AI Literacy Across Curriculum Design: Investigating College Instructors' Perspectives

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Abstract

Artificial Intelligence (AI) is increasingly prevalent, permeating various aspects of and spreading across education. However, a comprehensive understanding of AI applications and how to define AI literacy is under-investigated. On this note, teaching and evaluating AI literacy necessitates educators to integrate it into course content. The implementation and use of AI are reshaping college students' learning experiences. Limited efforts have been made to promote AI literacy for individuals at academic institutions. This study aims to investigate college instructors' perspectives on AI integration in curriculum design at a higher education institution, Palestine Technical University Kadoorie (PTUK). A mixed study approach is used with a pre-existing questionnaire containing 14 items in this study and 17 semi-structured interviews. The data were collected from nine different departments at PTUK. The target population consisted of 176 college instructors. The results revealed that college instructors perceive AI literacy as a weak element in the curriculum. Two themes merged from qualitative data: accomplishing educational goals, and lack of AI guidelines and concepts. Recommendations include the necessity to incorporate AI literacy curriculum design in higher education contexts in different disciplines.

Keywords: artificial intelligence, curriculum content, AI literacy, higher education, curriculum design

Introduction

Artificial intelligence (AI) is a technology designed to emulate human intelligence in performing cognitive tasks, such as learning and problem-solving, through the application of rules and environmental cues (Wang, 2019). As AI revolutionizes our methods of communication, work, and coexistence with both humans and machines, possessing AI literacy becomes increasingly vital for future endeavors (Long & Magerko, 2020). Educational frameworks for AI literacy have been crafted for primary, secondary, and higher education levels to enhance understanding in this field (Kong et al., 2023; Su & Yang, 2022).

Since higher education plays a crucial role in reshaping societies, the structure and arrangement of higher education curricula can be seen as the framework that guides societal progress (Leal Filho et al., 2018). As the world evolves due to technological and communicative advancements, societal characteristics and functions will inevitably transform.

This is a natural progression that occurs over time. In response to evolving individuals and societies, it becomes imperative to consider reforming higher education curricula to meet contemporary demands to equip pre-service teachers in higher education institutions (Varghese & Mustafa, 2022).

However, it is crucial to recognize that merely incorporating AI literacy into the curriculum will not suffice. Instead, a cultural shift towards digital and technological proficiency among students is necessary. College students need to be well-equipped with AI literacy skills and fostered through their development of technological intelligence. A well-rounded curriculum should encompass fundamental elements that promote a harmonious integration of these two aspects: AI literacy skills and technological intelligence (Varghese & Mustafa, 2022). To tackle this issue, this study seeks to bridge this knowledge gap and contribute to the advancement of social equity and sustainable development objectives by enhancing AI curricula tailored for higher education. This study focuses on AI literacy as it is part of the curriculum, where it is recognized as a vital competency for twenty-first-century individuals.

The novelty of this study lies in investigating AI literacy across the curriculum, which was an under-researched topic. To date, the integration of AI into educational curricula has primarily been limited to specific subjects, such as data science, computer science, and engineering (Cantú-Ortiz et al., 2020). This study investigates the integration of AI literacy in other subjects in higher education settings since there is a growing recognition of the necessity for a more comprehensive AI education across the entire campus (Ng et al., 2021). Moreover, factors like gender, technical skills, and academic rank that might influence the perspectives of college instructors on AI literacy integration across the curriculum were never investigated previously.

This study is significant since integrating AI literacy into college classrooms effectively forces educators to occupy a crucial role in determining which learning components (such as curriculum, instruction, and assessment) influence teaching effectively. This study is unique in this aspect. Moreover, rarely have studies explored demographic influence on the perspectives of college instructors, which affects AI literacy in curriculum infusion to some extent. Nonetheless, educators might lack familiarity with emerging technologies. Therefore, it is essential to explore the perspectives to assist educators in creating suitable learning activities that align with teaching objectives and learning outcomes. Consequently, this study will offer universities, and professional organizations, the opportunity to provide guidelines and standards for the development of AI literacy in curriculum integration materials and tools.

Additionally, this study will contribute to the limited literature in this area, showing college teachers and policymakers the importance of AI literacy infusion across the curriculum.

Problem Statement

Curricula need to be formulated to fit this digital era, as shifts in society and technology persist in shaping our lifestyles and professions. The curriculum must evolve to guarantee that students possess the digital competencies needed in the AI era. The incorporation of skills related to AI literacy into the curriculum framework holds significant importance since it should reflect the current requisites of society and the job market, it is a fundamental necessity for success across diverse occupations and daily affairs, and it fosters the capacity for innovative thinking among students, enabling them to devise creative solutions for intricate issues.

At PTUK as a technical university with diverse disciplines like: Engineering, Information Technology, Applied Science, Arts and Social Sciences, Agriculture Sciences and Technology, Business and Economics, and Physical Education and Sport Sciences, integration of AI literacy skills within the curriculum is crucial to equip and empower students with effective AI usage, ethical use, and responsibly utilization of AI. As a result, students should gain knowledge about AI. There still an ongoing debate regarding its precise integration into education at PTUK. Some propose the concept of AI literacy as a means to delineate the skills students need to develop to navigate a future imbued with AI in both their daily lives and careers.

Literature Review

AI Literacy in Higher Education

In higher education AI literacy is a fundamental pillar that encompasses the proficiencies and knowledge necessary to effectively carry out practical tasks expected of both instructors and students within an educational context while using AI (Su and Yang, 2024). AI literacy refers to the capacity to comprehend, apply, assess, and responsibly maneuver through AI technologies (Long & Megerko, 2020; Laupichler et al., 2022). There are four primary dimensions to AI literacy. Firstly, comprehension entails grasping the fundamental concepts of AI, encompassing its workings, machine learning algorithms, training data, and recognizing potential limitations and biases within AI systems. Secondly, utilization involves employing AI tools and platforms proficiently to tackle problems and achieve objectives, potentially necessitating coding skills and proficiency in handling extensive datasets. Thirdly, assessment and creation entail appraising the reliability and quality of AI systems, along with the capability to devise and construct ethically sound AI systems, requiring both technical expertise and an awareness of the societal and ethical ramifications of AI. Fourthly, AI ethics involves comprehending the ethical and moral considerations associated with AI and making well-informed decisions regarding its utilization across different contexts, encompassing aspects like fairness, transparency, accountability, and the broader societal impacts of AI.

Fostering related competencies and skill sets, such as programming and statistics, will enable AI to encompass academics courses. Even though AI literacy has advantages for students, studies, such as Stople & Hallstrom (2024), examining AI's implementation in education have highlighted numerous challenges for future educational endeavors. One such challenge is the significant risk of students encountering misinformation because of the variable quality of online data. Also, Bozkurt & Sharma (2023) reported several challenges while using generative AI, including potential algorithmic bias, the necessity for dependable knowledge sources and quality control, issues of inequality and inequity in access, limitations in fostering creativity and critical thinking, the potential for teacher displacement, concerns regarding privacy and ethics, complexities in technical implementation, and an increased reliance on technology. AI literacy necessitates a blend of technical acumen and an understanding of the ethical and social implications of AI (Yi, 2021).

Reviewing current AI literacy in curriculum infusion, it is evident that there is a demand for broadening the scope of AI literacy in the curriculum beyond specific subjects like computer science and engineering (Cantú-Ortiz et al., 2020). Few studies were found that explore the perspectives of college instructors towards AI literacy across the curriculum. For

example, the perspectives of instructors were examined regarding AI and reported negative results, such as thinking that relying too much on AI systems might minimize the student's ability to learn independently, solve problems creatively, and think critically (Seo et al., 2021). It is important to examine how students' and instructors' perceptions about AI integration in the curriculum was investigated by researchers. For example, Picciano (2019) reported the necessity of AI applications for instructors to assess the progress of both individual students and the entire class. Additionally, they received recommendations for enhancing instructional methods, including insights into AI and its impact on the educational landscape. Moreover, Bozkurt et al. (2023) noted that AI now has the potential to assume a broader range of educational responsibilities that were previously exclusive to human educators. Additionally, Schroeder et al. (2022) conducted a study with two professors from the University of Central Florida who employed AI-generated course materials as the main educational tool for their students. They personalized the selection and refinement of these materials to suit the specific context of each course. They identified qualitative changes in the impact on student engagement, preparedness, satisfaction, and exam performance.

AI Literacy Across the Curriculum

AI has become pervasive in society, serving as a widely adopted concept and tool that significantly influences everyday life. Therefore, ensuring that students possess a fundamental understanding and familiarity with AI is essential for nurturing competent global citizens.

The ongoing development of AI across the curriculum in higher education institutions aims to establish AI education as a pivotal component accessible to all students. It is an overarching objective to cultivate a workforce equipped with the necessary twenty-first-century skills, as recognized by the global workforce and governmental requirements. Adequately skilled human resources are imperative for addressing the complexities of the modern era (Southworth et al., 2023). Few studies suggested an AI literacy framework for curriculum integration like Wong et al. (2020), who presented a comprehensive AI literacy framework with three dimensions: understanding AI concepts (such as machine learning, deep learning, and neural networks), recognizing AI applications (like speech recognition, robotics, and smart assistants), and addressing AI ethics. Based on a systematic review that Ng et al. (2021) conducted, these AI education initiatives can bolster students' AI literacy across four key areas: (1) understanding AI fundamentals and applications, (2) applying AI in various contexts, (3) assessing and creating AI solutions, and (4) considering ethical implications of AI. Despite the potential benefits of AI, it's essential to acknowledge its adverse effects on students. For instance, exposure to biased AI algorithms can result in students internalizing and perpetuating biases (Melsión et al., 2021). Additionally, AI literacy raises ethical concerns, such as privacy and security issues, which may be challenging for students to comprehend and navigate (Ali et al., 2019). When designing an AI literacy curriculum, it is crucial to consider these potential negative impacts on students.

Li (2021) addressed the absence of clear definitions for AI literacy. Hence, this study explores college instructors' perspectives on the AI literacy infusion in curriculum content, materials, and teaching strategies to nurture students' skills. Also, this study investigates the influence of gender, technical skills, and academic ranks on college instructors' perspectives toward AI literacy integration into the curriculum, which was not investigated previously. Southworth et al. (2024) investigated possible paths to address potential gaps in AI literacy across the curriculum at a traditional research university, the University of Florida. Their results revealed that infusing AI across the curriculum will make AI education a cornerstone

opportunity for all students and will create an AI-ready workforce who possess essential twenty-first-century competencies.

Moreover, Bozkurt (2023) argues that generative AI presents a range of opportunities, such as enabling personalized learning, fostering inclusive curriculum, facilitating collaboration in educational settings, automating assessment tasks, enhancing accessibility, streamlining efficiency in time and effort, honing language skills, and ensuring round-the-clock availability of such technologies. Wolf and Wolf (2022) conducted a quasi-experiment to investigate the automated essay-scoring systems employing AI to assess writing skills for nursing students. It found that AI offers new opportunities for efficient, reliable, and valid assessments of writing skills. On the other hand, Laupichler et al. (2022) highlighted in their review that the exploration of AI literacy is in its infancy, resulting in a scarcity of literature on this subject.

After reviewing the literature, it seems that incorporating AI literacy into the curriculum can transform the dynamics of teaching and learning. Despite recent discussions on different facets of AI in education, educators often do not integrate AI skills effectively into their classrooms. The willingness of teachers to embrace AI literacy is shaped by their perspectives and other relevant factors. Thus, it is imperative to explore their perspectives and some demographic factors to leverage the potential of AI literacy integration effectively.

Navigating the literature related to AI literacy across the curriculum shows that there is a scarce amount of research addressing AI literacy in the context of curriculum development (Su and Yang, 2024). The literature review revealed a need for more studies measuring AI literacy inclusion in the curriculum and the factors that might influence these perspectives. There is a need to explore curriculum content in terms of AI competencies, and to define the current needs and establish a clear road map to enhance AI competencies in curriculum content. This study will seek to answer the following questions:

Research Questions
1. What are college instructors' perspectives towards AI literacy's infusion into curriculum content?
2. What is the influence of gender, technical skills, and academic ranks on the perspectives of college instructors toward AI literacy across the curriculum?

Methodology

To answer the study's questions, a mixed approach was used. For the quantitative part, a questionnaire was designed to target the college instructors' perspectives in different disciplines and the influence of gender, technical skills, and academic ranks on college instructors' perspectives. For the qualitative part, semi-structured interviews were conducted with participants to answer the first question, which is related to college instructors' perspectives towards AI literacy inclusion. Research designs of phenomenology and descriptive research were considered and adopted as they align well with the study objectives. The rationale for adopting a mixed-method design lies in the recognition that relying solely on either quantitative or qualitative approaches fails to comprehensively address the research issue. Morse (2016) advocates for the integration of qualitative data to validate quantitative findings, justifying this methodological choice.

Research Design

To investigate the perspectives of college instructors on AI literacy across the curriculum, a mixed-method explanatory sequential design was used. Mixed-method design employs different types of inquiry to gain a better understanding of a phenomenon by combining more than one data collection tool (Creswell & Clark, 2017). The sequential approach is used, with the quantitative phase being followed by the qualitative phase (Creswell, 2013); thus, the qualitative findings are used to contextualize the quantitative data to assess perspectives. A descriptive approach with initial quantitative steps was used in this study, with a questionnaire for college instructors. Because the researcher wants to describe the AI across curriculum experience, a phenomenological approach was used for the qualitative step.

Research Context and Participants

This study included 176 instructors from different colleges at PTUK a publicly funded university in Palestine, as participants. This university is one of eight institutions offering undergraduate and postgraduate programs across a wide range of disciplines, taught in English and Arabic languages. The participants had master's or doctoral degrees. They had some experience with AI tools in their personal lives and had previously integrated AI into their classes. PTUK is a technical-based university that focuses on technical programs. Faculty at PTUK use AI for research capacity and to prepare thousands of students annually to enter society equipped for success.

Study's Instrument

A questionnaire was adapted from a pre-existing scale for data collection in this study (Ng et al., 2023). The questionnaire consisted of 14 items. The responses, using a 5-point Likert scale, are provided. There are four dimensions of the scale: know and understand, use and apply, evaluate and create, and AI ethics. Information was gathered from faculty who were enrolled in different programs at PTUK. Ethical clearance was sought from the ethics committee at PTUK before data collection. Questionnaire responses were collected via Google Forms. Respondents' demographic characteristics are presented in Table 1.

Table 1

Respondents' Demographic Characteristics

Variable	Category	Frequencies	Percentage
	6–10	38	21.5%
Years of experience	More than 10	38	21.5%
	Less than 10	100	57%
	Engineering	14	7.6%
	Applied Sciences	25	14.2%
	Business and Economics	21	11.9%

	Agricultural Science and Technology	18	10.2%
	Arts and Educational Sciences	90	51.1%
College/Faculty	Physical Education and Sport Sciences	8	5%
	Male	120	68.2%
Gender	Female	56	31.8%
	Prefer not to mention	3	1%
	Professor	8	4.5%
Academic Rank	Associate professor	28	15.9%
	Assistant professor	84	47.7%
	Lecturer	56	31.8%
Digital literacy	Excellent	46	26.1%
	Very good	102	58%
	Good	28	15.9%
Overall		**176**	**100%**

Table 1 presents the sample demographic. Digital literacy is defined as the ability to locate, assess, employ, disseminate, and generate content using information technologies and the internet. It was classified into three levels: excellent, very good, and good.

Validity and Reliability of the Study Tool

The scale was validated by assessing face validity and construct validity by administering the pre-existing scale to professors from various universities with specialties in educational psychology, educational technology, and information technology. To assess the construct validity of a scale, a principal component analysis with the Varimax rotation test was conducted (Wang et al., 2022). The exploratory factor analysis test was used to assess how well the 14 measured AI literacy items of this scale represented the number of constructs, with a pilot study consisting of 60 college instructors. The Kaiser Meyer-Olkin measure of sample adequacy was 0.908, which was higher than the usually advised value of 0.6, and Bartlett's test of sphericity was significant ($\chi^2 = 1015.55$, $p = 0.000$), showing very strong validity of research data (Cheng & Shao, 2022).

Table 2

Principal Component Analysis

Items	Component			
	1	**2**	**3**	**4**
1. Part of the curriculum gives limited space for AI.	.860	.350	.275	.125
2. Part of the assessment process uses AI tools.	.782	.350	.298	.145
3. The curriculum emphasizes AI application usage (e.g., Siri, chatbot).	.762	.417	.276	.135
4. The curriculum explains the limitations and biases that can be present in AI systems.	.625	.159	.312	.248
5. The curriculum covers AI-related knowledge concepts.	.141	.802	.251	.414
6. The curriculum helps students to apply AI applications in their learning process.	.441	.765	.215	.310
7. The curriculum develops AI employability skills needed for educators.	.304	.709	.231	.365
8. The curriculum supports evaluating AI applications and concepts for different situations.	.196	.380	.814	.130
9. The curriculum is enriched AI-driven solutions (e.g., chatbots, robotics) to solve problems.	.484	.329	.691	.231
10. The curriculum emphasizes AI application integration.	.380	.174	.827	.421
11. Part of the assessment process uses AI tools.	.548	.391	.633	.122
12. The curriculum emphasizes AI ethics.	.094	.487	.256	.786
13. AI systems should benefit everyone, regardless of physical abilities and gender.	.141	.588	.567	.671

14. The curriculum explains how misuse of AI could result in substantial risk to humans.	.417	.263	.622	.762

To ascertain the reliability of the scale, Cronbach's alpha was computed for each of the four dimensions of the scale, as shown in Table 3. The calculation of reliability for AI literacy perceptions involves assessing internal consistency. Specifically, Cronbach's alpha value for the total scores of perspectives was .723. These findings indicate a high level of internal consistency for the overall scale, demonstrating strong reliability, as presented in Alnahdi (2020).

Table 3

Cronbach's Alpha Ability Values for the Questionnaire Items

Items	Number of Items	Cronbach's alpha values
Total	14	0.723

The interview participants were interviewed personally, and they were informed about the purpose and significance of the study, with an assurance that their input would be kept confidential and used solely for research purposes. The interview time ranges from 25 to 35 minutes. The interviews were conducted in a conducive environment with a respectful, grateful, and comfortable interaction between the researcher and participants. Participants were notified that their responses would be accurately recorded for thorough documentation and direct quotations.

Interview responses were transcribed objectively and without bias, with clarifications provided when participants faced difficulties understanding questions. After the interviews, participants were allowed to review and amend their responses. Table 4 presents the participant's characteristics for the semi-structured interviews.

Table 4

Semi-structured Interviews Participants' Characteristics

Instructor Department	Gender	Years of Experience	
Instructor1	Male	10	Chemistry
Instructor2	Female	7	Education
Instructor3	Female	23	Education

Instructor4	Female	11	Math
Instructor5	Male	5	Engineering
Instructor6	Female	9	English
Instructor7	Male	7	Math
Instructor8	Female	13	Education
Instructor9	Female	17	Engineering
Instructor10	Female	15	English
Instructor11	Male	6	Engineering
Instructor12	Female	3	Math
Instructor13	Female	7	Biology
Instructor14	Female	9	Physics
Instructor15	Male	8	Education
Instructor16	Male	11	Engineering
Instructor17	Female	10	Engineering

Data Analysis

To analyze the results of the first question ("What are instructors' perspectives towards AI literacy` infusion in the curriculum content?") both a questionnaire and a thematic analysis were conducted.

A qualitative approach was employed for thematic data analysis, aiming to identify themes that reveal trends and connections within the qualitative data and address the research questions, following the methodology outlined by Creswell & Clarke (2017). The analysis comprises multiple steps, starting with a thorough reading of transcribed interviews by the researcher to gain a deep understanding of the content. Thematic analysis is a method to identify and report patterns of meaning in qualitative data. This analysis method is a process for interpreting textual data and converting scattered data into rich and detailed data (Creswell and Clarke, 2017).

Trustworthiness of Qualitative Data

Four validation criteria were employed to ensure study reliability and validity. These included cross-referencing responses in semi-structured interviews with additional field experts in the coding process, achieving an 82% agreement rate, surpassing the acceptable threshold of 80%.

To ensure qualitative data credibility and dependability, four validation criteria were implemented. These included cross-referencing responses through semi-structured interviews with additional experts in the field, achieving an 82% agreement rate in coding, a percentage considered acceptable. The credibility of results was ensured through cross-checking codes and outcomes, verifying original data, and confirming the absence of discrepancies in the coding system. Triangulation, involving various research tools such as interviews and focus group discussions, was employed to enhance credibility.

Dependability was addressed through a code-recode strategy, where the same dataset was independently coded twice, with a two-week interval between coding instances. A comparison between the outcomes of these two coding rounds assessed their similarity or disparity.

For the second question, a questionnaire was used with SPSS 23. Mean and SD were calculated. One sample t-test was used to assess the perspectives toward AI literacy across the curriculum. Data was checked for normality and no significant outliers were found.

For the second question, a multiple regression analysis was conducted. Assumptions were checked, as there is a linear relationship between the dependent variable and independent variables and no significant outliers were presented**.**

Results

Perspectives Toward AI Literacy Across the Curriculum

To answer the first question, subscale means and one sample t-test are calculated as shown in Tables 4 and 5. Mean scores of perspectives were computed for each dimension. These resultant mean scores were compared to a scale formulated by Daher (2019). Per this scale, scores falling within the range of 0.8 to 1.8 were classified as "very weak," scores ranging from 1.8 to 2.6 were categorized as "weak attitudes," scores falling between 2.6 to 3.4 were considered "moderate attitudes," and scores between 3.4 to 4.2 were considered "strong attitudes" on this continuum. Finally, scores ranging from 4.2 to 5 were denoted as "very strong attitudes." A statistical evaluation, specifically a one-sample t-test, was conducted to compare the mean scores to the predetermined Daher's referenced scale as shown in Figure 1.

Figure 1
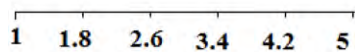
Interpretation Scale of Mean Scores (Daher, 2019, p. 5)

Table 5

Perspectives of College Instructors on AI Literacy in Curriculum Means and SD

Dimensions	Items	Mean	SD	Degree

Know and understand	Part of the curriculum gives limited space for AI.	3.750	.7892	Strong
	Part of the assessment process uses AI tools.	3.728	.7961	Strong
	The curriculum emphasizes AI application usage (e.g., Siri, chatbot).	3.727	.9162	Strong
	The curriculum explains the limitations and biases that can be present in AI systems.	3.943	.6821	Strong
Use and apply	The curriculum covers AI-related knowledge concepts.	4.18	.702	Very strong
	The curriculum helps students to apply AI applications in their learning process.	4.330	.7815	Very strong
	The curriculum develops AI employability skills needed for educators.	4.261	.7170	Very strong
Evaluate and create	The curriculum supports evaluating AI applications and concepts for different situations.	1.739	.8392	Very weak
	The curriculum is enriched AI-driven solutions (e.g., chatbots, robotics) to solve problems.	4.125	.6757	Medium
	The curriculum emphasizes AI application integration.	1.523	.7558	Medium
	Part of the assessment process uses AI tools.	4.489	1.3841	Medium
AI Ethics	The curriculum emphasizes AI ethics.	1.511	.7892	Very weak
	AI systems should benefit everyone, regardless of physical abilities and gender.	1.773	.7961	Very weak
	The curriculum explains how misuse of AI could result in substantial risk to humans.	1.807	.9162	Very weak
Total		**3.190**	**.197**	**Weak**

Table 5 indicates that the responses of the study sample towards AI literacy in the curriculum are weak, and dimensions, like know and understand, are strong. Use and apply

was also very strong. AI ethics dimension was weak. One sample was conducted to find if there is a significant difference between this mean and the population mean.

Table 6

One Sample t-test of the Total Score of Perspectives

	Test Value = 2.60					
Category	T	Df	Sig.	MD	95% CID	
					Lower	Upper
Total	12.781	175	.000	.34729	.2937	.4009

Table 6 shows that total perspectives mean = 3.190. To find the statistically significant difference between the sample-estimated population mean and the comparison population mean (2.60), one sample t-test was conducted, and the results indicate that there are statistically significant differences at the level of significance (0.05) between the average score of 3.19 and a test value of 2.6, a weak value.

To assess the influence of gender, technical skills, and academic qualifications on the perspectives toward ai literacy, multiple linear regression was calculated as shown in Table 7.

Table 7

Linear Regression

Variable	**B**	**Beta**	**T**	**Sig.**	**R**	**R²**	**F**
(Constant)	1.758		8.468	.000	.653	.427	42.703
Gender	.364	.472	7.358	.000			
Academic qualification	.092	.265	4.177	.000			
Technical skills	.246	.438	7.277	.000			

Linear regression analysis was used to test if gender, academic qualification, and technical skills influenced AI literacy perceptions. The results of the regression indicated the three predictors explained 42.7% of the variation in college instructors' AI literacy perceptions [$F(3,172) = 42.703$, $p = .000$]. These results were significant at the $p < .001$ level.

The results state that gender differences (more specifically, female college instructors) tend to have higher perceptions of AI literacy in curriculum development. The regression coefficient is positive (.364) and the relationship is statistically significant ($p > .001$). The regression coefficient is also positive for college qualification (.092), indicating that the

higher academic degree influences the perceptions of AI literacy in curriculum development; the relationship is statistically significant (p > .001). The regression coefficient is positive (.264), indicating strong technical skills influence college instructor perceptions towards AI literacy in curriculum content. The relationship is statistically significant (p > .001).

Semi-structured interviews were conducted after the questionnaire to gather data on the perspectives regarding the infusion of AI literacy in the curriculum. College instructors were asked to appraise the positive and adverse perspectives of the curriculum that relate to AI literacy.

By conducting content analysis, the collected qualitative data underwent assessment using the seven stages outlined in Kuckartz (2012) The initial phase of the process involves analyzing, organizing, and summarizing the text. Subsequently, the principal categories are identified and the initial coding phase begins for these categories. If necessary, subcategories can be established, leading to the implementation of the second coding phase. After this, diverse analyses can be carried out, culminating in the final step that involves documenting the procedure and outcomes. Importantly, the spiral process can be restarted as needed.

The initial step in the evaluation process was transcribing the text. Modifications were made to existing dialects for enhanced compatibility. The second stage encompassed rephrasing the text and pinpointing crucial details. The statements were then organized based on various categories, even though a single statement might relate to multiple subjects. Three primary themes were categorized, as Table 8 illustrates, based on the results from the transcription.

Table 8

Themes and Codes

Theme	Code	f (%)
Accomplishing *educational goals*	AI literacy skills are crucial to achieving educational goals.	8 (47)
	AI literacy is needed to search for and evaluate information.	4 (23)
	AI literacy enhances the curriculum.	5 (30)
Lack of AI ethical guidelines and concepts	Concerns about AI literacy ethics guidelines in the curriculum.	10 (58.8)
	AI literacy concepts are not covered in the curriculum.	7 (41.2)

Based on the thematic analysis of the data, two themes were found: accomplishing educational goals and lack of AI ethical guidelines and concepts.

<u>(1) Accomplishing educational goals</u>

Most participants showed positive perspectives toward implementing AI literacy across the curriculum. Three subthemes emerged.

AI literacy skills are crucial to achieving educational goals. Most of the participants mentioned that AI literacy in curriculum design is necessary for students to know. A participant commented "AI literacy across courses is necessary for Z-generation students since it facilitates their learning process."

AI literacy is needed to search for and evaluate information. Many college instructors explained the importance of AI literacy infusion in the designed curriculum. Instructor 7 said "It was very easy for me to enhance my research productivity with AI literacy. Infusion of AI literacy across the curriculum is vital for students to communicate and search for information, they are useful to be integrated in the course."

A participant supported the previous instructor: "I used to let my students use their mobile phones to search and evaluate information, I provide my students with links to AI applications to access text tutorials."

AI literacy enhances the curriculum. Many participants encouraged integrating AI literacy across their curriculum. Instructor 13 added, "Yes, AI literacy across the curriculum is crucial as it offers all undergraduate students the chance to explore and understand AI, not only within their specific field of study but also in a cross-disciplinary context that mirrors real-world work environments."

<u>(2) Lack of AI ethical guidelines and concepts</u>

Most college instructors showed negative perspectives toward AI literacy ethics guidelines in the curriculum. A college instructor said "The curriculum that I teach is traditional and needed a reform in terms of AI literacy." Another instructor added "It is imperative to augment curriculum with AI literacy at the college level, students are still dependent on the lecturer."

Overall, most of the college instructors are unsatisfied with the curriculum they teach in terms of AI literacy. On the other hand, they are generally welcoming to AI literacy integration. Despite these negative responses, college instructors highlighted some positive perspectives on AI literacy integration into their curriculum.

Discussion

To answer the first question of the study, "What are college instructors' perspectives towards AI literacy infusion into curriculum content?" one sample t-test was performed and revealed weak statistical significance of college instructors' perspectives of AI literacy across the curriculum. In the know and use and use and apply dimensions are at a very strong degree. This finding is in line with (Seo et al., 2023) who reported that AI tools minimize the skills of students to learn independently, solve problems creatively, and think critically. Qualitative results complement these findings that show AI literacy is needed in the curriculum to search and evaluate information and to help students achieve educational goals. This finding is in line with Southworth et al. (2024), who investigated possible paths to address potential gaps in AI literacy across the curriculum and revealed that infusing AI

across the curriculum is necessary for all students, which will create an AI-ready workforce for the twenty-first century. This study contrasts with a previous study (Kerneza, 2023), which stated that college students understand the content produced by chatbots at a more advanced level. Moreover, a study by Ng et al. (2023) has shown that adopting basic AI literacy across the curriculum, like knowing and using AI, will allow the students to cultivate advanced cognitive abilities, transforming them into discerning analysts, cooperative innovators, and adept problem-solvers capable of leveraging AI applications to address real-world challenges. Additionally, Bozkurt & Sharma (2023) have also mentioned some challenges while using generative AI such as algorithmic bias, lack of creativity and critical thinking,

It seems that AI literacy in curriculum development is at its starting point at PTUK. The curriculum at this point highlights how students comprehend, use, and apply AI concepts.

The AI ethics dimension was found to a weak degree. Qualitative results support this finding. Most college instructors report a lack of AI ethics inclusion in the designed curriculum. AI ethics integration in the curriculum is necessary. Broadening participation in AI literacy for all is necessary to ensure that the design and use of AI technologies are inclusive to address the under-representation of equity and quality. Many previous studies are in line with this finding. Bozkurt & Sharma (2023) also reported other concerns relating to using generative AI like inequality and inequity in access and concerns regarding privacy and ethics. Another study (Borenstein & Howard, 2020) stated that AI ethics education has not yet been fully integrated into the computing curriculum. This underscores the importance of education in cultivating a professional outlook among future generations of AI developers. If ethics is already part of the engineering or computing curriculum, there is a need to assess and possibly revise the approach, as it may not be sufficiently effective or widespread to influence a shift in mindset.

For the second research question, it appears that gender accounts for the perspectives of college instructors on AI literacy across the curriculum. Gender stereotypes may account for the fact that female participants feel happy by the necessity of implementing AI literacy across the curriculum.

Academic ranks also influence the perspectives of college instructors on integrating AI literacy across the curriculum. This could be due to the relationship between academic usage of AI literacy among different ranks to improve their academic productivity and enhance students' performance levels. Moreover, as academic rank increases, keeping pace with technological advancement is necessary. As one ascends in academic rank, there is a growing necessity to incorporate technology into both teaching methodologies and research endeavors. This is in line with Darawsheh et al. (2023) who stated that full professors are required to focus on teaching students to develop research and projects.

Digital literacy also influences the perspectives of AI literacy across the curriculum. It seems that digital skills necessitate the acquisition of new skills, which have the potential to facilitate the delivery of more efficient solutions like AI literacy. This study is in line with Lim (2023), which showed that there is a relationship with a positive correlation between digital literacy and the perspectives of AI education for students.

According to the received feedback, the curricula at the university level must be reformed such that more AI literacy must be employed. College instructors and students must

be trained on the latest technologies, teaching methods, and AI concepts that can innovatively support their learning.

The scope of AI in teaching and learning is enormous. The obvious benefits include access and research from the internet and the use of interactive tools that can assist students in better understanding the subject matter, removing the need to spend long hours reading traditionally.

Conclusions

Due to the growing interest in AI in the academic field, it is essential to bridge the gap between the market needs and the skills and competencies delivered by the university programs. For example, students should be upskilled with varying degrees of AI literacy due to the increasing presence of AI usage around them. AI literacy across the curriculum infusion is vital to equip students with essential real-world skills and expertise in AI technology. Understanding AI is crucial for students in the twenty-first century, as emphasized by various researchers (Cantú-Ortiz et al., 2020; Ng et al., 2021; St Louis et al., 2021), but it is equally vital for all subjects, not solely confined to technology and computer disciplines.

AI can cultivate society to be full of "competent digital citizens" and "collaborators on a global scale." The outcomes of this initiative will yield a pioneering educational approach that can serve as a blueprint for others, with a framework that can be tailored to various campus-wide endeavors beyond just AI.

Recommendations and Limitations

Based on the results of this study, the implementation of AI literacy should emphasize the following aspects of curriculum development. More attempts are needed to incorporate ethics into the curriculum that involves a focus on increasing students' familiarity with professional codes of ethics. Integrating core principles from the field of data science alongside ethical considerations regarding data acquisition, using actual datasets that necessitate students to confront matters of privacy, equity, and legality as they construct AI solutions. Additionally, providing ethical instruction through various formats and on multiple occasions is necessary.

This study has certain limitations. Initially, the sample was limited to individuals from a single university. Despite encompassing participants teaching various majors and academic levels, this sample does not accurately represent the broader population of Palestine, let alone participants from other nations or regions. Subsequent research endeavors could involve participants from multiple universities in Palestine and from diverse countries and regions, aiming to explore the impacts of integrating AI literacy across courses on more diverse and representative samples.

Declarations

Acknowledgment

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