Proceedings of the Informing Science + Information Technology Education Conference

An Official Publication of the Informing Science Institute
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July 20 – 28, 2025

MAKING A PRELIMINARY CASE FOR A UNIVERSAL COURSE ON AI LITERACY: AN OVERVIEW

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ABSTRACT

Aim/Purpose	Artificial Intelligence (AI) has pervaded all walks of life and is touted as a panacea for many of life's ills. Yet, few consumers of AI know what it entails or what its impact on society may be. The potential to use AI for good is vast, but the potential to misuse is not trivial.
Background	To mitigate the misuse of AI, it is imperative that consumers of AI fully grasp what it is, what it can do, and how to use it effectively and ethically. This study proposes the creation of a universal AI Literacy course to be deployed across universities.
Methodology	A literature review was conducted to determine what we know about AI literacy and then, based on three models including Bloom's Taxonomy, a framework was proposed for an universal AI Literacy course.
Contribution	The proposed universal AI Literacy course framework was used to develop content for a 16-week course on AI literacy
Findings	There is a need for a universal AI Literacy course that encapsulates information specific to AI such as prompting and ethicality. It should also ensure that the content included is robust enough to transcend disciplines and lends itself to pedagogical value.
Recommendations for Practitioners	Educators should develop AI Literacy courses that embody aspects of the framework provided herein so that they may test its efficacy while also evolving the course content to meet prevailing needs. Other users can also use the findings of this paper to become better consumers of AI.
Recommendations for Researchers	Researchers should continue to develop/update frameworks upon which an AI Literacy course is based

Accepted by Editor Michael Jones | Received: January 19, 2025 | Revised: May 6, 2025 | Accepted: June 10, 2025.
Cite as: Barreto, C. (2025). Making a preliminary case for a universal course on AI literacy: An overview. In M. Jones (Ed.), *Proceedings of InSITE 2025: Informing Science and Information Technology Education Conference*, Article 18. Informing Science Institute. https://doi.org/10.28945/5558

Impact on Society	Through the development of a universal AI Literacy course, consumers of AI applications will be better versed in evaluating its efficacy, utility and trustworthiness
Future Research	Future research will seek to validate the proposed AI Literacy course content by getting faculty from different disciplines to assess its utility and robustness. Other research will deploy an AI Literacy course to determine its pedagogical value as well as the efficacy of the course content.
Keywords	AI literacy, Bloom's taxonomy, artificial intelligence

INTRODUCTION

The triumvirate of big data, machine learning, and deep learning in the first two decades of the 21st century paved the way for Artificial Intelligence (AI) and its sundry tools to pervade the everyday lives of citizens globally. According to the National Artificial Intelligence Act of 2020, "…AI… can for a given set of human-defined objectives, make predictions, recommendations or decisions influencing real or virtual environments" (U.S. Department of State, 2020). From automation (e.g., driving automobiles) to healthcare (interpreting tests and making diagnoses) to data analysis (e.g., predicting hurricane paths) to education (e.g., developing learning plans), and quality of life (e.g., making voice-assisted phone calls), AI is making an impact on all walks of life (Brynjolfsson et al., 2019). Due to media attention, the public is aware that AI exists. Yet, few know what it entails or what its impact on society may be. A brief poll in several computer science/information technology classes at a medium-sized university showed that whereas most students were aware of AI, especially tools such as ChatGPT and Microsoft Pilot, few could discuss it or even define it. Knowledge about AI was scant. Furthermore, theoretical physicist Stephen Hawking issued a warning that AI could be used unethically and incorrectly, or ethically and correctly, but it will likely outsmart humans, and we may not be able to control it (Hawking, 2018). Buolamwini (2023), Broussard (2023), and Benjamin (2019) have shown that AI bias manifests when manmade algorithms embody selective preferences, which in turn, lead to biased results (e.g., discriminatory job-recruiting algorithms). AI has and will continue to disrupt traditional jobs and only time will tell how this will impact society in general and the economy in particular. AI has also blurred the lines about what constitutes ethical behavior (Bryson, 2019), and assessments of ethicality differ markedly across nations despite the world being a much smaller place than previously (e.g., global economies). On the one hand, Europe has already established AI regulations that seek to minimize unethical use or at the very least, ensure transparency. On the other hand, nations like the United States and China allow for more liberal and unpoliced usage of AI tools and applications. The American perspective may be broadly affected by its free-market philosophy and Freedom of Speech laws. Regardless, it is fair to say that AI is here to stay and will be used and misused for years to come.

Classes, books, and articles on AI literacy tend to focus on the technological aspects of AI such as how to design and build AI solutions or Applied Machine Learning and AI. As technology educators, however, it is also incumbent upon us to set the standard and provide guidance in terms of what ethical and useful usage of AI-enabled reports and results ought to look like. We must also educate learners/consumers of AI tools on how to critically evaluate generative AI results. Ferlazzo (2023), for instance, shares quotes from students in an IB *Theory of Knowledge* class including one where the student exposes the blatant misinformation spread by generative AI when it provided him with five quotes from *The Diary of Anne Frank*, which were never included in the publication. Another student showcased the bias embedded in an AI app (DALL-E 2) where a search for images of CEOs and corporate leaders rendered pictures of white men, 97% of the time. Ferlazzo (2023) also described instances where the AI tools "make up work that is not even real" simply because it looks for

patterns from the training data and draws inferences to create plausible responses. Such examples are plentiful, and each makes the case for AI Literacy.

Mills et al. (2024, p. 4) define AI Literacy as "the knowledge and skills that enable people to critically understand, evaluate, and use AI systems and tools to safely and effectively participate in an increasingly digital world." As AI tools and its content become pervasive amongst college students and others worldwide, AI Literacy should proliferate through a mandatory course for all undergraduate students, focusing on developing the knowledge and skills to critically comprehend, use, and evaluate AI tools and their results. Such a course should also cover AI ethics.

BACKGROUND ON FRAMEWORKS FOR A UNIVERSAL COURSE ON AI LITERACY

A review of the current literature only rendered a few articles that report scholarly research on AI Literacy. Ng et al. (2021) conducted an exploratory review on conceptualizing AI literacy and concluded that published research in the nascent area of AI Literacy is not yet prevalent. Yet, it is necessary if we are to understand and teach such skills to everyday users of generative AI tools. The literature review also concluded that to enable AI Literacy, it is paramount that we know and understand AI and address the usage of AI applications while understanding the technologies that drive it. Next, they found that learners must know how to use and apply AI knowledge and concepts in different scenarios. Third, since AI augments human intelligence, users should engage in higher-order thinking activities and thus, should critically evaluate AI applications while also communicating and collaborating with AI tools. Finally, users should understand and analyze ethical issues of AI. The exploratory review culminated in the creation of a framework based on Bloom's Taxonomy (Figure 1) that suggests that AI Literacy should follow the trajectory of moving toward higher order thinking in AI literacy by first seeking to build knowledge and comprehension of AI, followed by the application, analysis, synthesis, and evaluation of AI – all components of Bloom's Taxonomy.

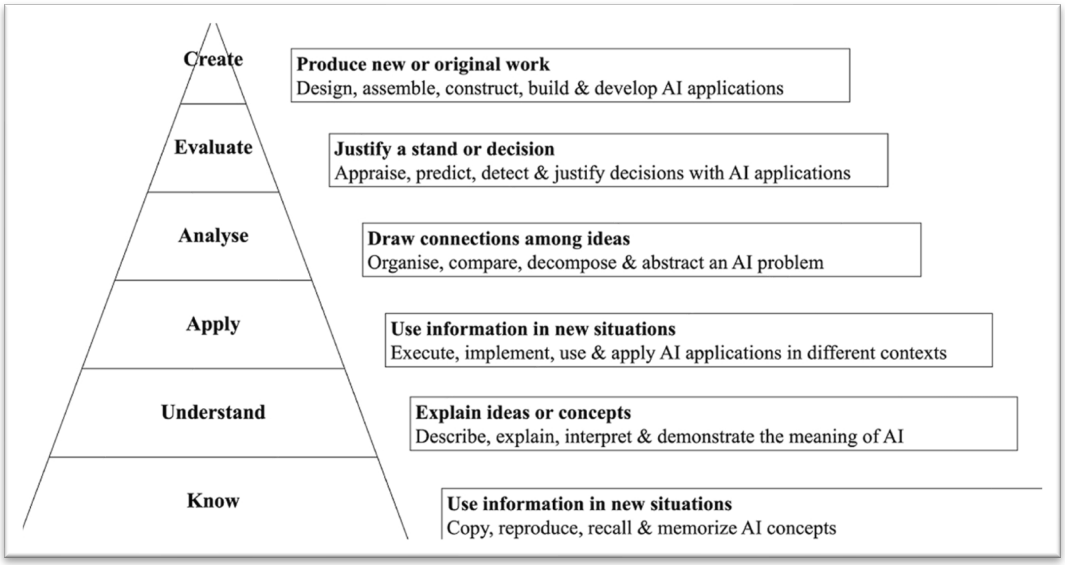

Figure 1: AI Literacy Framework Using Bloom's Taxonomy (Courtesy of Ng et al., 2021)

Digital Promise (Mills et al., 2024), a global nonprofit, presents an AI Literacy framework (Figure 2) illustrating that the decision to use AI to learn should hinge on our understanding and evaluation of AI tools and results (Mills et al., 2024). Thus, to *interact* with others, *create* new knowledge, and *solve*

problems, learners should employ three modes of engagement with AI-enabled tools which are to *Understand*, *Evaluate*, and *Use*. Then, six actionable AI Literacy practices are key to demonstrate learners' understanding and evaluation of AI-created content and may also be used by educators to develop AI literacy in learners. These practices include *AI information and mis/disinformation*, the *ethics and impact* of AI, and more. For instance, to ascertain the validity of AI-enabled tool outputs (information and mis/disinformation), learners must know how to evaluate AI inputs (datasets) and AI outputs (results) for accuracy. To accomplish this, learners must identify potential biases in data collection that could impact AI output, evaluate the credibility of the AI output, and triangulate their findings using other valid and citable sources. Finally, the framework also recognizes that *human judgment* and *centering justice* are pivotal core values that aid learners as they safely and efficiently use AI-enabled tools.

Figure 2: AI Literacy Framework Showing Modes of Engagement, Actionable Practices, Core Values and Types of Use (Courtesy of Digital Promise)

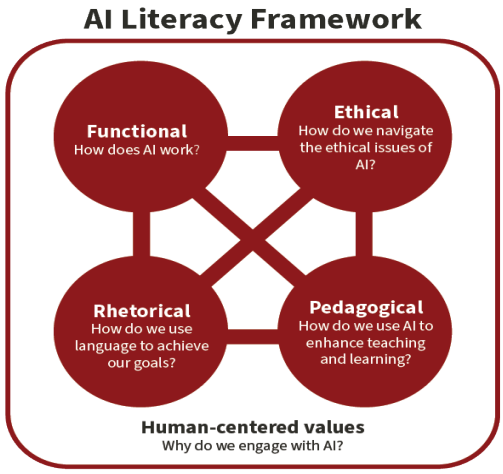

Figure 3: AI Literacy Framework showing four intersection domains of understanding: Functional, ethical, rhetorical and pedagogical literacy (Courtesy of Teaching Commons at Stanford University)

Teaching Commons at Stanford University has also put forth an AI Literacy framework (Figure 3) to help learners become more critical users and assimilators of AI-generated content. Specifically, the framework suggests that to effectively use AI content, learners should develop four types of literacy: Functional (knowing how AI works), Ethical (effectively navigating the moral issues embodied in AI usage), Rhetorical (knowing how to use natural and AI-generated language to achieve goals) and pedagogical (knowing how to use AI to enhance teaching and learning). For instance, according to Teaching Commons at Stanford, functional literacy can be achieved at the novice level by focusing on objectives that seek to provide a learner with access to common Gen-AI tools, practicing basic prompting, defining common terminology, and describing the AI training process. However, at the intermediate level, the objectives would be to analyze the limitations and capabilities of Gen-AI, use advanced features and tools, and practice complex prompting. Finally, at the advanced level, the objectives would be to customize Gen-AI tools, develop support resources, and coordinate shared resources.

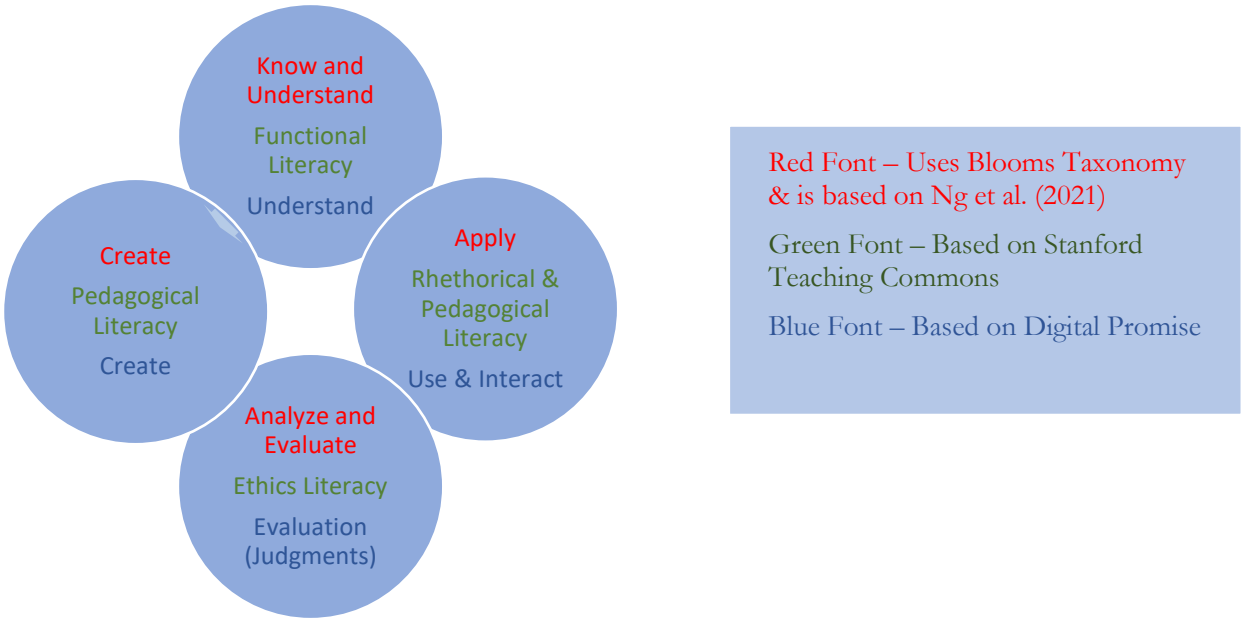

Figure 4: Revised AI Literacy Framework

The key difference between the frameworks shown in Figures 2 and 3 is that Figure 3 goes beyond the learner and reckons with the teachers and how they can use AI to effectively enable learning. As mentioned earlier, AI is here to stay and expecting students to not use generative AI tools such as ChatGPT or Microsoft Pilot is naïve and perhaps, even counterproductive. Also, the framework in Figure 3 embodies a human-centered approach by prioritizing human agency. Through such agency, the framework when implemented seeks to hold individuals and the collective responsible for the appropriate use of AI tools.

We propose an amalgamation of the frameworks by drawing upon the strengths of each and eschewing aspects that are not pivotal at this early stage of devising a universal AI Literacy course. Anchored in Bloom's Taxonomy, a revised framework is presented in Figure 4.

Using the framework above in Figure 4, we propose an AI literacy course.

DESIGNING A UNIVERSAL COURSE ON AI LITERACY

Many universities offer AI courses on the technical components of AI that are designed for learners seeking a CS/IT or similar degree. Some universities such as Vanderbilt University offer a course titled *AI Everywhere* that focuses on navigating the AI landscape by exploring how AI works, how to use AI more effectively and on issues of privacy and sustainability. Other courses such as the University of Alberta's *Artificial Intelligence Everywhere* focus more on the history of AI and use case studies to showcase modern AI. Robinson (2020), shares that nations could follow the approach taken by the Norwegian government (Modernisation, 2020, p. 44) to offer an "AI for Everyone: Elements of AI" course to all their citizens wherein they would conceptualize AI literacy by encapsulating AI topics for adults who do not need to have any prior AI knowledge.

However, for AI Literacy courses to become the norm, more universities and other entities must design and offer it to all learners. Based on our review and analysis (Kim et al., 2021; Lin et al., 2021; Ng et al., 2021; Touretzky et al., 2019), a universal course on AI literacy should focus on achieving conceptual understanding and not on coding. In keeping with the well-accepted and implemented Technological, Pedagogical, and Content Knowledge (TPACK) framework introduced by Mishra and Koehler (2006) for courses that incorporate technology into pedagogy and course content, a universal course on AI Literacy should focus on technological, pedagogical, and content knowledge. The

four areas depicted in Figure 4 --*Know and Understand, Apply, Analyze* and *Evaluate*, and *Create*-- address TPACK and we maintain that to be of pedagogical value to learners in a university setting, a 16-week AI literacy course should include the following 16 units of content.

KNOW AND UNDERSTAND

Based on the extensive review conducted for this research coupled with the knowledge gained from the AI Literacy Framework Using Bloom's Taxonomy (Figure 1), it was determined that to know and understand AI, we need to focus at the "what" and "why" levels of understanding and comprehension. In seeking to fill the *Know and Understand* gap, we must first seek to recall what we already know followed by demonstrating an understanding of the facts. Accordingly, we seek to arrange, define, describe, and identify core knowledge (Anderson & Krathwohl, 2001). We also seek to compare, describe, explain and recognize pivotal knowledge (Anderson & Krathwohl, 2001). In determining what elements of AI should be encapsulated in the *Know and Understand* category, we begin with what AI is and then segue into how it works at the software and hardware levels. Knowledge about what is not AI is just as important as what it is and such information also belongs in the *Know and Understand* category.

- 2 units on what is AI, how does AI work, hardware/software overview of types of AI (Chai et al., 2020), and what AI can do (e.g., Touretzky et al.'s (2019) Five Big Ideas about AI) (Druga et al., 2019; Kim et al., 2021).
- 1 unit on AI Apps/tools (software) across industries (Lin et al., 2021; Wan et al., 2020)
- 1 unit on AI misinformation/disinformation (Chu-Ke & Dong, 2024)

APPLY

Per Bloom's Taxonomy (Anderson & Krathwohl, 2001), to accrue knowledge at the *Application* level we must apply knowledge to actual scenarios. Thus, the focus is on constructing, illustrating, interpreting and using pivotal knowledge. Consequently, the units for this level focus on first gaining technical and hands-on knowledge followed by direct application via a problem-solving unit.

- 1 unit on technological knowledge such as AI intelligent agents, gamification and other role-playing learning tools (Rodríguez-García et al., 2021)
- 1 unit on hands on experience on popular AI tools (Rodríguez-García et al., 2021)
- 1 unit on Russell and Norvig's (2009) AI Syllabus plus specific pedagogy such as project/problem-based learning, storytelling (Schaper et al., 2020), or collaborative learning

ANALYZE AND EVALUATE

Again, per Bloom's Taxonomy (Anderson & Krathwohl, 2001), analysis breaks down complex ideas into simpler ones while looking for evidence to validate generalization, whereas evaluation creates and supports judgments using evidence. Thus at this level, the focus is on appraising, comparing, contrasting, and testing as well as on assessing, choosing and summarizing AI knowledge. To this end, units on evaluation AI output, assessing AI impacts and ethical judgments are crucial.

- 1 unit on critically evaluating AI output focusing on sources of biases and how to validate AI generated content (Varsha, 2023)
- 1 unit on impact of AI (limitations and positives) on society using AI tools such as chatbot (Ng et al., 2021; Robinson, 2020)
- 2 units on the ethicality of AI including use of a machine learning model builder such as LearningML to develop critical thinking (Robinson, 2020; Rodríguez-García et al., 2021)

CREATE

Per Bloom's Taxonomy (Anderson & Krathwohl, 2001), to create/synthesize AI knowledge we develop new wholes from component ideas, or we simply propose new solutions. The focus here is on

assembling, categorizing, generating and synthesizing AI knowledge. To this end. Units on AI prompting, training models and solving real world problems using AI tools are warranted.

- 2 units on AI prompting - basic, intermediate and advanced (Knott et al., 2024)
- 1 unit on training AI models (Vazhayil et al., 2019)
- 2 units on solving real world problems using AI tools (Chubb et al., 2023)

FUTURE WORK

This research effort will continue along two streams. First, the proposed course will be shared amongst faulty from multiple colleges at a medium sized university to determine it robustness across a diverse array of disciplines. Second, based on the course model presented above, a course is being designed at a medium sized university and it will be taken by students in the Winter of 2026. Data will be collected to evaluate the efficacy of the course design and determine changes to be made to the course.

CONCLUSION

As AI continues to evolve, re-invent and pervade most aspects of life, there is a need for users to understand its import and impact on their lives and on society in general. A universal course on the non-technical aspects of AI that focuses on ethics, content and pedagogy is important if we are to become critical and savvy consumers of its products. There is a need for universities to offer an AI Literacy course that addresses topics akin to those developed in the 16-unit course design. There is also a need to critically evaluate the impact and usefulness of such a course so that it may be revised and with an eye toward informing all users about the ever-changing landscape of AI.

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