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BOARD # 66: Does Gender Play a Role? An Explorative Study on the Differences in Educational Approaches Towards Artificial Intelligence Literacy

Jinyi Jiang, Nanyang Technological University
Dr. Ibrahim H. Yeter, Nanyang Technological University

Ibrahim H. Yeter, Ph.D., is an Assistant Professor at the National Institute of Education (NIE) at Nanyang Technological University (NTU) in Singapore. He is an affiliated faculty member of the NTU Centre for Research and Development in Learning (CRADLE) and the NTU Institute for Science and Technology for Humanity (NISTH). Dr. Yeter serves as the Director of the World MOON Project and holds editorial roles as Associate Editor of the IEEE Transactions on Education and Editorial Board Member for the Journal of Research and Practice in Technology Enhanced Learning. He is also the upcoming Program Chair-Elect of the PCEE Division at ASEE. His current research interests include STEM+C education, specifically artificial intelligence literacy, computational thinking, and engineering.

Bridging Gender and Disciplinary Gaps: A Tri-Pillar Framework for Inclusive Artificial Intelligence Literacy among Female Undergraduates

Abstract

As Artificial Intelligence (AI) becomes integral across various sectors, AI literacy has emerged as an essential competency for undergraduate students. However, current conceptual frameworks often neglect the intersection between gender and disciplinary background, particularly regarding how female students in Science, Technology, Engineering and Mathematics (STEM) and non-STEM fields engage with AI. This review synthesizes existing literature on AI literacy, highlighting the distinct challenges and strengths of female undergraduates across disciplines. We propose a Tri-Pillar Integrative Framework—Technical Competency, Ethical Reasoning, and Contextual Application—to foster comprehensive AI literacy. The paper underscores the fragmented nature of current AI education, emphasizing gender-specific barriers such as stereotype threat and techno-anxiety, and identifies gaps that require intersectional and longitudinal research. By centering female students' experiences, we provide future research directions and pedagogical strategies to cultivate inclusive, interdisciplinary AI literacy.

1. Introduction

The pervasive integration of AI across industries necessitates comprehensive AI literacy as a fundamental skill within higher education. (Timon Sengewald & Tremmel, 2024) AI literacy encompasses not only technical knowledge—such as algorithms and computational logic—but also ethical awareness, societal implications, and practical applications. (Ng et al., 2021; Matthias Carl Laupichler et al., 2022) As AI increasingly influences communication, decision-making, and knowledge creation, students must be equipped with robust literacy to participate responsibly in an AI-driven world.

Despite this importance, AI education remains fragmented. STEM-focused curricula prioritize technical proficiency, often overlooking ethical and societal dimensions. Conversely, non-STEM programs frequently emphasize social implications without providing adequate computational training. (Southworth et al., 2023) This disciplinary division restricts students' holistic understanding of AI.

Gender disparities further compound these challenges. Women remain underrepresented in AI-related fields and face barriers such as stereotype threat, confidence gaps, and limited technical exposure. (Cadaret et al., 2016; Verdugo-Castro et al., 2022) Female non-STEM students, despite exhibiting strengths in ethical reasoning and contextual analysis, often report lower confidence and fewer opportunities for technical skill development. (Denejkina, 2023)

Interdisciplinary approaches integrating technical, ethical, and societal considerations have been proposed to mitigate these issues. (Southworth et al., 2023) Moreover, the necessity for

intersectional research—addressing gender, race, and socioeconomic factors—and longitudinal studies tracking AI literacy development over time is increasingly recognized. (Ulnicane, 2024)

Research Question:

How have conceptual frameworks of AI literacy been developed for female undergraduates in STEM and non-STEM disciplines, and what gaps exist to guide future theoretical and curricular research?

2. Thematic Literature Review

2.1 Defining AI Literacy: A Multidimensional Construct

AI literacy is conceptualized as multidimensional, integrating technical proficiency, computational thinking, ethical reasoning, and societal impact awareness. While learners should understand AI operation, critically assessing its broader implications is equally vital. (CIRCL Admin, 2020) Yet, most frameworks remain discipline-neutral, reducing their effectiveness for diverse student groups, particularly concerning gender and disciplinary orientation. (Matthias Carl Laupichler et al., 2022)

2.2 AI Literacy in Female STEM Undergraduates

In STEM education, AI literacy typically emphasizes technical instruction, including algorithms, programming, and data analysis. (Xu & Ouyang, 2022) However, female STEM students frequently encounter structural and psychological barriers such as stereotype threat, underrepresentation, and diminished confidence. (Westcoast Women in Engineering, Science & Technology, 2014; Cheryana et al., 2020; Funk, 2018) Despite high academic capability, these barriers hinder their engagement. Current frameworks seldom address these gendered dynamics, revealing a gap in supporting equitable technical education experiences. (Jackson et al., 2021)

2.3 AI Literacy in Female Non-STEM Undergraduates

Female non-STEM students often excel in ethical reasoning, critical reflection, and socio-cultural analysis of AI. Despite these strengths, they typically lack foundational technical training. (Allen & Kendeou, 2023) Models presuming prior computational fluency marginalize these learners, resulting in incomplete AI literacy. (Long & Magerko, 2020) Comprehensive frameworks must therefore integrate accessible technical components alongside ethical and contextual analysis to support holistic learning.

2.4 Gendered and Disciplinary Barriers in AI Education

The intersection of gender and disciplinary background significantly impacts AI learning experiences. Female STEM learners may experience exclusion from technical domains, whereas

non-STEM peers might perceive AI as irrelevant to their field. (UNESCO, 2017) Most existing literacy models neglect these intersectional realities, necessitating responsive frameworks addressing systemic, cultural, and educational barriers to equitable AI competency. (Cheryana et al., 2020)

2.5 Cross-Disciplinary Synthesis: Toward an Integrated View

The division between technical and humanistic AI education approaches limits comprehensive AI literacy development. Female STEM students offer algorithmic and technical proficiency, while non-STEM learners provide ethical and contextual insights. Integrating these perspectives into a unified conceptual framework can enhance inclusivity and foster comprehensive AI understanding across disciplines.

3. Proposed Integrative Framework

Responding to the limitations in existing AI literacy models, we propose a Tri-Pillar Integrative Framework—Technical Competency, Ethical Reasoning, and Contextual Application—designed to support inclusive AI literacy for female undergraduates across STEM and non-STEM disciplines. This framework emphasizes interconnected learning domains and incorporates gender-responsive educational practices.

3.1 Pillar 1: Technical Competency

Technical competency involves foundational knowledge and practical skills necessary to interact effectively with AI systems. This pillar emphasizes algorithmic thinking, data literacy, programming skills, and familiarity with AI models. (Long & Magerko, 2020) For female STEM students, this pillar supports the enhancement of existing skills while actively addressing prevalent confidence gaps and barriers through collaborative coding environments, peer mentoring programs, and interactive workshops designed to foster a supportive learning atmosphere. (Zhou et al., 2023) For non-STEM students, the framework advocates accessible technical skill-building through user-friendly tools such as low-code platforms, interactive simulations, and interdisciplinary training modules, thus bridging technical gaps without imposing high barriers to entry. (Yash & Maher, 2024)

3.2 Pillar 2: Ethical Reasoning

Ethical reasoning encompasses critical analysis of AI's societal and moral implications, such as fairness, transparency, accountability, privacy concerns, and algorithmic biases. (Wynants et al., 2025) This pillar leverages the strengths of female students from non-STEM fields, who often possess significant capacity in philosophical and sociocultural analysis. (Olga et al., 2024) The integrative model recommends embedding ethical discussions within technical curricula and facilitating ethical debates through case studies, role-playing scenarios, and reflective writing

assignments. This reciprocal approach ensures mutual learning and cross-disciplinary dialogue, enhancing ethical consciousness and responsibility across student populations.

3.3 Pillar 3: Contextual Application

Contextual application connects AI literacy to real-world professional and societal contexts, promoting relevance, practical engagement, and interdisciplinary collaboration. (Lindauer, 2024) Students apply AI knowledge within scenarios tailored to their specific academic disciplines—such as healthcare diagnostics, educational technology, policy formulation, media analysis, and creative arts. By integrating AI literacy into authentic, discipline-specific problems, students gain motivation and sustained engagement, particularly benefiting non-STEM students who may not traditionally identify with technical roles. (Díaz-Rodríguez et al., 2023) This pillar reinforces that comprehensive AI literacy is crucial across all fields, cultivating versatile professionals capable of critically leveraging AI technologies.

3.4 Interdisciplinary Synergy

Central to this framework is the synergy among the technical, ethical, and contextual pillars. Rather than isolating these domains, the framework advocates a holistic pedagogical strategy that integrates them seamlessly into curriculum designs. Educational activities that concurrently involve technical problem-solving, ethical evaluations, and contextual applications foster deeper and more cohesive learning experiences. (Yash & Maher, 2024) Interdisciplinary projects and collaborative assignments further allow students to appreciate diverse perspectives, enriching their overall AI literacy. (Tzirides et al., 2024)

3.5 Gender-Responsive Adaptability

The framework explicitly incorporates gender-responsive pedagogical strategies, recognizing differentiated barriers encountered by female students. (Chapin & Warne, 2021) Inclusive practices—such as stereotype threat reduction, diverse role models, targeted mentorship, inclusive language, and representation in instructional materials—are integral components. (Zhou et al., 2023) By proactively addressing gender-specific challenges, the framework promotes equitable educational environments, empowering female students across disciplines to fully engage with and benefit from AI literacy initiatives.

4. Conceptual Gaps and Future Research Directions

While the proposed Tri-Pillar Integrative Framework provides a solid foundation for inclusive AI literacy, several critical conceptual gaps require deeper examination to advance theoretical understanding and inform effective curricular practices.

4.1 Intersectional Frameworks

Current AI literacy models often treat learners as homogeneous groups, neglecting how intersecting identities—such as gender, race, socioeconomic status, and disability—collectively influence learning experiences and outcomes. (Ulnicane, 2024) An intersectional perspective recognizes that female students' experiences are shaped by multiple, overlapping identities, each bringing unique barriers and strengths. (Kwami, 2022) Future research should develop nuanced frameworks that explicitly integrate these intersections, offering more targeted and supportive educational strategies. Scholars should explore how intersectionality influences AI literacy outcomes, examining specific barriers and enablers across diverse student populations.

4.2 Longitudinal Studies

Most AI literacy research relies on static, cross-sectional assessments, capturing competencies at single points in time. Consequently, there is limited understanding of how AI literacy evolves throughout students' educational and professional trajectories. (Leite, 2025) Longitudinal research is needed to trace developmental trajectories, identifying critical periods for intervention, shifts in confidence, competence development, and long-term impacts of educational initiatives. Such studies would offer insights into when and how technical, ethical, and contextual competencies emerge or diminish, providing educators and policymakers with actionable strategies for sustained support.

4.3 Validation of Integrated Models

While integrated frameworks combining technical, ethical, and contextual elements are increasingly proposed, few have undergone rigorous conceptual validation. Future research should employ methodological approaches such as Delphi studies, expert panels, and participatory design processes involving diverse stakeholders—students, educators, and industry professionals—to critically assess and refine integrative models. (Lintner, 2024) Conceptual validation through robust, stakeholder-driven methodologies ensures frameworks are both theoretically sound and practically applicable, aligning educational strategies closely with learner needs and real-world demands. (Laupichler et al., 2023)

4.4 Disciplinary and Contextual Adaptability

Existing AI literacy frameworks frequently originate from narrow disciplinary contexts, primarily focusing on computer science or ethics education. To be truly interdisciplinary, frameworks must be adaptable across varied academic contexts, including healthcare, law, business, social sciences, and creative arts. Future research should systematically explore how AI literacy components can be tailored to specific disciplines without compromising their integrative core principles. (Southworth et al., 2023) Examining disciplinary adaptability helps

facilitate broader acceptance, applicability, and effectiveness of AI literacy programs across diverse educational settings. (Allen & Kendeou, 2023)

4.5 Institutional and Policy-Level Influences

The role of institutional policies and structural support systems in shaping AI literacy outcomes remains underexplored. Institutional factors such as curriculum design policies, faculty training initiatives, resource allocation strategies, and diversity-promoting practices significantly influence the effectiveness of AI literacy education. (DerSimonian & Montagnino, 2025) Future research must investigate how institutional frameworks and national educational policies either enable or constrain inclusive AI literacy initiatives. (Downs, 2023) Studies should aim to identify scalable, policy-driven strategies for embedding gender-responsive and interdisciplinary AI literacy into broader educational contexts, supporting systemic change towards inclusivity.

5. Educational and Policy Implications

The proposed Tri-Pillar Integrative Framework and identified conceptual gaps carry significant implications for educational practices and institutional policies aimed at promoting inclusive and comprehensive AI literacy among female undergraduates.

5.1 Discipline-Specific Curriculum Development

AI literacy initiatives should extend beyond generalized training to include discipline-specific contexts. For STEM curricula, this means integrating explicit ethical and societal considerations alongside technical training, such as embedding modules focused on AI ethics within coding and algorithmic coursework. (Usher & Barak, 2024) Conversely, non-STEM curricula should provide accessible technical foundations, utilizing low-code environments, interactive tutorials, and guided learning tools, thus demystifying AI technologies. (Farah et al., 2020) Such tailored approaches leverage each discipline's inherent strengths, ensuring comprehensive, relevant AI literacy.

5.2 Gender-Responsive Pedagogical Strategies

Educational practices must proactively address gendered barriers affecting female students' engagement and confidence in AI-related fields. Effective strategies include reducing stereotype threat through growth mindset training, using inclusive language, and fostering classroom environments that actively support diversity. (Kwak, 2021) Highlighting diverse female role models in AI, implementing mentorship programs, and incorporating gender-sensitive case studies can significantly enhance female students' self-efficacy, participation, and persistence in AI courses. (Dumbuya, 2025)

5.3 Institutional Support for Interdisciplinary Learning

Institutions should actively support interdisciplinary AI literacy by encouraging collaborative learning and research across different academic departments. Initiatives such as cross-departmental courses, joint workshops, and interdisciplinary AI-focused projects facilitate meaningful exchanges between STEM and non-STEM students, promoting mutual understanding and appreciation of complementary skill sets. (Southworth et al., 2023; Li et al., 2025) Institutional incentives, such as funding interdisciplinary teaching initiatives and recognizing cross-disciplinary achievements, can further solidify these efforts.

5.4 Policy Frameworks for Inclusive AI Education

National education agencies and accrediting bodies must explicitly recognize AI literacy as an essential graduate competency, requiring educational programs to embed ethical and societal considerations into AI curricula. (UNESCO, 2021) Policy frameworks should mandate comprehensive AI education practices that address structural inequities and promote inclusive teaching methodologies. Additionally, strategic funding should prioritize developing inclusive curricula, faculty training programs, and student support services that emphasize diversity and interdisciplinarity.

5.5 Sustainable AI Literacy Ecosystems

Building sustainable AI literacy ecosystems requires robust collaboration among academia, industry, and civil society. Universities should develop partnerships with technology companies, NGOs, and government agencies to provide real-world project experiences, internships, and practical learning opportunities. (Nixon et al., 2024) Such collaborations enable students to apply their AI competencies in authentic contexts, benefiting from industry mentorship and aligning academic training with evolving workforce requirements. (Capital One Tech, 2025) This comprehensive ecosystem approach ensures sustained relevance and inclusivity in AI education.

6. Conclusion

The accelerating integration of Artificial Intelligence into various sectors demands a reconsideration of AI literacy within higher education, particularly emphasizing intersections of gender and disciplinary context. This paper reviewed current conceptual frameworks, highlighting their fragmentation and the unique barriers faced by female students in STEM and non-STEM fields. In response, we proposed the Tri-Pillar Integrative Framework—comprising Technical Competency, Ethical Reasoning, and Contextual Application—as a comprehensive model for fostering inclusive AI literacy.

The review also identified critical conceptual gaps, including the need for intersectional frameworks, longitudinal research, rigorous validation of integrative models, disciplinary

adaptability, and supportive institutional policies. Addressing these gaps through targeted educational strategies and policy initiatives is essential for developing robust AI literacy programs. Ultimately, ensuring female undergraduates from all academic backgrounds are effectively equipped with the necessary technical, ethical, and contextual skills to engage critically with AI technologies is fundamental for promoting equity, informed citizenship, and adaptability in an increasingly AI-driven society.

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References

Capital One Tech. (2025, April 3). *Advancing AI research: industry & academia collaborations*. Capital One. https://www.capitalone.com/tech/ai/ai-research-industry-academia/

Allen, L. K., & Kendeou, P. (2023). ED-AI Lit: An Interdisciplinary Framework for AI Literacy in Education. *Policy Insights from the Behavioral and Brain Sciences*, *11*(1), 3–10. https://doi.org/10.1177/23727322231220339

Cadaret, M. C., Hartung, P. J., Subich, L. M., & Weigold, I. K. (2016). Stereotype threat as a barrier to women entering engineering careers. *Journal of Vocational Behavior*, *99*, 40–51. https://doi.org/10.1016/j.jvb.2016.12.002

Chapin, J., & Warne, V. (2021, January 14). *Gender Responsive Pedagogy in Higher Education | INASP*. Inasp.info. https://www.inasp.info/publications/gender-responsive-pedagogy-higher-education

Cheryana, S., Lombard, E. J., Hudson, L., Louis, K., Plaut, V. C., & Murphy, M. C. (2020). Double isolation: Identity expression threat predicts greater gender disparities in computer science. *Self and Identity*. https://doi.org/10.1080//15298868.2019.1609576

CIRCL Admin. (2020, April 3). *What is AI Literacy? Competencies and Design Considerations – CIRCL*. Circlcenter.org. https://circlcenter.org/what-is-ai-literacy-competencies-and-design-considerations/

Denejkina, A. (2023, August 25). *Generative AI - Gender gap identified in skills and confidence • Youth Insight*. Youth Insight. https://youthinsight.com.au/education/generative-ai-gender-gap-identified-in-skills-and-confidence/

DerSimonian, R., & Montagnino, C. (2025, March 26). *Crafting Thoughtful AI Policy in Higher Education: A Guide for Institutional Leaders -- Campus Technology*. Campus Technology. https://campustechnology.com/articles/2025/03/26/crafting-thoughtful-ai-policy-in-higher-education-a-guide-for-institutional-leaders.aspx

Díaz-Rodríguez, N., Ser, D., Coeckelbergh, M., López, M., Herrera-Viedma, E., & Herrera, F. (2023). *Connecting the Dots in Trustworthy Artificial Intelligence: From AI Principles, Ethics, and Key Requirements to Responsible AI Systems and Regulation*. ArXiv.org. https://arxiv.org/abs/2305.02231

Downs, L. (2023, December 7). *Developing Institutional Level AI Policies and Practices: A Framework*. WCET. https://wcet.wiche.edu/frontiers/2023/12/07/developing-institutional-level-ai-policies-and-practices-a-framework/

Dumbuya, E. (2025). *Gender-Inclusive Pedagogies: Addressing Barriers to Female Participation in STEM Education*. https://doi.org/10.2139/ssrn.5023250

Farah, J., Moro, A., Bergram, K., Purohit, A., Gillet, D., & Holzer, A. (2020). *Bringing Computational Thinking to non-STEM Undergraduates through an Integrated Notebook Application*. https://ceur-ws.org/Vol-2676/paper2.pdf

Funk, C. (2018, January 9). *Women and Men in STEM Often at Odds Over Workplace Equity*. Pew Research Center. https://www.pewresearch.org/social-trends/2018/01/09/women-and-men-in-stem-often-at-odds-over-workplace-equity/

Jackson, C., Mohr-Schroeder, M. J., Bush, S. B., Maiorca, C., Roberts, T., Yost, C., & Fowler, A. (2021). Equity-Oriented Conceptual Framework for K-12 STEM literacy. *International Journal of STEM Education*, *8*(1). https://doi.org/10.1186/s40594-021-00294-z

Kwak, J. (2021, December 20). *Mitigating Stereotype Threat: How to Support Minoritized Students in the Classroom - Every Learner Everywhere*. Every Learner Everywhere. https://www.everylearnereverywhere.org/blog/mitigating-stereotype-threat-how-to-support-minoritized-students-in-the-classroom/

Kwami, J. (2022, November 3). *An intersectional approach to digital education: facilitating empowerment and justice - NORRAG -*. NORRAG -. https://www.norrag.org/an-intersectional-approach-to-digital-education-facilitating-empowerment-and-justice/

Laupichler, M. C., Aster, A., & Raupach, T. (2023). Delphi study for the development and preliminary validation of an item set for the assessment of non-experts' AI literacy.

Computers and Education: Artificial Intelligence, *4*, 100126. https://doi.org/10.1016/j.caeai.2023.100126

Leite, H. (2025). Artificial intelligence in higher education: Research notes from a longitudinal study. *Technological Forecasting and Social Change*, *215*, 124115. https://doi.org/10.1016/j.techfore.2025.124115

Li, T., Zhan, Z., Ji, Y., & Li, T. (2025). Exploring human and AI collaboration in inclusive STEM teacher training: A synergistic approach based on self-determination theory. *The Internet and Higher Education*, 101003–101003. https://doi.org/10.1016/j.iheduc.2025.101003

Lindauer, S. (2024, June 18). *AI Literacy: A Framework to Understand, Evaluate, and Use Emerging Technology – Digital Promise*. Digital Promise. https://digitalpromise.org/2024/06/18/ai-literacy-a-framework-to-understand-evaluate-and-use-emerging-technology/

Lintner, T. (2024). A systematic review of AI literacy scales. *Npj Science of Learning*, *9*(1). https://doi.org/10.1038/s41539-024-00264-4

Long, D., & Magerko, B. (2020). What is AI Literacy? Competencies and Design Considerations. *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, 1–16. https://doi.org/10.1145/3313831.3376727

Matthias Carl Laupichler, Aster, A., Schirch, J., & Raupach, T. (2022). Artificial intelligence literacy in higher and adult education: A scoping literature review. *Computers and Education Artificial Intelligence*, *3*, 100101–100101. https://doi.org/10.1016/j.caeai.2022.100101

Ng, D. T. K., Leung, J. K. L., Chu, S. K. W., & Qiao, M. S. (2021). Conceptualizing AI literacy: An exploratory review. *Computers and Education: Artificial Intelligence*, *2*, 100041. https://doi.org/10.1016/j.caeai.2021.100041

Nixon, N., Lin, Y., & Snow, L. (2024). *Catalyzing Equity in STEM Teams: Harnessing Generative AI for Inclusion and Diversity*. ArXiv.org. https://arxiv.org/abs/2402.00037

Olga, A., Zapata, G., Nikoleta Polyxeni Kastania, Saini, A. K., Castro, V., Ismael, S. A., You, Y., Afonso, T., Searsmith, D., O'Brien, C., Cope, B., & Kalantzis, M. (2024). Combining human and artificial intelligence for enhanced AI literacy in higher education. *Computers and Education Open*, *6*, 100184–100184. https://doi.org/10.1016/j.caeo.2024.100184

Southworth, J., Migliaccio, K., Glover, J., Glover, J., Reed, D., McCarty, C., Brendemuhl, J., & Thomas, A. (2023). Developing a model for AI Across the curriculum: Transforming the higher education landscape via innovation in AI literacy. *Computers and Education Artificial Intelligence*, *4*, 100127–100127. https://doi.org/10.1016/j.caeai.2023.100127

Timon Sengewald, & Tremmel, A. (2024). *Teaching AI Literacy for Innovation: Work in Progress*. 1–4. https://doi.org/10.1145/3632634.3655874

Tzirides, A. O. (Olnancy), Zapata, G., Kastania, N. P., Saini, A. K., Castro, V., Ismael, S. A., You, Y., Santos, T. A. dos, Searsmith, D., O'Brien, C., Cope, B., & Kalantzis, M. (2024).

Combining human and artificial intelligence for enhanced AI literacy in higher education. *Computers and Education Open*, *6*, 100184. https://doi.org/10.1016/j.caeo.2024.100184

Ulnicane, I. (2024). Intersectionality in Artificial Intelligence: Framing Concerns and Recommendations for Action. *Social Inclusion*, *12*. https://doi.org/10.17645/si.7543

UNESCO. (2017). Cracking the code: girls' and women's education in science, technology, engineering and mathematics (STEM). In *Unesco.org*. https://unesdoc.unesco.org/ark:/48223/pf0000253479

UNESCO. (2021). Recommendation on the Ethics of Artificial Intelligence. In *Unesco.org*. https://unesdoc.unesco.org/ark:/48223/pf0000380455

Usher, M., & Barak, M. (2024). Unpacking the role of AI ethics online education for science and engineering students. *International Journal of STEM Education*, *11*(1). https://doi.org/10.1186/s40594-024-00493-4

Verdugo-Castro, S., García-Holgado, A., & Sánchez-Gómez, M. C. (2022). The gender gap in higher STEM studies: A systematic literature review. *Heliyon*, *8*(8), e10300. https://doi.org/10.1016/j.heliyon.2022.e10300

Westcoast Women in Engineering, Science & Technology. (2014). Stereotype Threat. In *Westcoast Women in Engineering, Science & Technology*. https://wwest.sites.olt.ubc.ca/files/2014/05/Stereotype-Threat.pdf

Wynants, S., Childers, G., De La Torre Roman, Y., Budar-Turner, D., & Vasquez, P. (2025). *ETHICAL Principles AI Framework for Higher Education | CSU AI Commons*. Calstate.edu. https://genai.calstate.edu/communities/faculty/ethical-and-responsible-use-ai/ethical-principles-ai-framework-higher-education

Xu, W., & Ouyang, F. (2022). The application of AI technologies in STEM education: a systematic review from 2011 to 2021. *International Journal of STEM Education*, *9*(1). https://doi.org/10.1186/s40594-022-00377-5

Yash, T. S., & Maher, M. L. (2024). AI Literacy for All: Adjustable Interdisciplinary Socio-technical Curriculum. *ArXiv.org*. https://doi.org/10.1109/FIE61694.2024.10893159.

Zhou, K. Z., Cao, J., Yuan, X., Weissglass, D. E., Kilhoffer, Z., Sanfilippo, M. R., & Tong, X. (2023). *"I'm Not Confident in Debiasing AI Systems Since I Know Too Little": Teaching AI Creators About Gender Bias Through Hands-on Tutorials*. ArXiv.org. https://arxiv.org/abs/2309.08121