tailored and adaptive learning materials and feedback. This brings us to our fourth benefit theme: special learning requirements. Our quantitative phase showed that 75% of the respondents agreed that AI supports students with special learning needs. This aligns with findings by Alam and Pratama *et al*. [55, 56], who found that special education is required to ensure student fairness and accessibility. AI provides new resources for

individualised learning and improved accessibility, making this feasible for students with different learning requirements.

Conversational chatbots can function as teaching assistants in the classroom and assist with providing instructional assistance. Additionally, they can let teachers produce personalised messages for students and parents, give automatic feedback reports, and assess students' progress. They can also give students access to lesson plans and resources. These results themes align with Lameras and Arnab, Borup *et al*. [8, 57] who found the same results.

Although there are many benefits, there are also concerns about using AI in higher education. Our results revealed eight concerns including inequity concerns, ethical concerns, dependency concerns, legislation concerns, social and academic connection concern, privacy concerns, bias concerns, and other concerns.

The issue of equity is one of the main concerns. In other words, there is a distinction between those who have the infrastructure needed to utilise AI correctly, wherever, at any time, and those who do not. Due to the lack of essential portable devices or access to the internet and technical support for students from rural regions or low-income families, this divide has the potential to worsen already existing inequities. To address this issue, legislators, educators, and the government must work closely together to guarantee that all educators and learners have fair access to technology resources. The results of the equity concern were comparable to those of reference [41], who discussed the matter. 88.8% of respondents agreed that using AI technologies is not a competency that all educators have, which sheds light on the issue of inequality. Thus, inequity in the adoption of AI is a major problem, but it is crucial to take into consideration the contextual elements that fuel this concern, particularly in developing nations like Jordan. The lack of access to dependable digital infrastructure, such as fast internet and modern devices, creates significant obstacles to the equal deployment of AI in education by both educators and learners. For instance, the lack of resources needed to effectively use AI technologies in rural regions contributes to the digital divide. Additionally, obstacles pertaining to financial concerns impact educators' capacity to acquire and sustain cutting-edge technologies. We require certain policies, including free internet access, regional training initiatives, and reasonably priced, scalable solutions tailored to Jordan's particular situation, so as to solve these imbalances.

The results regarding the demand for AIHEd ethics are in line with those of Zhang *et al*., [58] who talked about initiatives to address the emerging crucial challenges such as AI ethics documents by different stakeholders, and Zhang and Aslan [59] who emphasised the urgent need for ethics in AI in higher education and declared that everyone involved—researchers, educators, administrators, technologists, and members of the general public—must act immediately to address this issue. Participants emphasised that to properly handle AI ethical issues, higher education institutions must have an integrated strategy for the implementation of AI applications. This has been stated previously by reference [58]. We think that having this comprehensive strategy is crucial and needs to fit with the objectives and values of universities.

Other results of our study revealed many privacy concerns similar to the concerns revealed by references [40, 41]. Our results also showed that there are no legislations from the Ministry of Higher Education addressing AI in teaching and learning which is the same for the results of Zhang and Aslan [59] who also raised issues related to ethics and privacy that were also raised in our interviewees. As a result, an AI code of ethics that establishes standards for transparency, privacy, and inclusion is required. This enhances the beneficial effects of AI in higher education and helps to guarantee the ethical use of AI-generated data by students.

The unreliability of AI technologies was mentioned by research participants as another concern. This has been proven in other studies, such as reference [60]. Several further studies, like reference [61], have supported the use of academic data for student guidance and monitoring. Many participants brought up this problem and reported that if the data has biases, the suggestions will also be biased. The authors also confirm that in many areas and modules, the AI-generated content may pose a significant reliability challenge. This is because AI may produce inaccurate or biased content. Such limitations may be a result of limited training data or algorithmic biases which leads to misleading outcomes.

To this end, AI is a two-sided coin that must be handled carefully to maximise its benefits and minimise its drawbacks. When implementing AI in higher education, we must maintain a balance. We also need qualified and trained educators who can guide and support their students. AI literacy is crucial for preparing our students to overcome obstacles and develop into leaders with vision who will support learning rather than use AI as a substitute for learning [62].

TAM [63], which claims that perceived usefulness and perceived ease of use are significant drivers of technology adoption, allows us to partially explain our findings. While problems like inequity and ethical dilemmas create barriers to perceived ease of use, our analysis of the benefits—such personalised learning—aligns with perceived usefulness. Although TAM is not entirely used in our study, its principles provide a guide for our analysis, particularly when it comes to comprehending how educators assess AI tools as new technology. Future research on the adoption of AI in higher education may attain a thorough and complete application of TAM.

To this point, our study has successfully answered the first two research questions and contributed to the development of a thorough comprehension of the benefits and concerns presented by the use of AI in higher education. We looked at the potential, issues, and benefits of Jordanian higher education institutions. Our findings show that it is feasible to apply AI in higher education while maintaining ethical and equitable norms. We established a basis for more research in this field, which is developing and evolving rapidly, by providing answers to these questions. The third research question is answered in section VII.

VI. Conclusions

The application of AI in higher education can completely transform the field of teaching. While there are numerous benefits there are also several concerns. The results of our study highlighted the importance and the benefits achieved by utilizing AI in higher education as perceived by educators

in the Jordanian higher educational institutions. The most important benefits are proofreading and grammar checks, special learning requirements, research and development, teaching plans and resources, assessment and grading, professional communication, personalised lesson plans, creative thinking, group discussions, and other benefits. Moreover, concerns related to this utilization were investigated. We have identified eight concerns themes including inequity concerns, ethical concerns, dependency concerns, legislation concerns, social and academic connection concern, privacy concerns, bias concerns, and other concerns. Then, we have distributed a questionnaire to educators to generalise the results.

Despite the importance of the research topic of AI in higher education, there is a scarcity of studies on the topic from educators' perspective, particularly within the Jordanian higher education institutions. This study which employed a novel sequential exploratory mixed method design adds to the literature on the AI in the Jordanian higher education institutions and clarify the benefits and the concerns of this use which may serve as framework for researchers in the field.

The paper looks at the study's data and compares it with the results of other studies. We found that most results are consistent with the results of the other studies in other contexts. Thus, this study concludes the results, points out some problems, and suggests areas where more research could be done.

Regarding to the third research question:

What directions can be given on how to take advantage of opportunities and get beyond concerns to support higher education institutions?

Even though AI has the potential to change the way students learn and educators work, there are still many problems that researchers and educators who work with related application systems need to resolve to go beyond concerns and benefit of such new technologies. Such concerns require more focus on properly and responsibly addressing ethical dilemmas and the dilemma of to what extent students in higher education be allowed to use AI. A complete strategy including stakeholder participation, training, strong governance structures, and ongoing assessment and improvement of AI applications in higher education institutions are needed to address these concerns successfully. Educators also need to give students instructions on how to use AI for their homework and classwork. For instance, it is inappropriate for students to turn in a whole text generated by AI as their work because that would be regarded as plagiarism. Most of these tools do work with language models such as ChatGPT and others. Students should be made aware that these language models typically need help to produce high-quality text on a specific, specialised topic.

We believe that paid license agreements, free training seminars on AI literacy, and the integration of easily accessible AI technologies into institutional platforms should all be implemented by higher education institutions to ensure avoiding inequities and having equal opportunities by both educators and learners. Additionally, it is crucial to assess the technology infrastructure and involve educators in the development of policies.

Even while AI has the ability to completely transform the way we think about education, there are still a lot of concerns and issues that need to be resolved.

It is critical that researchers and developers continue to investigate the use of AI in educational settings. The effectiveness of using AI technologies in various educational contexts should be the main focus of future research. This might be assisted by studies that examine the adoption of AI in rural and urban areas. Furthermore, quantitative research should be used investigate the accessibility of AI technologies, their influence on the educational process, and the rates at which educators and learners are using them. Additionally, future research might look into how access to AI technologies can evolve and grow over time in such contexts and the consequences for educational equity that arise. Such study may offer practical insights into the fair integration of AI in education and guide institutional policy creation by utilising dependable and well-structured procedures and attempting to investigate various contexts and populations. Furthermore, because Jordanian students have positive opinion regarding mobile learning [64], we are looking to connect mobile learning and AI to enhance education and to provide personalised content that adapt to student needs which has the potential to provide real-time feedback.

Our collected data provided valuable insights about the use of AI in the Jordanian higher education and they can be generalised. However, their generalisability may be improved by distributing the questionnaire to a larger population of educators. The next phase of our research will examine the advantages and issues of AI in Jordanian higher education from the perspective of the students, and we will compare our results with those of other studies.

Additionally, we intend to look into whether these benefits and concerns vary when face-to-face learning replaced by online learning.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

SA, LFA contributed to the conceptualisation of the study by initiating the main idea; SA, LFA, AMA and AFA collected the data; SA, LFA, and AMA analysed the data; SA, LFA, and AMA wrote the initial draft of the paper; LFA wrote the final version of the paper; all authors had approved the final version.

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