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Empowering Critical AI Literacy through Sociology of Knowledge: Pedagogical Strategies for Undergraduates

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Abstract

This article proposes pedagogical applications to enhance AI literacy for undergraduates through the lens of the sociology of knowledge. These applications are designed to help students navigate the risks and benefits of AI-based tools while ensuring both effective learning and academic integrity. The intended AI literacy competencies include critical thinking, ethical awareness, and digital literacy. To develop these competencies, the article proposes forming diverse and interdisciplinary student groups, training students to use valid and reliable data to evaluate AI-generated results and encouraging creative engagement with learning materials through group activities, debates, arts, and role-playing.

Keywords: Critical AI literacy, pedagogical applications, sociology of knowledge

Introduction

Before the rapid proliferation of artificial intelligence (AI)-based tools, particularly with the commercialization of ChatGPT by OpenAI in November 2022, debates about the promising capabilities and threatening perils of AI had already surfaced. These discussions encompass both critical reflections on AI risks and optimistic perspectives on its advantages. Bostrom (2014) articulated grave concerns regarding AI's potential to surpass human intelligence, leading to AI “superintelligence” and potential loss of “human control” over AI systems. Conversely, Russell and Norvig (2016) delineated numerous applications of AI in their comprehensive book, highlighting the potential benefits derived from its use. Additionally, scholars have delved into the intricate aspects of imbuing machines with "mental qualities" through machine learning techniques, as articulated by the “father of artificial intelligence”, McCarthy (1979).

Critical AI literacy is essential to address both security risks and intellectual challenges. On the security front, there is a critical need to assess AI advancement and its implications on job security due to automation (Hutter and Hutter, 2021), there are serious concerns over the potential unreliability of AI-based security tools which could lead to AI-driven warfare (Cummings,2017;Putz,2023), and there is a global need to evaluate cybersecurity vulnerabilities caused by the spread of AI-based online tools (Wiafe et al., 2020). On an intellectual level, the threats posed by AI include the dissemination of AI-generated misinformation (Partadiredja et al., 2020), issues of algorithmic bias (Kordzadeh & Ghasemaghaei, 2022), moral biases (Keles, 2023), and the opacity surrounding AI development and deployment (Seizov & Wulf, 2020).

This paper aims to enhance AI literacy in undergraduate education by introducing college students to the nature and definition of knowledge i.e. information, drawing on sociology of knowledge to be able to

evaluate the reliability of AI-generated information. This is done by incorporating low-challenge activities and role-playing for fun purposes, which can help students build a community of solidarity and support. Knowledge without a strong sense of community can be fruitless. Community activities are also essential for enhancing group dynamics and establishing group norms to maximize engagement with the learning activities.

The focus on college-level education is justified by the need to prepare students for the growing academic and professional challenges intensified by AI. These include the spread of inaccurate AI-generated information, unethical use of AI in completing academic assignments, and the need for students to understand how AI will affect their future job prospects. To address these AI related challenges, the paper proposes pedagogical applications to equip college-level students with AI literacy skills, so they can become informed and responsible participants in an AI-driven world. AI literacy, therefore, refers to equipping students with the conceptual understanding, practical skills, and ethical compass to navigate the misuse of generative AI, its biases, and to responsibly use AI as a technological tool in accordance with social and moral expectations.
Before delving into these pedagogical applications to empower AI literacy among undergraduate students, it is important to acknowledge the breadth of these activities and their respective fields of study. Therefore, the focus of AI literacy in this paper is to empower undergraduate students with AI literacy tools to safeguard themselves against misinformation and bias and develop moral code to navigate AI technologies. To achieve this, I propose applied learning activities that highlight strategies to ensure student engagement by forming diverse and interdisciplinary teams. Additionally, I suggest debriefing sessions to extract key lessons from the learning activities, which will empower students' critical AI literacy.

AI-Driven Tools in Higher Education: Risks, Benefits, and the Imperative for AI Literacy

The Internet provides vast access to information, yet it also leads to information loss, distortion, and misappropriation. This phenomenon is compounded by the powerful capabilities of generative AI tools, making it increasingly difficult to discern reliable information. Furthermore, the proliferation of educational ChatBots like ChatGPT and Gemini (formerly Bard) has not been accompanied by adequate preparation for learners, particularly undergraduate students, to critically engage with these technologies.

Numerous studies across different regions have highlighted both the risks and potential benefits of AI-driven educational tools in higher education, which impact students' learning experiences (Strzelecki, 2023; Kumar & Raman, 2022). It is worth emphasizing that the exploration into the risks and potential benefits of using AI tools among students in higher education gained momentum after the widespread adoption of generative AI tools. According to Crompton and Burke (2023), “the number of publications in 2021 and 2022 increased almost two to three times compared to previous years.". Emerging research on AI impact on higher education reflects a responsive approach rather than a preemptive approach to assessing AI tools. This responsive approach is justified by the urgency prompted by the commercialization of AI tools, led by platforms like ChatGPT. This therefore urges educators to critically evaluate these technologies to ensure meaningful learning and valid assessment practices.

With the advent and rapid rise of generative AI usage among undergraduate students, there have been increasing calls to address how generative AI threatens traditional teaching and assessment methods in higher education. These calls emphasize that the focus of digital literacy must shift towards equipping students with the necessary critical thinking skills, ethical conduct, and active intellectual engagement to navigate generative AI. (Walczak & Cellary, 2023).

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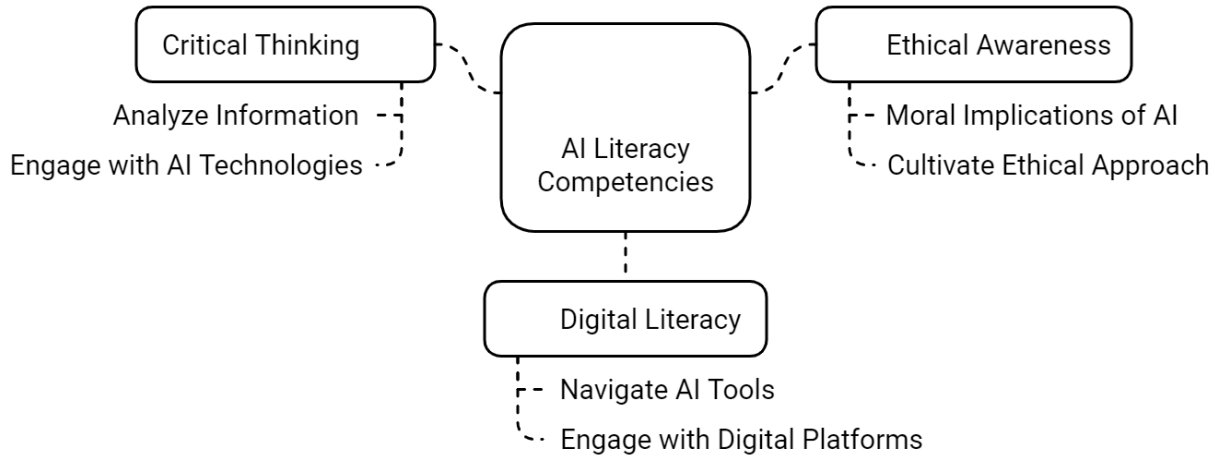
Within college education, any proposed literacy skills and ethical considerations in the age of AI must be grounded in an examination of how undergraduate students engage with AI technologies, as well as the risks and benefits posed by these technologies. For instance, research by Li (2023) demonstrates that students' attitudes and actual use of AI-based systems in Chinese higher education are significantly influenced by factors such as perceived usefulness and ease of use. However, challenges persist, as evidenced by Ghotbi and Ho's (2021) identification of "limited moral awareness" among students in the Japanese higher educational milieu, amidst widespread AI-based educational tool adoption. Similarly, studies conducted in the US context reveal how students use AI tools to enhance review strategies post-learning, particularly in disciplines like public health (Lee & Chen, 2022). Additionally, research from Croatia illustrates students' utilization of ChatGPT for tasks such as idea generation and proofreading in written assignments (Črček & Patekar, 2023)

Several educational strategies aim to enhance AI literacy by improving skills in computational thinking, digital literacy, and programming. These skills involve understanding and applying the fabrics of algorithmic and data thinking in the development and critique of AI tools (Liu & Xie, 2021). Additionally, efforts include developing AI-empowered educational tools to bridge the global digital divide, ensuring equitable access and benefits from AI technologies (Eguchi, 2021). From a teaching standpoint, Kong et al (2021) propose an AI literacy course to educate about technical knowledge in AI development, covering topics such as programming and machine learning (Kong et al., 2021).

While variations on AI use exist across research contexts, the common thread of AI usage underscores a global urgency to cultivate AI literacy within higher education worldwide. This imperative transcends boundaries, emphasizing the need for concerted efforts to foster the following AI literacy competencies: critical thinking, ethical awareness, and digital literacy.

Figure 1 AI Literacy Competencies



As is known, AI literacy is a broad field that requires input from multiple disciplines, given that the risks of AI technology encompass various complex social, political, and technological areas. For this reason, from a teaching standpoint, AI literacy can be approached from different perspectives depending on the academic discipline, learning outcomes, and the specific risks and benefits associated with that discipline. Within the social sciences, Figure One reflects key literacy competencies informed by insights from the sociology of knowledge. These skills are threefold. First, critical thinking, which involves examining AI-generated information, such as biases and the role of AI technology in either benefiting society or creating

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problems like the digital divide or disparities between the "haves" and "have-nots." Second, ethical awareness, which refers to the principle that just because we can do something with AI doesn't mean we should—especially if it affects privacy, confidentiality, or violates academic integrity. Third, digital literacy, which encompasses the skills needed to question the authenticity of digital outputs, such as fake videos, AI-generated voices, and AI-created images. The development of the proposed AI literacy competencies, in figure one, will be connected to the applications of sociology of knowledge.

Leveraging the Sociology of Knowledge for AI Literacy

The sociology of knowledge has significantly enhanced our comprehension of the interplay between scientific pursuits and socio-political institutions. Pioneers in this field have approached this interaction from diverse perspectives. For instance, Karl Mannheim delves into the social construction of knowledge, illustrating the robust connection between knowledge formation and prevailing political systems (Mannheim, 1936/2013). As articulated by Mannheim (1936/2013) more than 80 years ago, "the sociology of knowledge has set itself the task of solving the problem of the social conditioning of knowledge by boldly recognizing these relations and drawing them into the horizon of science itself."

Building upon Mannheim's groundwork, Berger and Luckmann (1966) proposed a structured framework elucidating how knowledge is shaped within sociopolitical frameworks and through processes of legitimation, transforming a notion into an accepted fact. Similarly, Michel Foucault's insights on power dynamics in relation to knowledge underscore how power structures influence what is included or excluded from the realm of knowledge (Foucault, 1969).

The sociology of knowledge offers valuable conceptual and methodological perspectives on how AI shapes our social understanding of reality. Below, we will apply some of these perspectives by using pedagogical activities. It's important to highlight that our approach to AI literacy, drawing from the sociology of knowledge, prioritizes practical application (experiential learning) over theoretical exploration (focusing solely on theoretical and conceptual origins of sociology of knowledge). This emphasis is justified by the diverse disciplinary backgrounds of undergraduate students, requiring a program that meets their specific learning needs. However, for students specializing in fields related to the sociology of knowledge, a deeper dive into the historical and theoretical underpinnings of this discipline can be extremely enriching.

Below are three pedagogical applications to delineate how students can learn and apply experientially the sociology of knowledge to engage critically with AI-based tools. The applications below will cover the abovementioned tenets of sociology of knowledge by applying them on AI as put in figure 1 below: a) AI and social construction of reality, b) AI discourse and power dynamics, and c) Contextualizing AI within social structures.

Figure 2 Tenets of Sociology of Knowledge and AI

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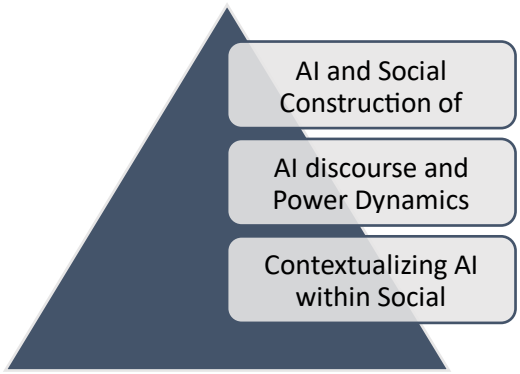

First Application on AI and Social Construction of Reality

In this application, using role-playing scenarios, students will engage in testing the predominant types of knowledge embodied by AI tools, such as ChatGPT. For instance, in diverse student groups, participants will investigate ChatGPT's efficacy in generating knowledge across various native languages using prompts in different languages. This exercise aims to illuminate language biases inherent in AI educational tools, highlighting the influence of underlying data sets. Moreover, this activity unveils cultural biases inherent in AI tools, particularly considering their origins primarily within Western knowledge hubs. Expanding on this theme, students can explore different manifestations of AI biases. These include:

- AI and social media: Analyzing how AI algorithms influence users' ideological inclinations in social media platforms.
- AI and automation: Assessing potential hazards, such as those encountered when AI systems are responsible for driving vehicles.
- AI and healthcare diagnosis: Examining the limitations of AI systems in accounting for health conditions prevalent among marginalized groups.
- AI and news creation: Investigating the role of AI in news generation and the potential consequences, including the proliferation of fake news.
- AI and Global Political Conflicts: Students will have the opportunity to use AI tools to generate information about global conflicts. This activity aims to uncover any biases that AI may have regarding specific global or regional conflicts.

A debriefing suggestion is to discuss, following students' engagement with an AI tool for information generation, how the activities concerning AI biases shed light on the impact of limited diversity among stakeholders in AI development. Additionally, these discussions can explore how biases in the datasets used contribute to a skewed construction of knowledge that fails to capture the intricate nature of global knowledge systems, including indigenous types of knowledge.

The exclusion of indigenous knowledge leads to a biased and flawed social construction of knowledge, where certain forms of knowledge are valued while others are marginalized. For example, Western frameworks dominate discussions on what constitutes a "good life" or a "good society," which excludes indigenous perspectives that emphasize communal well-being, harmony with nature, and spiritual balance. For example, In the field of environmental conservation, indigenous knowledge about sustainable land management practices, such as the use of controlled burns by Native American tribes to maintain forest health, is frequently overlooked in favor of industrial approaches. This marginalization

results in incomplete understandings and ineffective policies that fail to address the diverse realities of different communities.

Generative AI further exacerbates this biased and flawed construction of knowledge by replicating and amplifying the dominant knowledge systems embedded in the data it is trained on. To connect the use of generative AI and social construction of knowledge, the table below highlights how the literacy competencies mentioned in figure 1 can be improved in light of social construction of knowledge:

Figure 3 AI Literacy and Social Construction of Knowledge

Skill	Description	Development in Light of AI and Social Construction of Knowledge
Critical Thinking	The ability to analyze and evaluate information objectively.	- **Refining AI-generated content through prompt engineering**: teach learners to practice developing unbiased prompts to generate more accurate and reliable AI content. This is a good skill to develop asking good research questions - **Evaluating AI outputs**: encourage students to critically assess the content produced by generative AI, questioning the assumptions, biases, and gaps in the knowledge generated, especially regarding diverse cultural perspectives.
Ethical Awareness	Understanding and addressing moral issues surrounding AI.	- **Ethical prompt design**: emphasize the ethical implications of prompt engineering, such as avoiding biased language that might reinforce stereotypes or marginalize groups. - **Addressing AI bias**: use generative AI as a case study for understanding how biased inputs lead to biased outputs, discussing issues like data privacy, intellectual property, and the reproduction of harmful content. For example, the use of generative AI, like the navigation of the internet can exacerbate self-fulfilling prophesy: getting research results which confirms our ideological inclinations and biases.
Digital Literacy	The ability to critically evaluate and use digital tools and platforms.	- **Training on detecting fake media:** such as recognizing deepfakes through inconsistencies in lighting or facial movements and using verification tools to cross-check information from multiple sources. A verification tool can be looking for the sources of the produced media. - **Identifying biases in AI outputs**: teach learners to recognize when generative AI content reflects biased data, showing how to cross-verify information and refine prompts to avoid misinformation and manipulation. For instance, references mentioned by generative AI can be verified using university database and accessing scientific journals.

Second Application on AI Discourse and Power Dynamics

In this application, students will be organized into groups representing diverse stakeholder perspectives on AI use in higher education:

a) Those who are opposed to AI technologies.
b) Proponents of disseminating AI technologies in higher education.
c) Advocates for limited applications of AI in higher education.
d) Proponents of a precautionary approach until AI technology capabilities are fully understood.

The primary objective of this activity is to analyze the varied concepts and terminology used by different stakeholders, reflecting a broad spectrum of social sectors—including business, government, academia, human rights advocacy, and more—to support and frame their positions on AI use. In other words, using the field of higher education as a context, the objective is to examine different and opposing discourses on the use of AI in higher education. For example, students can be divided into multiple groups representing the sectors above to advocate for their positions on AI applications in higher education by simulating adoption of the following positions:

- Reliance on AI can lead to plagiarism and the absence of originality in submitted assignments.
- AI as a learning tool can enhance efficiency and personalized learning.
- AI can be used to encourage creativity through simulations and conversational practices.
- AI use in higher education should be halted until the technology behind it is fully understood, and students are prepared to use it responsibly.

The focus should be on examining the aforementioned stances, using role-playing to understand how proponents and opponents of AI package and present their stances and ideological perspectives regarding AI and its applications. This role-playing exercise encourages the development of discourse analysis skills (how language is being used), which are integral to critical thinking. Below are examples of some of the used concepts to advocate for the positions above:

Figure 4 Role-Playing Stances on AI

Positions on AI applications in higher education	**Examples of Language used (discursive practices): concepts, terms, and theories**
Reliance on AI can lead to plagiarism and the absence of originality in submitted assignments.	• Plagiarism Detection Software • Originality in Academic Writing • Ethical Use of AI in Education • Academic Integrity • Copyright Law
AI as a learning tool can enhance efficiency and personalized learning	• Adaptive Learning Systems • Machine Learning Algorithms • Personalized Learning • Efficiency in Education • Learning Analytics
AI can be used to encourage creativity through simulations and conversational practices	• Creativity Support Tools • Simulation-Based Learning • Natural Language Processing (NLP) • Creative AI • Design Thinking

AI use in higher education should be halted until the technology behind it is fully understood, and students are prepared to use it responsibility	• Precautionary Principle • Technology Assessment • Responsible AI Development • AI Governance • Ethical AI

Additionally, language analysis should be accompanied by examination of stakeholders' socio-economic status, academic and professional disciplinary backgrounds, and interests. This involves assessing their significant economic, political, and value-based motivations regarding the use of AI in Higher education. For instance, major AI companies may advocate for AI use in higher education to align with their profit objectives, educators may prioritize maintaining academic integrity, and university leadership might adopt the technology to remain competitive and abreast of technological advancements.

Debriefing suggestion: Students should be encouraged to analyze the language used by various stakeholders to support their positions on AI use in higher education. The discussion should delve into dissecting the underlying concepts and theories advanced by a certain stakeholder, while also considering their historical and cultural contexts. This is important to equip students with analytical skills to engage critically with the language used by different stakeholders, unpacking its political and value-based determinants.

For instance, when the concept of "efficiency" is used to advocate for AI use in higher education, students can critically examine this concept by highlighting its historical uses. They can also evaluate its applicability in the realm of education by asking critical questions, such as: do we need efficient learning, or do we require something deeper, such as meaningful learning? Such critical questions foster a deeper understanding of the nuances within discourse, encourage critical thinking, and promote a more nuanced analysis of stakeholders' arguments, framings of the issue at hand. Discourse analysis (how language is being used) can promote the proposed AI literacy competencies presented in figure 1, for which more examples are provided below:

Figure 5 AI Literacy Competencies and AI Discourse

AI Literacy Competencies	AI Discourse and Power Dynamics	Examples
Critical Thinking	Developing the ability to identify biases, evaluate stakeholder agendas, and assess how language affects AI outputs. Using different natural languages can lead to varying outputs. For example, generative AI models trained on limited Arabic data may exhibit deficiencies in basic development tasks.	If a generative AI model is primarily trained on English-language data, it may produce answers that reflect Western cultural norms and perspectives. For instance, when asked to generate examples of leadership qualities, the model might prioritize traits like assertiveness and competitiveness, which may not align with cultures that value collectivism or humility.
Ethical Awareness	Evaluating stakeholder's moral justification of using AI or opposing it.	This includes analyzing arguments for AI's potential to enhance efficiency and productivity versus concerns about privacy, bias, and job displacement. For example, proponents may argue that AI can streamline processes and improve decision-making, while opponents may highlight

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		ethical issues related to data privacy and the risk of reinforcing systemic biases.
Digital Literacy	Learning how language choices in prompts engineering influence AI behavior and can lead to unethical and inaccurate outputs.	Biased prompts, such as the following, can lead to biased outputs: *Create an immigration policy that focuses on strict border control to prevent illegal immigration*. A more inclusive prompt would be: *Create an immigration policy that balances border security with humane treatment of migrants and pathways to citizenship*.

Third Application on Contextualizing AI Within Social Structures

This application aims to explore AI's profound impact on various aspects of our existence: life, values, economy, the future of humanity, and security. Engaging activities can be developed to analyze AI's effects on our social institutions, including religion, culture, economy, values, media, and more. These activities are designed to reflect the ongoing debate between proponents of technological determinism and social determinism. Both perspectives encompass a spectrum of beliefs, ranging from Luddites cautioning against the perils of technology to technophiles advocating for its essential role in human development and welfare. For instance, one area of examination could be the impact of AI on the economy, particularly in terms of employment, which is a key concern for college students. The economy, as a social structure, is intricately linked to technological advancements and their implications for labor markets and skills development.

According to the International Monetary Fund (Giorgieva, 2024), “AI will affect almost 40 percent of jobs around the world, replacing some and complementing others.” The Pew Research Institute found that “Women, Asian, college-educated, and higher-paid workers have more exposure to AI” (Kochhar, 2023). College education, therefore, is central to discussions about AI's role in reshaping the skills necessary for entry into the labor market.

Critical literacy on AI plays a crucial role here as it enables college students to develop personal perspectives on AI's impact on their educational and career aspirations. It also empowers them to form politically informed opinions about AI policies in the job market. To do so, I propose an activity where students navigate the impact of AI on the job market pursuing four key avenues of research and thinking:

Figure 6 Learning Activity on the Impact of AI on the Job Market

Groups will be formed around the four aforementioned research and thinking avenues on AI and the job market. Each group will be composed of students from diverse disciplinary backgrounds to cultivate interdisciplinary thinking and explore the challenges associated with it in academia and the professional world. This can be a valuable exercise for students to gain appreciation for different disciplines and understand the critical importance of interdisciplinary collaboration in addressing complex problems. *Debriefing suggestion:* students should be allowed sufficient time to share their findings and the sources of their data. This fosters the development of key research skills and communication skills necessary to effectively convey research results. If needed, basic research training can be provided, prior to group activities, on obtaining reliable data by emphasizing the importance of primary data sources, peer-reviewed articles, and scholarly databases. In addition to utilizing reliable data sources, students should be supported and encouraged to demonstrate critical thinking, ethical awareness, and digital literacy when

examining the impact of AI on their employment prospects. The table below provides examples of how AI literacy can be cultivated in the context of understanding the effects of AI on employment:

Figure 7 AI Literacy Skills and Social Structures (example of employment)

AI Literacy Skills	**AI within Social Structures: employment as an example**	**Examples**
Critical Thinking	Analyzing and evaluating how AI affects job opportunities and workplace dynamics.	- Assessing the role of AI in the hiring process, such as understanding how applicant tracking systems filter resumes based on keywords.- Evaluating the potential for AI to create new job categories while also automating existing roles, leading to job displacement in certain sectors.
Ethical Awareness	Recognizing ethical implications of AI in employment practices.	- Understanding the risks of algorithmic bias in hiring algorithms, which may disadvantage certain demographic groups.- Considering the ethical responsibility of companies to ensure transparency in how AI is used for hiring and employee evaluation.
Digital Literacy	Effectively using AI tools and technologies to enhance employability.	- Learning to leverage AI-powered job search platforms that match skills to job openings, while being aware of data privacy issues.- Utilizing AI tools for professional development, such as personalized learning platforms that recommend courses based on career aspirations.

Concluding remarks and thoughts:

The sociology of knowledge and its proposed pedagogical applications can serve as engaging and meaningful learning tools to empower AI literacy among undergraduate students. The expected outcomes are threefold. First, cultivating critical thinking among college students to examine the role of AI in shaping their personal and professional lives by enabling them to detect biases in AI-generated outputs

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and to question the sources of evidence and data used by generative AI tools. Second, empowering students to develop their ethical awareness by considering whether developers of generative AI systems pay attention to the ethics of technology development, such as addressing digital divides, biases, privacy, access, and affordability. Third, enhancing digital literacy by equipping students with prompt engineering skills to develop ethical prompts that allow them to responsibly benefit from generative AI technologies, as well as skills to discern and detect fake AI-generated media, such as deepfakes

The efficacy and success of the proposed AI literacy applications depend on four key criteria. First, forming groups with interdisciplinary and cultural diversity is crucial, as it allows students to educate each other on challenges based on their cultural backgrounds, fostering peer education. Second, providing engaging training to prepare students for research development enables them to use reliable and valid data sources effectively. Third, encouraging creative forms of engagement, such as skits and debates among students, facilitates the sharing of findings and reflections in a fun and engaging manner. These criteria are essential for ensuring meaningful learning and engagement while supporting students in taking ownership of the task of AI literacy as a community-based effort.

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