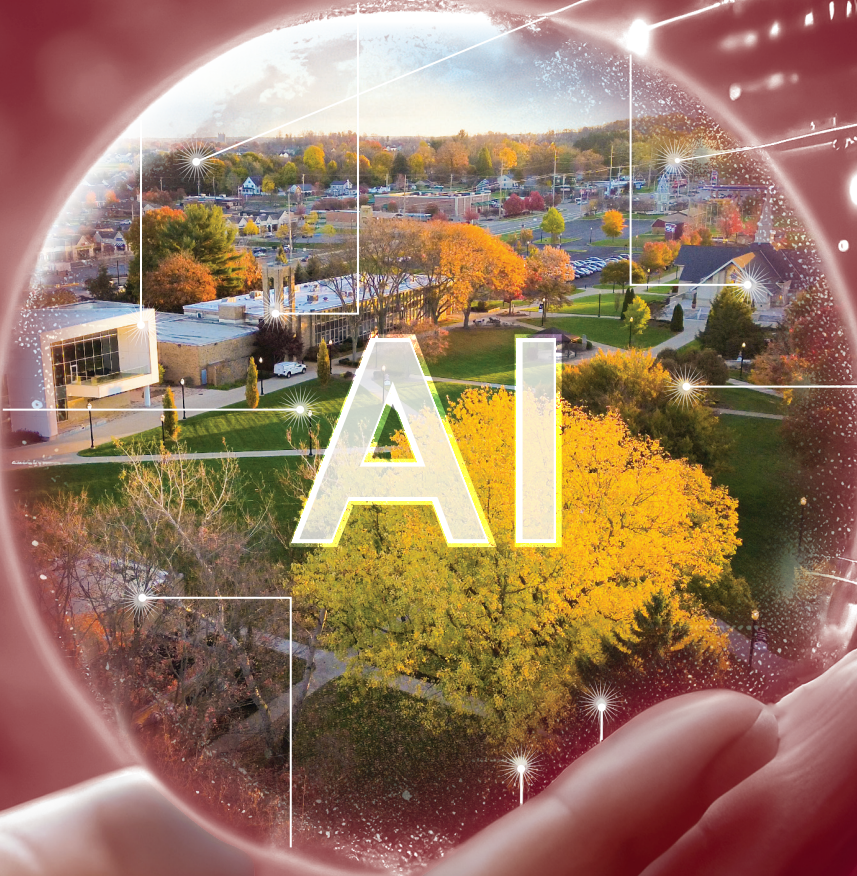


WALSH UNIVERSITY'S

Inspirations in AI Innovation



AI

Volume 3

Walsh University's Inspirations in AI Innovation
Volume 3

September 25, 2026

Table of Contents

Letter from the Editors.....	4
Entangled Selves in the Age of AI: Moral Responsibility and Identity in the Sale of Digital AI Twins.....	5
Artificial Intelligence Use and Postgraduate Student Satisfaction in Higher Education: The Mediating Role of Learning Engagement in Ghana	7
Bridging the Equity Gap: How Generative AI Can Build Digital Capital for Underserved Students.....	10
Vertical Migration of Microplastics in Soil Powered by AI-Assisted Quantification, Polymer Identification, and Depth-Risk Prediction	12
Agentic AI as a Reliable STEM Tutor for African College Preparation: Evaluating Reliability, Hallucination Risk, and Citation Accuracy Across STEM Disciplines.....	15
AI in Teaching, Evaluation, & Assessment	18
Artificial Intelligence as a Design Assistant in Architectural Concept Development and Planning	20
Evaluating the Abilities of LLMs to Aid in Query Creation and Student Success in Learning Data Analytics.....	24
Empowering Future Generations: AI Innovation at FAMU DRS	28
Agentic AI-TPACK Among Preservice Teachers: A PLS-SEM Model of Ethical, Pedagogical, and Technological Knowledge Integration	31
How Environmental AI Tools Can Help Increase Understanding and Imagination of Interactive Climate Response Analysis for Architecture Students.	34
Agentic AI for Fostering Sustainable Hospitality Advancements Beyond Borders	36
Cross-Border Crisis Response: Agentic AI for Disaster Relief in Ghana and the USA.....	40
Orchestrating Survival: Real-Time AI Triage & Dynamic Resource Routing for Obstetric Emergencies	42
Bridging Belonging Gaps Through Agentic AI in Higher Education	45
Agentic AI and Continuous Glucose Monitoring: Advancing Personalized Nutrition for the Common Good.....	49
Using AI to Re-imagine Traditional Kurdish Architecture	53
How AI-Based Tools Can Improve Clinical Decision-Making Skills in Dental Students	56
Youth Empowerment and AI: Leveraging Technology for a Brighter Future in African American Churches	58
Agentic AI Tutoring for Economics Excellence: Innovation for Global Impact.....	61
Preparing Global Leaders: A Cross-Cultural Exploration of Agentic AI in Management Education	66
Agentic AI in Nursing Care and the Future of Human-Centered Healthcare Innovation	70

AI for Enhancing Geography Education: Increasing Student Success and Faculty Support Through Faith-Based Innovation	75
Faith-Guided Agentic Artificial Intelligence in Data Analytics Education: Enhancing Student Success in Ghana and Global Contexts	79
Global Partnership, Local Impact: Ethical Agentic AI Innovation for Transforming Cocoa Processing in Ghana.....	84
Serving the Common Good: Faith-Informed Agentic AI for Quality and Efficiency in Public Health Laboratories.....	89
Balancing Autonomy and Accountability: Ethical Integration of Agentic AI in Human Resource Management.....	92
Ethically Responsible Agentic AI in the Opioid Crisis: A Framework for Harm Reduction, Human Dignity, and Hope	97
Towards Human-Centric Predictive Maintenance: Leveraging Worker Pose Estimation to Improve Machine Productivity	101
When Does Agentic AI Improve Economics Students' Learning? The Roles of Output Quality, Cognitive Engagement, and Academic Self-Efficacy	104
Applying Agentic AI for the Greater Society: A Recovery Agent for Continuous Post-Operative Care	107
Profiling Artificial Intelligence Ethical Awareness Among University Students in Ghana.....	111
Safeguarding Intellect and Autonomy: Agentic AI, Student Self-Efficacy, and Cross-Cultural Higher Education in Ghana and the U.S.	113
Empowering Economics Teachers' Agentic AI Adoption in Ghana: Attitude as the Key to Behavioural Intention.....	117
University Students' AI Value Beliefs and Engagement in AI for Social Good.....	120
Toward Artificial General Intelligence: A New Pathway in Undergraduate AI Research at Walsh University.....	124
Profiling AI-TPACK Readiness for Agentic AI Integration: Evidence from Ghanaian Preservice Teachers	128
Preservice Teachers' AI Ethical Reflection (AIER): A Multi-Analytical Approach Using Network, Latent Profile, and Multivariate Analyses	133

Letter from the Editors

Inspiration in Faith and Innovation: A Collaborative Commitment to Academic Excellence

This publication is born from a shared mission, a calling to serve students through the pursuit of academic excellence, always in harmony with *Walsh University's* Catholic identity and institutional mission. *Walsh University*, in collaboration with the *University of Cape Coast*, continues to foster academic excellence and innovation across diverse contexts.

Walsh University has been recognized by the *Cardinal Newman Society* for its fidelity to Catholic education. The *University of Cape Coast* is a premier higher education institution in Ghana and Africa, recognized as the *Africa Outstanding University of the Year at the 2026 Africa Education Summit*. Also, the *University of Cape Coast* was ranked *first in Ghana and West Africa and eleventh in Africa in the 2025 Times Higher Education rankings*. Building on this shared foundation, we envisioned a space where faith and intellect converge, and where students, faculty, and researchers alike can give voice to their ideas, discoveries, and innovations.

Today, we are humbled and grateful to present *Walsh University's Inspirations in AI Innovation, Volume 3*. This work is more than a collection of research; it is a testament to the boundless creativity that God has placed in the human spirit. Guided by His wisdom, we seek to cultivate innovation not merely for its own sake, but as a means of service to improve lives, expand knowledge, and inspire the next generation of scholars across the globe.

We honor the dedication of the authors whose contributions fill these pages, and we encourage them to continue pursuing truth with courage, excellence, and humility. We also extend our heartfelt gratitude to *Walsh University* for its steadfast support in making this scholarly work possible.

May this volume ignite new ideas, deepen faith, and strengthen our shared resolve to transform education and research for the greater good. May God's blessings accompany you at every step of your academic journey.

With hope and inspiration,

DR. AMY J. HESTON

Editor-in-Chief

Walsh University (North Canton, Ohio, USA)

Email address: aheston@walsh.edu

Contact: +1 330 401 9412

DR. FRANCIS ARTHUR

Editor-in-Chief

University of Cape Coast (Central Region, Cape Coast, Ghana)

Email address: a.francis1608@gmail.com/francis.arthur007@stu.ucc.edu.gh

Contact: +233 246558939

Entangled Selves in the Age of AI: Moral Responsibility and Identity in the Sale of Digital AI Twins

Ferdinand Fosu-Blankson
University of Ghana (Accra, Ghana)
ferdblankson@gmail.com

The sale and licensing of digital AI twins to third parties are emerging practices that pose significant identity crises and spur debates in contemporary AI ethics and policy (Ishiguro, 2022; Gunkel, 2023). These algorithmic systems, designed to replicate the identity, expressions, and behavioural patterns of living individuals, act as autonomous agents or as neutral commercial assets. This paper argues that the practice is conceptually inadequate because it fails to account for *the entanglement of identity* between the living individual and their digital AI twin.

The argument is that digital AI twins are neither ontologically autonomous nor socially separable from their human originals (Kocarev & Koteska, 2020). Instead, they function as *entangled identity extensions*: the moral trajectory, actions and public standing of the living individual shape how the AI twin is interpreted (Schechtman, 1996; Floridi, 2013), while the AI twin's deployment and use have a consequential effect on the living person's reputational, moral, and social identity (Shoemaker, 2021). This entanglement persists even where legal disclaimers or contractual autonomy are asserted (Behdadi & Munthe, 2020; Sweeney, 2023). This poses an identity crisis in the minds of many observers in society as they battle with disentangling the identities. For instance, this problem has persisted for movie actors over the years as some of them assume roles due to professional or artistic credence and business returns, yet their inner identity battles the various assumed professional characters. “Khaby Lame's fan-based commercialization could generate more than \$4 billion in annual sales”: this is the headline that launches the tight-lipped comedy skits artist. The sold brand, which is based on the digital identity, remains vulnerable to other commercial usage despite Khaby being a controlling shareholder. The question remains how much control he could get to control the brand use on functions that do not align with personal values. The contract targets a short-time monetization and long-term brand building with a diminished moral rhythm.

Policy frameworks such as consent-based data protection under the General Data Protection Regulation and Intellectual Property and Licensing Models that rely solely on consent, ownership, or liability assignment overlook the social reality of moral attribution (European Parliament News, 2023). Beyond the fluidity of identity, it is proposed that a morally stimulated policy-oriented framework is required. One that treats digital AI twins as derivative yet morally consequential identity artefacts. Such a framework requires continuous consent mechanisms, strict contextual limitations on use, and shared-responsibility models that reflect social perception rather than legal abstraction and commercial maximisation alone.

References

- Behdadi, D., Munthe, C. (2020). A normative approach to artificial moral agency. *Minds Mach.* 30(2), 195–218 (2020). <https://doi.org/10.1007/s11023-020-09525-8>
- European Parliament News. (2023). *MEPs ready to negotiate first-ever rules for safe and transparent AI*. Retrieved from <https://www.europarl.europa.eu/news/en/press-room/20230609IPR96212/mepsready-to-negotiate-first-ever>

- Floridi, L. (2013). *The ethics of information*. Oxford University Press.
- Gunkel, D. (2023). *Person, Thing, Robot*. Cambridge, MA: MIT Press (2023)
- Ishiguro, H. (2022). Realisation of the Avatar Symbiotic Society: The Concept and Technologies. In Hakli, R. et al. (eds.), *Social Robots in Social Institutions*. Amsterdam: IOS Press: 623.
- Kocarev, L., & Koteska, J. (2020). Digital me ontology and ethics. *arXiv preprint arXiv:2012.14325*.
- Schechtman, M. (1996). *The constitution of selves*. Cornell University Press.
- Sweeney, P. (2023). Avatars as proxies. *Minds and Machines*, 33, 525–539.
<https://doi.org/10.1007/s11023-023-09643-z>

Artificial Intelligence Use and Postgraduate Student Satisfaction in Higher Education: The Mediating Role of Learning Engagement in Ghana

Reuben Kwadzo Gblonyah (PhD[c])
Department of Business and Social Science Education
University of Cape Coast (Cape Coast, Ghana)
reuben.gblonyah@stu.ucc.edu.gh

The growing integration of artificial intelligence (AI) in higher education has created new opportunities to improve teaching, learning, assessment, and academic support systems (Chiu, 2023; Kasneci et al., 2023). Generative AI tools such as ChatGPT are increasingly used by university students to support academic writing, idea generation, information synthesis, and problem-solving, thereby reshaping how students interact with academic content (Dempere et al., 2023; Tlili et al., 2023). When used within pedagogically sound learning environments, these tools offer opportunities for personalised learning, real-time feedback, adaptive academic support, and improved learning efficiency (Chiu, 2023; Kasneci et al., 2023). However, AI use in higher education also raises concerns about academic integrity, overreliance, reduced originality, and weakened critical engagement when students use AI tools passively rather than reflectively (Bin-Nashwan et al., 2023; Cotton et al., 2024; Tlili et al., 2023).

Although the literature on AI in higher education is expanding, much of the existing research has focused on adoption, perceived usefulness, behavioural intention, academic integrity, and performance-related outcomes (Bhullar et al., 2024; Chiu, 2023). Less attention has been paid to how AI use affects students' satisfaction with their learning experience, particularly among postgraduate students in developing higher education contexts (Almufarreh et al., 2024; Almassaad et al., 2024). This gap is important because student satisfaction is not only a measure of service quality but also an indicator of how students evaluate the relevance, usefulness, and effectiveness of their learning experiences (Almufarreh et al., 2024). In AI-supported learning environments, satisfaction may depend less on access to technology alone and more on whether AI tools enhance students' meaningful engagement with learning activities (Balalle et al., 2024; Noroozi et al., 2025).

Learning engagement is an important lens for understanding how AI use may influence satisfaction, as it captures students' behavioural participation, cognitive investment, and emotional involvement in learning (Balalle et al., 2024). Recent evidence suggests that technology-enhanced learning environments improve student outcomes when they support active participation, self-regulated learning, interaction, and deeper cognitive processing (Balalle et al., 2024; Noroozi et al., 2025). Similarly, emerging AI-in-education studies indicate that generative AI can support learning when used to stimulate inquiry, scaffold understanding, and strengthen students' ability to engage with academic content (Kasneci et al., 2023; Qi et al., 2025). However, AI may weaken learning engagement when students use it as a shortcut for task completion rather than as a tool for reflective learning and knowledge construction (Bin-Nashwan et al., 2023; Cotton et al., 2024).

This study therefore examines the relationship between AI use and postgraduate student satisfaction, with learning engagement serving as a mediator. Specifically, the study assesses the effect of AI use on student satisfaction, examines the effect of AI use on learning engagement,

analyses the effect of learning engagement on satisfaction, and tests whether learning engagement mediates the relationship between AI use and satisfaction. By focusing on postgraduate students in Ghana, the study contributes to the limited empirical literature on AI-supported learning in Sub-Saharan African higher education contexts and responds to calls for context-sensitive research on AI integration in education (Chiu, 2023; Noroozi et al., 2025).

A quantitative research design was adopted, using survey data collected from 534 postgraduate students at selected Ghanaian universities. The data were analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM), which is appropriate for examining complex predictive models involving latent constructs, mediation effects, and non-normal data in educational research (Hair & Alamer, 2022). The results showed that AI use had a significant positive effect on learning engagement ($\beta = 0.573$, $p < .001$), indicating that students who use AI tools are more likely to be actively involved in learning. Learning engagement also had a strong positive effect on student satisfaction ($\beta = 0.770$, $p < .001$), suggesting that engaged students are more likely to evaluate their postgraduate learning experience positively. Although AI use had a significant direct effect on student satisfaction ($\beta = 0.134$, $p < .001$), mediation analysis showed that learning engagement carried a stronger indirect effect ($\beta = 0.390$, $p < .001$), indicating that AI improves satisfaction mainly when it enhances engagement.

These findings suggest that universities should move beyond merely encouraging AI adoption and instead promote pedagogically guided AI integration to strengthen student engagement. Higher education institutions should develop AI literacy programmes, provide ethical-use guidelines, and train lecturers to design learning activities that prompt students to evaluate, critique, and meaningfully apply AI-generated outputs. Policymakers should also support digital infrastructure, responsible AI policies, and inclusive learning environments that enable postgraduate students to use AI tools productively and ethically. Overall, the study shows that AI use can enhance postgraduate student satisfaction, but its strongest contribution is through learning engagement.

References

- Almassaad, A., et al. (2024). Student perceptions of generative artificial intelligence in higher education. *Systems*, 12(10), 385. <https://doi.org/10.3390/systems12100385>
- Almufarreh, A., et al. (2024). Determinants of students' satisfaction with AI tools in higher education. *Sustainability*, 16(13), 5354. <https://doi.org/10.3390/su16135354>
- Balalle, H., et al. (2024). Exploring student engagement in technology-based learning environments. *Social Sciences & Humanities Open*, 100870. <https://doi.org/10.1016/j.ssaho.2024.100870>
- Bhullar, P. S., et al. (2024). ChatGPT in higher education: A synthesis of the literature and bibliometric analysis. *Education and Information Technologies*. <https://doi.org/10.1007/s10639-024-12723-x>
- Bin-Nashwan, S. A., et al. (2023). Use of ChatGPT in academia: Academic integrity hangs in the balance. *Technology in Society*, 75, 102370. <https://doi.org/10.1016/j.techsoc.2023.102370>
- Chiu, T. K. F. (2023). Systematic literature review on opportunities, challenges, and future research recommendations of artificial intelligence in education. *Computers and Education: Artificial Intelligence*, 4, 100118. <https://doi.org/10.1016/j.caeai.2022.100118>

- Cotton, D. R. E., Cotton, P. A., & Shipway, J. R. (2024). Chatting and cheating: Ensuring academic integrity in the era of ChatGPT. *Innovations in Education and Teaching International*, 61(2), 228–239. <https://doi.org/10.1080/14703297.2023.2190148>
- Dempere, J., Modugu, K., Hesham, A., & Ramasamy, L. K. (2023). The impact of ChatGPT on higher education. *Frontiers in Education*, 8, 1206936. <https://doi.org/10.3389/feduc.2023.1206936>
- Hair, J., & Alamer, A. (2022). Partial least squares structural equation modeling (PLS-SEM) in second language and education research: Guidelines using an applied example. *Research Methods in Applied Linguistics*, 1(3), 100027. <https://doi.org/10.1016/j.rmal.2022.100027>
- Kasneci, E., Sessler, K., Küchemann, S., Bannert, M., & Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences*, 103, 102274. <https://doi.org/10.1016/j.lindif.2023.102274>
- Noroozi, O., et al. (2025). Artificial intelligence in higher education: Impact on learning and teaching. *Innovations in Education and Teaching International*. <https://doi.org/10.1080/14703297.2025.2539579>
- Qi, X., et al. (2025). A systematic review and meta-analysis of the effectiveness of generative AI in education. *Computers and Education: Artificial Intelligence*, 6, 100455. <https://doi.org/10.1016/j.caeai.2025.100455>
- Tlili, A., Shehata, B., Adarkwah, M. A., & Bozkurt, A. (2023). What if the devil is my guardian angel: ChatGPT as a case study. *Smart Learning Environments*, 10, 15. <https://doi.org/10.1186/s40561-023-00237-x>

Bridging the Equity Gap: How Generative AI Can Build Digital Capital for Underserved Students

Amelia L. Marsh

School of Education: Higher Education Administration

Saint Louis University (Missouri, USA)

amelia.marsh@slu.edu

Émile Durkheim explains that an educational system will evolve based on what the current society deems as important (Durkheim, 1922). Today, artificial intelligence is becoming an integral part of society. When underserved students are taught how to effectively use generative AI, they can grow their digital capital, which could narrow the equity gap (Ragnedda & Ruiu, 2020; Yosso, 2005).

Pierre Bourdieu explains that every individual possesses forms of capital that can be accumulated over time. Each capital has the “potential capacity to produce profits and to reproduce itself in identical or expanded form” (Bourdieu, 1986, p. 15). Massimo Ragnedda builds upon Pierre Bourdieu's forms of capital by introducing digital capital. Digital capital is “the accumulation of digital competencies (information, communication, safety, content-creation and problem solving) and digital technology” (Ragnedda & Ruiu, 2020, p. 30).

Digital capital is considered a bridge capital because its outcomes can be transferred from the digital space to other forms of capital such as economic, cultural, human or social capitals (Ragnedda & Ruiu, 2020). One instance of how digital capital can be converted into other forms of capital is with LinkedIn. In the context of a college student, a student would need to have the digital competency to make a LinkedIn profile and know how to properly navigate the platform. LinkedIn users can elevate their experience by utilizing its AI-assisted search engines to more efficiently find professional development opportunities that align with their interests. Once a student has an established LinkedIn profile, they can begin to make professional connections and build their social capital in the digital realm. Students will have a higher social capital if they have a larger network and to maintain this network, individuals must invest in these relationships (Bourdieu, 1986). If a student were to acquire an internship or full-time position through LinkedIn, their social and economic capital would be converted into the offline world. Because the student would be communicating with other professionals outside of the digital realm, they would be investing in their economic capital because of the monetary amount earned from the position. This demonstrates how important it is for higher education to teach how to advance digital competencies because it will empower its underserved students to grow their digital capital (Ragnedda & Ruiu, 2020).

When underserved students learn digital competencies, their digital capital will grow. For the academically underprepared students, generative AI tools such as ChatGPT can help the student better understand a concept through personalized learning. Additionally, because there is 24/7 access to generative AI, first-generation students can use these tools to look up information in the privacy of their own space on topics about college without feeling embarrassed about things they should already know (Johnson & Davis, 2024). Generative AI also provides greater access to rural students who may have historically been excluded from higher education. Rural students can attend class online, complete assignments from their homes and have a more enriching

learning experience instead of having to be physically on the college campus. These examples clearly demonstrate how generative AI can foster inclusivity within higher education (Chan & Colloton, 2024; Johnson & Davis, 2024).

Generative AI can also assist students who come from lower socioeconomic backgrounds. These students can use generative AI tools such as RaiseMe to find grants or scholarships they may be eligible for to help fund their post-secondary education. They can also use large language models, such as ChatGPT to find local resources if they are experiencing food insecurity or need assistance with finding affordable housing. Generative AI can also support students with disabilities because it encompasses advanced accessibility features and can tailor information in a way that helps students best process information, such as using the generative AI tool, Mindgrasp (Addy et al., 2024; Johnson & Davis, 2024; Yosso, 2005).

Generative AI is here to stay and higher education's social contract with society is to prepare students not only for an AI-workforce, but also on how to be well-informed citizens who are leaders and can give back to their communities (Harper & Saltmarsh, 2024; Weisbrod et al., 2008). This technology has the potential to lower the equity gap for underserved students by providing greater support and access to resources and information.

References

- Addy, T., Kang, T., Laquintano, T., & Dietrich, V. (2024). Who benefits and who is excluded? Transformative learning, equity, and generative artificial intelligence. *Journal of Transformative Learning*, 10(2). <https://jotl.uco.edu/index.php/jotl/article/view/518>
- Bourdieu, P. (1986). The forms of capital. In J. Richardson (Ed.), *Handbook of theory and research for the sociology of education* (pp. 241-258). Greenwood.
- Chan, C. K. Y., & Colloton, T. (2024). *Generative AI in higher education: The ChatGPT effect*. Routledge.
- Durkheim, É. (1956). The nature and method of pedagogy. In S. D. Fox (Trans.), *Education and sociology* (pp. 23–35). Free Press. (Original work published 1922)
- Harper, J. & Saltmarsh, J. (2024) Pausing in Pursuit of a New Social Contract Between Higher Education and Society, *Change: The Magazine of Higher Learning*, 56:2, 4-10, DOI: 10.1080/00091383.2024.2322907
- Johnson, D. L., & Davis, C. G. (2024). Bridging the gap for underserved populations: Personalized AI solutions for college access and learning support. *New Directions for Higher Education*, 207, 47–62. <https://doi.org/10.1002/he.20511>
- LinkedIn. (2023). *What is LinkedIn and how can I use it?* LinkedIn Help Center. <https://www.linkedin.com/help/linkedin/answer/a548441>
- Ragnedda, M., & Ruiu, M. L. (2020). *Digital capital: A Bourdieusian perspective on the digital divide*. Emerald Publishing Limited
- Weisbrod, B.A., Ballou, J.F., & Asch, E.D. (2008). Mission and money: Understanding the university. New York, NY: Cambridge University Press, Chapters 1, An Introduction to the Higher Education Industry. Retrieved from http://assets.cambridge.org/9780521515108/excerpt/9780521515108_excerpt.pdf
- Yosso, T. J. (2005). Whose culture has capital? A critical race theory discussion of community cultural wealth. *Race Ethnicity and Education*, 8(1), 69–91. <https://doi.org/10.1080/1361332052000341006>

Vertical Migration of Microplastics in Soil Powered by AI-Assisted Quantification, Polymer Identification, and Depth-Risk Prediction

Robert Cobbinah

Dr. Albert Eshun

Department of Laboratory Technology, University of Cape Coast (Cape Coast, Ghana)

robert.cobbinah001@stu.ucc.edu.gh; albert.eshun@ucc.edu.gh

Abstract

Microplastics (MPs), tiny plastic pieces smaller than a grain of rice, are quietly building up in agricultural soils around the world. In Ghana, there is not yet a clear picture of how deep these plastics go or which types are most common. This study will have two main goals: first, to measure how microplastics move down through different soil layers on the University of Cape Coast (UCC) farm, and second, to test whether artificial intelligence (AI) can help count particles, identify plastic types, and predict contamination risk faster than traditional methods alone. Soil will be collected from three depths (0–10 cm, 10–20 cm, and 20–30 cm), microplastics will be extracted, and analyses will be conducted using both standard laboratory techniques (FTIR spectroscopy) and a custom AI model. It is expected that microplastic abundance will be highest in the topsoil and will decrease with depth. The AI system will classify particles by shape (fiber, fragment, or bead), color, and polymer type (Polyethylene, Nylon, Polystyrene, and Polyester). Statistical tests (Chi-square, Cramér's V) will be used to determine relationships between particle shape, circularity, and polymer type. The study is expected to demonstrate that AI can significantly accelerate microplastic analysis and help predict which particles are most likely to move deeper into the soil, posing a risk to groundwater and food crops.

The Problem

Imagine walking through a farm. The soil may look healthy but hidden inside may be millions of microscopic plastic pieces. These may originate from plastic mulch films, compost, sewage sludge, and even from plastic waste breaking down in the sun. While microplastics are known to exist in many environments, there remains a major gap in evidence: how far down do they travel in Ghanaian farmland? Do they remain near the surface, or do they move deep enough to reach root crops or groundwater? Answering these questions is urgent because microplastics can carry toxic chemicals and may eventually enter the food chain.

How AI Fills the Gap

Traditional microplastic analysis is slow and tiring. A human looking through a microscope must count every particle, estimate its shape, measure it, and note its color. Then, expensive machines like FTIR are needed to confirm the plastic type. This process can take days or weeks.

This is where artificial intelligence may change the game. For this study, a simple AI architecture will be designed to work in three steps:

1. Input: The system will take three things—the depth layer, a microscope image of the particle, and FTIR-confirmed polymer data.

2. Processing: A machine learning algorithm will analyze the particle's shape, size, and color and compare these features to a library of known microplastics.

3. Output: The AI will predict the polymer type and calculate a depth-risk score, representing the likelihood that the particle can move down to the next soil layer.

Using this AI-assisted approach, analysis time is expected to be reduced significantly compared to manual methods. The AI is expected to be especially effective at distinguishing fibers from fragments.

Field and Lab Work

Composite soil samples will be collected from three depths (0–10 cm, 10–20 cm, 20–30 cm) at the UCC farmland. In the laboratory, density separation and hydrogen peroxide digestion will be used to remove organic matter, after which the samples will be vacuum-filtered. The particles will be stained with Nile Red dye and examined under a microscope. Finally, the images will be fed into the AI model for classification.

Expected Findings

- Abundance is expected to decrease with depth.
- Fragments are expected to be the most common shape, followed by fibers and beads.
- FTIR and AI are expected to identify Polyethylene (PE), Nylon, Polystyrene (PS), and Polyester.
- Statistical analyses are expected to reveal significant relationships between shape, circularity, and polymer type.

Why This Matters for the Future

This research will not only focus on counting plastic pieces but will also contribute to the development of a smarter monitoring system. With AI, a laboratory technician in Ghana may one day take a soil sample, photograph it with a standard microscope, and obtain a risk prediction in minutes instead of weeks.

The study is expected to provide baseline data for Ghana that other researchers can build upon. It may also indicate whether microplastics are present in deeper soil layers and whether they pose potential risks to groundwater and food crops.

Limitations and Next Steps

First, the study will be limited to one farm and a depth of only 30 cm. Second, the AI model may initially be limited by the number of training images available. Third, minor laboratory contamination cannot be completely ruled out, although blanks and cotton clothing will be used to minimize contamination.

Recommendations

- Farmers should reduce plastic mulch use and properly dispose of plastic waste.
- Researchers should consider using both AI and FTIR together.
- Policymakers should begin monitoring agricultural soils for microplastics before the problem becomes severe.

Conclusion

This study will investigate the vertical migration of microplastics in UCC farmland soil and evaluate the potential of AI-assisted analysis. By combining traditional chemistry with machine learning, the research is expected to provide a faster and smarter approach to environmental monitoring in Ghana. The next step will be to expand the AI model, train it on more images, and develop it into a free, open-source tool for laboratory use.

References

- Bolan, N. S., Kirkham, M. B., Halsband, C., Nugegoda, D., & Ok, Y. S. (2020). Particulate plastics in terrestrial and aquatic environments. CRC Press.
- de Souza Machado, A. A., Lau, C. W., Till, J., Kloas, W., Lehmann, A., Becker, R., & Rillig, M. C. (2018). Impacts of microplastics on the soil biophysical environment. *Environmental Science & Technology*, 52(17), 9656–9665.
- Möller, J. N., Löder, M. G. J., & Laforsch, C. (2020). Finding microplastics in soils: A review of analytical methods. *Environmental Science & Technology*, 54(4), 2078–2090.
- Ranjan, V. P., Joseph, A., Sharma, H. B., & Goel, S. (2022). Effects of size and polymer type on vertical mobility of microplastics in porous media. *Science of the Total Environment*, 807, 150563.
- Zhang, B., Yang, X., Chen, L., Chao, J., Teng, J., & Wang, Q. (2020). Microplastics in soils: Sources, analytical methods and ecological impacts. *Journal of Chemical Technology & Biotechnology*, 95(8), 2054–2065.

Agentic AI as a Reliable STEM Tutor for African College Preparation: Evaluating Reliability, Hallucination Risk, and Citation Accuracy Across STEM Disciplines

George D. Hicks
Ronny O. Donkor
Amy J. Heston, Ph.D.
Walsh University (Ohio, USA)

Andrew A. Doku
Lead for Ghana (Accra, Ghana)
ghicks3@walsh.edu; rdonkor1@walsh.edu; andrewdoku7@gmail.com

Project Overview

Three African researchers—majoring in actuarial science, computer science, and chemistry—test whether agentic AI can act as a safe, accurate tutor for college preparation across African contexts without inventing facts or sources. Using standardised prompts in insurance, cyber security fundamentals, and chemistry calculations (unit conversion, Avogadro’s number, energy of a reaction), they run repeated trials across multiple AI models under identical constraints. Outputs are scored for correctness, clarity, context fit, citation validity, and consistency.

Project Details

Researchers from South Africa and Ghana will investigate a practical “AI for good” question: can agentic AI function as a trustworthy tutor for college-level STEM? This matters because STEM learning requires accurate reasoning, correct formulas, reliable references, and feedback that adapts to mistakes. The project builds on the distinction between generative AI and agentic AI. Generative AI usually produces answers, while agentic AI guides learning toward a goal, checks understanding, and adjusts support over multiple steps. As shown in Figure 1, the project is visually represented through a Gamma-generated image of a student learning from an agentic AI platform.

Figure 1: Gamma-generated image showing a student learning from an agentic AI platform



If reliable, agentic AI could provide step-by-step practice, adaptive explanations, immediate feedback, and targeted revision for learners who lack access to private tutoring. This could support more equitable university preparation in South Africa and Ghana. If unreliable, however, agentic AI could scale misinformation through incorrect formulas, fake citations, or unsupported local examples.

Using a controlled protocol, the team compared multiple AI models on three equally weighted prompt sets. The actuarial science set tested insurance pricing, reserving triangles, risk pooling, and inflation-driven claim costs. The computer science set tested coding basics, algorithmic complexity, database normalization, integrity constraints, and error explanation. The chemistry set tested concentration calculations, stoichiometry, unit conversion, and enthalpy from balanced equations and data.

The study also examined localization. Core subject knowledge does not change by country, but AI often adapts examples, tone, laws, curriculum references, and institutions to fit the learner's setting. This can make examples feel relevant, such as rand-based actuarial problems or Ghanaian classroom examples. However, localization can create believable errors if the model invents regulations, institutions, curriculum details, or country-specific facts. Figure 2 summarizes the expected finding that agentic AI is most useful as a support tool rather than a replacement for human expertise, while localized delivery must still be verified.

Figure 2: Overall findings from the project presentation showing that agentic AI is most valuable as a support tool, that core subject knowledge remains unchanged, and that localized delivery requires verification (Gamma AI)



To reflect agentic tutoring, each model must diagnose misconceptions, provide a guided solution path with checks, generate targeted practice questions, and give feedback. It must also produce two to three verifiable references. Prompts will be rerun to measure whether each model remains correct and consistent across attempts.

A shared rubric will score correctness, clarity, context fit, citation validity, consistency, and honest uncertainty. Hallucinations will be tagged as fake sources, invented statistics, wrong

formulas, incorrect units, unsafe advice, or unsupported local claims. The actuarial and chemistry students will build correctness keys, while the computer science student will manage the protocol and reliability analysis. Deliverables will include a reliability profile, a comparison of generative versus agentic tutoring behavior, and a classroom-ready “safe tutor” checklist.

Mission Alignment

This project aligns with Walsh University’s mission because it promotes critical thinking, communication, academic excellence, international perspective, and service to others through values-based education. Walsh prepares students to become leaders in service to others, and this project applies that mission by asking how AI can support safer, more equitable STEM learning across African contexts. It also connects with Lead for Ghana’s commitment to expanding access to excellent education and developing leaders who solve educational challenges. By testing AI tutoring reliability rather than assuming it is automatically beneficial, the project reflects both organizations’ shared concern for ethical leadership, educational equity, and meaningful impact.

Conclusion

This project shows that agentic AI can be valuable as an educational support tool, but only with human oversight, verification, and care. In alignment with Walsh University’s mission and Lead for Ghana’s commitment to service, this work aims to advance education by helping students access safer STEM tutoring. It also helped us grow as student researchers by strengthening collaboration, international teamwork, AI skills, and ethical evaluation. Ultimately, this project reflects faith-driven, service-centered innovation by using AI to support learning, equity, and the common good.

References

Grok AI: grok.com

ChatGPT: www.chatgpt.com

Gamma AI: www.gamma.app

AI in Teaching, Evaluation, & Assessment

Laura Ayuso del Hoyo
Moise Bahuwimbuye
Johanna Haynes
Kyle Wedner
Dannielle Joy Davis, Ph.D.
Saint Louis University (Missouri, USA)
dannielle.davis@slu.edu

The use of artificial intelligence (AI) in educational settings for teaching and assessment has risen exponentially in recent years. This presentation explored benefits and challenges of using artificial intelligence in educational settings for student learning, to overcome barriers, and to promote teaching effectiveness. While there are numerous benefits to using artificial intelligence as an educational tool, these must be considered through a culturally responsive, critical lens when working with traditionally marginalized populations. The educational use of AI brings forth questions regarding ethics, regulations needed to ensure equitable practices, and digital equality. The professional presentation served as research-centered, experiential learning for educators enrolled in the graduate course, “Culturally Responsive Teaching and Assessment.”

While applying culturally responsive teaching as a framework (Gay, 2018), the class sought to explore practices, tools, and processes of teaching, learning, and assessment rooted in the identities of their K-12 students. Some benefits of AI for these teachers include personalized learning for students and individualized experiences or personalized assessment. If teachers have large course loads with many students, it can be difficult to meet the needs of students because of time restraints. AI tools may help reduce the workload for teachers and clear time to devote to other parts of their jobs.

AI also can provide data insight that supports better teaching decisions. If teachers are able to see where students are and how they're performing, AI may help guide decision making on how to adjust teaching to meet the needs of learners. It might also help address blind spots that teachers may not see. For instance, experts in their fields regularly use phrases or terms that are commonplace within the profession. However, sometimes educators forget that field-specific terms are not familiar to everyone, especially to students. AI can be used as a tool to check for these potential blind spots (Schwartz, 2025) as educators develop curriculum materials.

In addition, there has been a push in some American school systems to promote project-based learning, where students create projects through learning processes while applying course content (Ruiz, Sánchez, & Ruiz, 2025). Using AI within project-based learning may facilitate self-directed projects. Research shows that this may result in better student outcomes, as long as AI does not thwart critical thinking or authenticity.

The challenges of using artificial intelligence in educational settings center upon promoting ethical practices, digital equality, and avoiding over-reliance upon it (Hansen & Renguette, 2024). Limited infrastructure availability is an ethical concern, as not all schools or students have access to the same types of technology. Data privacy issues would need to be addressed for safe and equitable environments suitable for students. Further, overreliance on AI may reduce both

healthy human interaction and critical thinking, which is exacerbated by some AI reinforcing social inequalities due to being trained on biased data.

References

- Gay, G. (2018). *Culturally responsive teaching: Theory, research, and practice* (3rd ed.). Teachers College Press.
- Hansen, M., & Rengnette, C. (2024). Applying a diversity, equity, inclusion, and justice (DEIJ) lens to assessment. In S. P. Hundley & C. J. Keith (Eds.), (2nd ed., pp. 20–38). Routledge.
- Ruiz, V., Sánchez R., & Ruiz P. (2025). The Role of Artificial Intelligence in Project-Based Learning: Teacher Perceptions and Pedagogical Implications. *Education Sciences*, 15(2):150.
- Schwartz, D. L. (2025). Achieving an adaptive learner. *Educational Psychologist*, 60(1), 7–22.

Artificial Intelligence as a Design Assistant in Architectural Concept Development and Planning

Hardi Wahab Ahmed
Nohara Yousif Odeesh
Zaia Mazin Warda
Joudy Fouad Bayda

Catholic University in Erbil (Erbil, Kurdistan Regional Government, Iraq)
hardi@cue.edu.krd; cuear21023@cue.edu.krd; cuear21020@cue.edu.krd;
cuear21014@cue.edu.krd

Project Overview

Artificial Intelligence (AI) is transforming many fields including architecture by providing new tools that support design development and decision-making. In architectural practice, AI can assist with concept generation, spatial planning, modelling, and design evaluation, which helps architects to progress their design workflow more efficiently and explore multiple design alternatives in a shorter time. However, architectural design is not only a technical process; it also involves cultural understanding, environmental response, user experience, and creative thinking. This study explores the use of AI tools throughout the design process of a contemporary courtyard villa in Duhok city, Iraq, by examining AI-generated concepts, planning solutions, and error detection capabilities. The research evaluates both the advantages and limitations of AI in comparison with human-designed architecture.

Project details

This study uses a comparative approach to analyse Artificial Intelligence for architects by comparing traditional design methods with AI-assisted design. The comparison is based on key factors such as design speed, accuracy, creativity, and efficiency. Each factor is evaluated to show how AI changes the design process compared to manual methods. The results highlight the advantages and limitations of using AI in architectural practice. This process has been done by using the following AI tools:

ChatGPT, Gemini, Helonic AI, Claude, Revit PlanFinder

Case Study

1. Concept generation

The project began by providing basic information about the site, including its mountainous context and the intention to design a residential villa. Initial prompts were entered into AI systems such as ChatGPT, Claude, and Gemini to explore different design directions. Multiple concepts were generated, and a courtyard-based design approach was selected because it reflects traditional Iraqi housing principles while incorporating contemporary architectural solutions. After selecting the courtyard concept, more detailed prompts were provided to address privacy, climate response, Iraqi lifestyle requirements, and mountain views. AI-generated recommendations helped establish zoning strategies, spatial organization, environmental considerations, and volumetric relationships. The resulting proposal included a U-shaped villa organized around a central courtyard as shown in Figure 1, providing both environmental

benefits and social interaction spaces and design details after several improvements in the prompts were given for the purpose of rendering.

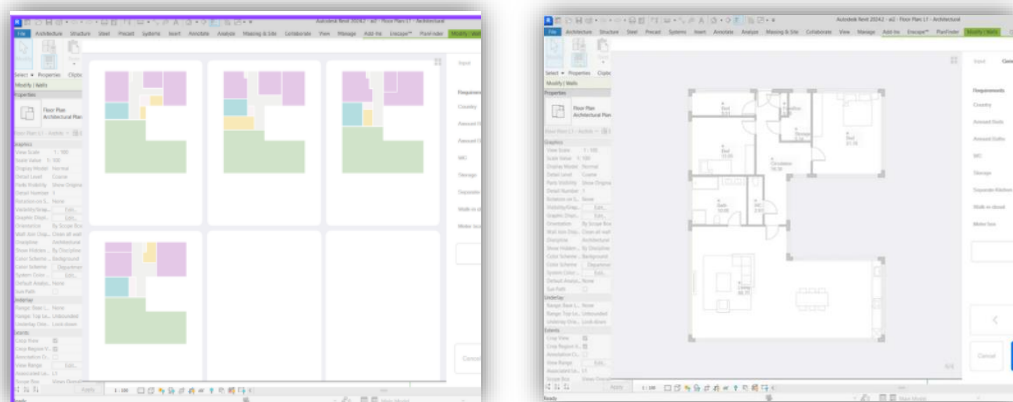
Figure 1. 3D and plan generation (Gamma AI)



2. Plan generation

The study also evaluated the use of Revit program's PlanFinder, which is an AI-assisted planning tool. Several floor plan alternatives were generated automatically using the plugin as shown in Figure 2. While the software provided quick planning solutions and efficient space allocation, the generated layouts often lacked cultural appropriateness, privacy considerations, and effective courtyard relationships. Compared with traditional Iraqi courtyard houses, many AI-generated plans failed to respond adequately to climate, social behaviour, and local architectural identity.

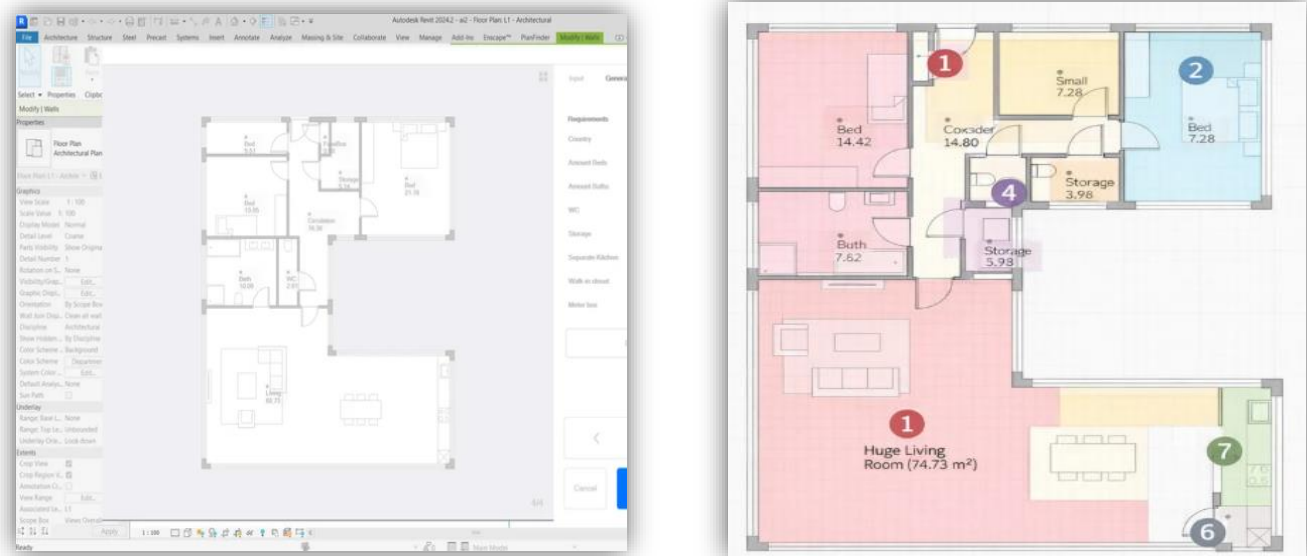
Figure 2. Generating plans by Revit plugin (PlanFinder)



3. Detecting errors

To further assess AI capabilities, Helonic AI was used for design review and error detection. The system identified circulation problems, privacy concerns, inefficient wet-zone organization, weak entrance hierarchy, daylight risks, and structural inconsistencies. AI-generated feedback helped improve the overall quality of the floor plan and demonstrated the potential of AI as a design evaluation tool.

Figure 3. Detecting errors of the design (Helonic AI)



Overall, the project revealed that AI can significantly accelerate concept development, planning, and analysis. However, successful architectural design still requires human judgment to interpret cultural values, user behaviour, spatial quality, and contextual factors.

Mission Alignment

The purpose of this research is to examine the different uses of AI for helping architects generate a wider understanding of the AI use for architectural design, which aligns with the conference's main objective, that is to showcase AI innovations for the purpose of improving the quality of life and the common good.

Conclusion

The study shows that AI can successfully assist architects during concept generation, planning, and design evaluation. AI tools improve efficiency, accelerate decision-making, and help identify design errors. However, human architects remain essential for addressing cultural values, contextual understanding, and meaningful spatial experiences. The most effective architectural outcomes are achieved through collaboration between AI technologies and human creativity.

References

ChatGPT: www.chatgpt.com

Claude: <https://claude.ai>

Gemini: <https://gemini.google.com>

Revit PlanFinder: <https://www.autodesk.com>

Helonic AI: <https://helonic.ai>

Evaluating the Abilities of LLMs to Aid in Query Creation and Student Success in Learning Data Analytics

Maddox Kelly
Walsh University (Ohio, USA)
mkelly8@walsh.edu

Introduction

Generative AI has become more commonly used for a variety of tasks in the last few years. With this increased use, we find benefits and challenges. Despite these growing pains, AI has found a place in many industries. Data analytics is no different, and AI tools have already begun to find their way into many aspects of this field. From visualization to helping automate queries, these tools will make both performing and learning data analytics much easier than more traditional “by-hand” methods. It is in this area that this research focuses.

Methods

For simplicity purposes, this research will only focus on the evaluation of LLMs (large language models) and how accurately they generate queries. These tools, specifically Claude, ChatGPT, Gemini, Grok, Copilot, Perplexity, and Poe were provided with the same set of prompts, and their resulting queries were run to determine where they fail or where they succeed. This process helped determine if the tool could help students learn Structured Query Language (SQL) or other query languages. This study conducted three trials to gauge and evaluate the performance of each tool. Trial one assessed the ability of each tool to create queries when provided with a simple prompt. Trial two assessed and ranked each tool’s performance, however, with a much more robust prompt. Lastly, Trial three assessed and ranked each tool’s performance by providing each LLM with a sample query and tasking it with correcting mistakes.

Findings

Findings from Trial one showed that Copilot, Grok (Expert Mode), and Claude AI performed the best. Copilot was the most comprehensive tool, and included null handling, summary statistics, and Pearson correlation analysis. Grok (Expert Mode) results matched well with the provided prompt and yielded clean variations and refinement. Lastly, Claude AI provided clean formatting and insightful aggregate queries. These tools provided better statistical rigor compared to lower ranked tools, and additionally, gave dialect-specific advice and clear directions on when to use specific clauses. Although some tools performed better than others, each tool successfully created a variety of SQL queries that matched the directions provided in the prompt. These queries worked and ran smoothly with no issues. Table 1 below details the complete rankings of the selected tools, as well as the advantages and disadvantages of each LLM.

Table 1: Comparison Table for Trial 1

Tool	Advantages	Disadvantages	Overall Rank (1 = Best)
Copilot	Most comprehensive and analytical. Strong statistical support and dialect-specific guidance.	Slightly more complex for beginners. Assumes SQL dialect knowledge.	1
Grok (Expert)	Matches the exact request first, then offers clean refinements. Concise and focused.	Less statistical depth than Copilot.	2
Claude AI	Very clean formatting and strong focus on the requested columns. Highly readable.	No correlation or stddev; fewer variations.	3
Chat GPT (GPT-5.3)	Balanced and user-friendly. Good for iterative help and clarification.	No advanced stats or dialect notes.	4
Perplexity	Simple queries with useful filtering and grouping. Straightforward to follow.	Least analytical depth of the top entries.	5
Grok (Auto)	Very context-rich and helpful. Adds many useful refinement options.	Includes extra columns not requested, making it less precise.	6
Gemini	Simple core query plus useful grouping and filter ideas. Mentions data-type handling.	Sometimes adds unrequested columns and has scattered formatting.	7
PPoe.com	Provides basic queries and offers prompt tailoring for deeper analysis.	Least analytical depth; feels more like prompt advice than direct SQL help.	8

Findings for Trial two found Grok (Expert mode), Grok (Auto mode), and Perplexity to be top performers with the refined prompt. Grok (Expert mode) provided clear robust statistical analysis, deeper insight potential, clear comments, and next steps through its responses. Grok (Auto mode) provided similar depth, but provided extra tips, specific clause guidance, and more full coverage of analytic avenues. Perplexity was extremely thorough and provided dialect specific alternatives, as well as a variety of queries to perform different analyses. During this trial, the tools all performed well with the robust prompt and included a more educational tone. Additionally, the LLMs provided a variety of queries aimed at performing more in-depth analyses. Lastly, the tools all produced working queries, which ran smoothly when tested. Table 2 below details the rankings of the tools for Trial two and includes the advantages and disadvantages of each.

Findings for Trial three indicated that Gemini, Claude AI, and Grok (Auto mode) were the best performers. Gemini was the most thorough in identifying errors and suggesting clean fixes for the provided query. Claude AI provided an excellent comparison between the broken and polished queries. Lastly, Grok (Auto mode) included an accurate diagnosis, suggested corrections, and helpful improvements in its response. All the tools performed well in this trial, however, some offered less robust responses and lower ranked tools missed some nuances in the broken query. Similarly to previous trials, all of the LLMs produced working queries that ran with no issues. Table 3 below shows the rankings of each LLM used in Trial three, as well as their disadvantages, advantages, and trends found in their responses.

Table 2: Comparison Table for Trial 2

Tool	Advantages	Disadvantages	Overall Rank (1 = Best)
Grok (Expert)	Best overall match to the prompt. Clean, reusable, and statistically strong.	Minor repetition across Grok variants.	1
Grok (Auto)	Very deep coverage with helpful extra tips and strong analytical structure.	Slightly more verbose than Expert.	2
Perplexity	Extremely thorough and adaptable across SQL dialects. Strong fallback options and analysis breadth.	Slightly longer and more fragmented than Grok.	3
Chat GPT (GPT-5.3)	Broad, educational, and well structured. Excellent at window trends and reusable query patterns.	Some queries go beyond the exact request.	4
Copilot	Directly follows the prompt with a clean 6-query structure. Professional and concise.	Less statistically rich than the top entries.	5
Gemini (Pro)	Well organized and assumption-aware. Strong on thresholds and ranking logic.	Very similar to Copilot, with limited extra insight.	6
<u>Poe.com</u>	Flexible and reusable, with good breakdowns and tailoring support.	More back-and-forth and slightly less polished statistically.	7
Claude AI	Readable structure and thoughtful ordering. Good at making the analysis easy to follow.	Incomplete response due to length limits.	8

Table 3: Comparison Table for Trial 3

Tool	Advantages	Disadvantages	Trends	Overall Rank (1 = Best)
Gemini	Most thorough bug list; clean fixed query.	Slightly longer response.	Strong BigQuery syntax troubleshooting and cloud-specific best practices.	1
Claude	Excellent comparison table; polished corrected query.	Fewer bonus suggestions.	Highly readable, tabular explanations suited for students.	2
Grok	Accurate diagnosis; helpful extra improvements.	No visual summary table.	Concise fixes with practical, forward-looking enhancements.	3
Copilot	Clear formatting; detailed issue breakdown.	A few minor overstatements.	User-friendly debugging with checklist-style, integration-friendly extras.	4
Perplexity	Solid fixes; good error explanations.	Least formatted and visual.	Practical, adaptable fixes with follow-up questions.	5
ChatGPT	Clear issues; helpful query summary.	Less polished; missed some nuances.	Educational tone focused on explaining the why.	6
POE	Readable extra CTE; useful questions.	Verbose query; minor quoting confusion.	Iterative help with confirmation and clarification questions.	7

Conclusion

In conclusion, all three trials indicated that LLMs can successfully be used as a learning aid for students learning SQL and data analytics. The selected tools in this project demonstrated the ability of AI LLMs to create working queries based on simple and robust prompts, and additionally, identify and correct errors in broken queries. Although not a substitute for traditional methods, this research found that AI has the potential to become a useful learning aid for students exploring data analytics. This research aligns with the Walsh mission as it serves the common good and contributes to the field by exploring the uses of AI to aid in student learning in data analytics. Additionally, this project helps generate curiosity in educational technologies and brings attention to how AI technologies can be used to further improve data analytics at all levels.

References

ChatGPT: www.chatgpt.com
Claude AI: <https://claude.ai.com>
Copilot: <https://copilot.microsoft.com>
Gamma: <https://gamma.app/>
Gemini: <https://gemini.google.com>
Grok AI: grok.com
Perplexity: <https://www.perplexity.ai/>
Poe: <https://poe.com>

Empowering Future Generations: AI Innovation at FAMU DRS

Dr. April Ivery

Dr. Kelley Bolden Bailey

Florida Agricultural and Mechanical University (Florida, USA)

april.ivery@famu.edu; kelley.bailey@famu.edu

Abstract

This article examines how FAMU Developmental Research School (FAMU DRS) can use artificial intelligence (AI) to personalize K–12 learning while preserving educational equity. It highlights AI’s potential for adaptive instruction, real-time tutoring support, and data-informed decision-making, along with strategies to reduce administrative workload. The article also addresses key implementation challenges—particularly the digital divide, infrastructure readiness, and ethical risks such as privacy violations and algorithmic bias—by proposing a phased, pilot-based approach grounded in transparency and accountability.

Introduction

Educational systems face a dual responsibility: preparing students for a digitally driven world while ensuring equity and academic excellence. Laboratory schools such as FAMU DRS are uniquely positioned to pursue this mission because they can trial innovations, gather evidence, and refine approaches before wider adoption. On April 18, 2026, Dr. Kelley Bailey and Dr. April Ivery presented a roadmap for AI-enabled K–12 transformation at the 3rd International AI Conference hosted by Walsh University (Bailey & Ivery, 2026). Their presentation, “Empowering the Florida Agricultural & Mechanical University Developmental Research School (DRS) through AI Innovation,” provides a framework for integrating AI responsibly within a school setting.

This article synthesizes that framework and outlines how AI innovation at FAMU DRS can support both learning quality and fairness. The central goal is to use AI not as an add-on, but as an instructional and operational support that strengthens everyday teaching and learning for all students.

The Unique Landscape of FAMU DRS

FAMU DRS serves a K–12 population with diverse academic needs. The school’s philosophy pairs educational experimentation with equity-focused practice, treating advanced learning tools as a baseline opportunity rather than a privilege for a small group. Because of this mission, FAMU DRS can test AI-enabled instruction in ways that generate actionable findings while emphasizing student benefit, teacher usefulness, and ethical safeguards.

AI’s Role in Classroom Transformation

Integrating AI into classroom practice shifts education away from “one-size-fits-all” instruction. In the Bailey and Ivery (2026) framework, AI functions as an adaptive layer within instruction,

helping educators respond to student needs more efficiently and accurately. Specific capabilities include:

- **Personalized learning pathways:** Adjusting content, pacing, or supports so students encounter learning materials aligned to their current readiness.
- **Real-time tutoring support and feedback:** Offering immediate guidance when students experience difficulty, which can reduce the time between error and correction.
- **Data-informed analytics:** Supporting instructional decision-making by surfacing patterns in student progress that may be difficult to detect through manual tracking.

AI may also reduce administrative load through targeted automation—for example, streamlining routine tasks or supporting lesson-related organization—so teachers can focus more time on mentorship and direct instructional interaction.

Research in related educational contexts suggests that AI-supported environments can improve learning experiences and help connect theoretical knowledge with practical performance (Azizah et al., 2025). Further, integrating AI tools with personalized monitoring may enhance the evaluation of competencies and soft skills (Marengo et al., 2025).

Challenges and Strategic Integration

AI implementation introduces real risks and practical barriers. Persistent achievement gaps can worsen if AI access and benefits are uneven, especially where the digital divide limits devices, connectivity, or home support. Infrastructure limitations and insufficient teacher training may also slow adoption. Ethical risks are equally critical: automated systems can create or amplify bias, and student data can be exposed if privacy protections are weak (Holmes et al., 2023; Holmes & Porayska-Pomsta, 2022).

FAMU DRS addresses these issues through a deliberate integration strategy. The approach pairs adaptive AI systems and smart classroom supports with updated digital literacy curricula. Using targeted pilot programs, the school evaluates effectiveness in context, refines implementation based on evidence, and builds toward scalable adoption (Liu et al., 2025).

Ethical Framework and Future Steps

A sustainable AI transition requires an equity-first ethical framework. FAMU DRS emphasizes student data privacy, active efforts to reduce algorithmic bias, architectural transparency, robust staff ethics training, and clear accountability procedures to support fair decision-making.

The implementation plan proceeds in structured phases: initial infrastructure development and teacher training, followed by pilot programs to generate actionable data analytics that guide refinement (Mustafa et al., 2024). By combining careful evaluation with an explicit commitment to equity, FAMU DRS aims to establish a model for responsible AI-enabled K–12 education.

References

- Azizah, N., Hanafi, I., & Yusro, M. (2025). Artificial intelligence in vocational education: Perspectives and practices from a literature study. *Global Synthesis in Education Journal*, 3(2), 37–44. <https://doi.org/10.61667/w0efrt90>
- Bailey, K., & Ivery, A. (2026, April 18). *Empowering the Florida Agricultural & Mechanical University Developmental Research School (DRS) through AI Innovation* [Conference presentation]. 3rd International AI Conference, Walsh University.
- Holmes, W., Bialik, M., & Fadel, C. (2023). Artificial intelligence in education. *Data Ethics: Building Trust: How Digital Technologies Can Serve Humanity*, 621–653. <https://doi.org/10.58863/20.500.12424/4276068>
- Holmes, W., & Porayska-Pomsta, K. (2022). *The ethics of artificial intelligence in education*. Routledge. <https://doi.org/10.4324/9780429329067>
- Liu, Z., Cheon, S., Stanbury, A., Jiao, X., Xing, W., & Kang, H. (2025). Towards contextual-based AI: A scoping review of artificial intelligence in X reality for personalized learning. *Computers and Education: Artificial Intelligence*, 8, Article 100523. <https://doi.org/10.1016/j.caeai.2025.100523>
- Long, D. Y., Wang, S., Md Rashid, S., & Lu, X. T. (2026). Artificial intelligence in higher education: A systematic review of its impact on student engagement and the mediating role of teaching methods. *Frontiers in Education*, 10. <https://doi.org/10.3389/feduc.2025.1648661>
- Marengo, A., Pagano, A., Lund, B., & Santamato, V. (2025). Research AI: Integrating AI and gamification in higher education for e-learning optimization and soft skills assessment through a cross-study synthesis. *Frontiers in Computer Science*, 7. <https://doi.org/10.3389/fcomp.2025.1587040>
- Mustafa, M. Y., Tlili, A., Lampropoulos, G., Huang, R., Jandrić, P., Zhao, J., Salha, S., Xu, L., Panda, S., Kinshuk, N., López-Pernas, S., & Saqr, M. (2024). A systematic review of literature reviews on artificial intelligence in education (AIED): A roadmap to a future research agenda. *Smart Learning Environments*, 11(1). <https://doi.org/10.1186/s40561-024-00350-5>

Agentic AI-TPACK Among Preservice Teachers: A PLS-SEM Model of Ethical, Pedagogical, and Technological Knowledge Integration

Eric Boateng

Department of Business and Social Sciences Education
Faculty of Humanities and Social Sciences Education
University of Cape Coast, Cape Coast, Ghana
Email: eboateng017@stu.ucc.edu.gh
<https://orcid.org/0009-0009-1246-632X>

Francis Arthur, Ph.D.

Department of Business and Social Sciences Education
Faculty of Humanities and Social Sciences Education
University of Cape Coast, Cape Coast, Ghana
E-mail: a.francis1608@gmail.com
<https://orcid.org/0000-0001-7792-6563>

Francis Obeng Gyedu

Department of Business and Social Sciences Education
Faculty of Humanities and Social Sciences Education
University of Cape Coast, Cape Coast, Ghana
E-mail: francis.gyedu@stu.ucc.edu.gh
<https://orcid.org/0009-0009-4248-2064>

Emmanuel Quayson

Department of Business and Social Sciences Education
Faculty of Humanities and Social Sciences Education
University of Cape Coast, Cape Coast, Ghana
Email: equayson005@stu.ucc.edu.gh
<https://orcid.org/0000-0003-0400-401X>

Short Paper

The rapid evolution of Artificial Intelligence (AI) from assistive technologies to increasingly autonomous and agentic systems is transforming educational practice and teacher preparation worldwide (Luckin & Cukurova, 2019; UNESCO, 2024). Agentic AI systems possess the capacity to perform tasks, make recommendations, and support decision-making with varying levels of autonomy, creating new opportunities and challenges for classroom instruction. Consequently, preservice teachers require not only technological competence but also pedagogical, disciplinary, and ethical knowledge to integrate these systems effectively and responsibly (Ng et al., 2023; Holmes et al., 2022). Extending the Technological Pedagogical Content Knowledge (TPACK) framework, Agentic AI-TPACK provides a comprehensive perspective for understanding how future teachers develop the competencies necessary for sustainable AI integration in education (Koehler et al., 2014; Mishra & Koehler, 2006).

This study examined the structural relationships among AI Technological Knowledge (AITK), AI Content Knowledge (AICK), AI Pedagogical Knowledge (AIPK), AI Ethical Knowledge (AIET), and integrated Agentic AI-TPACK among preservice teachers in Ghana. The study was grounded in the AI-TPACK framework and informed by emerging scholarship on responsible

AI, teacher readiness, and ethical technology integration in education (Ng et al., 2023; Chiu, 2024). Understanding these relationships is essential because successful adoption of agentic AI in classrooms depends on teachers' ability to align technological capabilities with pedagogical goals, disciplinary content, and ethical considerations (Holmes et al., 2022; UNESCO, 2024).

A cross-sectional survey design was employed, involving 509 preservice teachers enrolled in teacher education programmes across selected higher education institutions in Ghana. Data were collected using an adapted AI-TPACK scale measured on a seven-point Likert scale. Partial Least Squares Structural Equation Modelling (PLS-SEM) was utilised to examine direct and indirect relationships among the study constructs and to assess the explanatory power of the proposed model. PLS-SEM is particularly suitable for theory development and predictive modelling in emerging educational technology research (Hair et al., 2022).

The findings revealed that AI Ethical Knowledge emerged as the strongest direct predictor of Agentic AI-TPACK, highlighting the centrality of ethical reasoning in preparing teachers for responsible AI integration. AI Pedagogical Knowledge and AI Content Knowledge also demonstrated significant positive effects on integrated competence. Although AI Technological Knowledge significantly enhanced both pedagogical and content knowledge, it did not directly predict Agentic AI-TPACK, suggesting that technological proficiency alone is insufficient for effective agentic AI integration. These findings align with recent studies indicating that AI adoption in education is shaped not merely by technical competence but also by pedagogical preparedness and ethical awareness (Arthur et al., 2025; Parviz & Arthur, 2025; Salifu et al., 2025).

Mediation analyses further revealed that pedagogical knowledge served as an important pathway through which technological and content knowledge contributed to integrated competence. Moreover, ethical knowledge influenced Agentic AI-TPACK through multiple sequential pathways, reinforcing its foundational role in shaping responsible and context-sensitive AI practice. These results support emerging arguments that ethical reflexivity should be positioned at the centre of AI readiness frameworks in education (Holmes et al., 2022; UNESCO, 2024).

These findings provide important implications for teacher education institutions, curriculum developers, and policymakers. The results suggest that programmes designed to prepare future teachers for AI-enhanced classrooms should move beyond technical training and place greater emphasis on ethical reasoning, pedagogical agency, and responsible AI use. By demonstrating the interconnected nature of technological, pedagogical, content, and ethical knowledge, this study advances the emerging Agentic AI-TPACK framework and contributes to the growing literature on AI readiness in teacher education (Ng et al., 2023; Chiu, 2024). The findings underscore the need for holistic approaches that prepare educators to harness the benefits of agentic AI while ensuring accountability, inclusivity, and educational effectiveness.

References

- Chiu, T. K. F. (2024). Future research recommendations for transforming higher education with generative AI. *Computers and Education: Artificial Intelligence*, 6, 100197.
- Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (3rd ed.). Sage.
- Holmes, W., Bialik, M., & Fadel, C. (2022). *Artificial Intelligence in Education: Promises and Implications for Teaching and Learning*. Center for Curriculum Redesign.

- Luckin, R., & Cukurova, M. (2019). Designing educational technologies in the age of AI. *British Journal of Educational Technology*, 50(6), 2824–2838.
- Ng, D. T. K., Leung, J. K. L., Chu, S. K. W., & Qiao, M. S. (2023). AI literacy: Definition, teaching, evaluation and ethical issues. *Computers and Education: Artificial Intelligence*, 4, 100125.
- UNESCO. (2024). *Guidance for Generative AI in Education and Research*. UNESCO Publishing.
- Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017–1054.
- Koehler, M. J., Mishra, P., Kereluik, K., Shin, T. S., & Graham, C. R. (2014). The technological pedagogical content knowledge framework. In J. M. Spector et al. (Eds.), *Handbook of Research on Educational Communications and Technology* (pp. 101–111). Springer.
- Arthur, F., Salifu, I., Acquah, B. Y. S., Opoku, E., Nortey, S. A., & Tetteh, S. A. (2025). Modelling economics students' use of ChatGPT and academic performance: Insights from self-determination theory and epistemic curiosity. *Discover Artificial Intelligence*, 5(1), 1–24.
- Salifu, I., Arthur, F., Acquah, B. Y. S., Opoku, E., Nortey, S. A., & Boateng, E. (2025). Exploring graduate students' use of generative artificial intelligence in Ghana: Insights from an extended UTAUT2 model, PLS-SEM, IPMA and fsQCA. *Discover Education*, 4(305), 1–21.
- Parviz, M., & Arthur, F. (2025). Exploring EFL teachers' behavioral intentions to integrate GenAI applications: Insights from PLS-SEM and fsQCA. *Human Behavior and Emerging Technologies*, 2025, 1–24.

How Environmental AI Tools Can Help Increase Understanding and Imagination of Interactive Climate Response Analysis for Architecture Students

Hardi Wahab Ahmed

Yousif Sudad Samaan

Catholic University in Erbil (Erbil, Kurdistan Regional Government, Iraq)

hardi@cue.edu.krd; cuear23002@cue.edu.krd

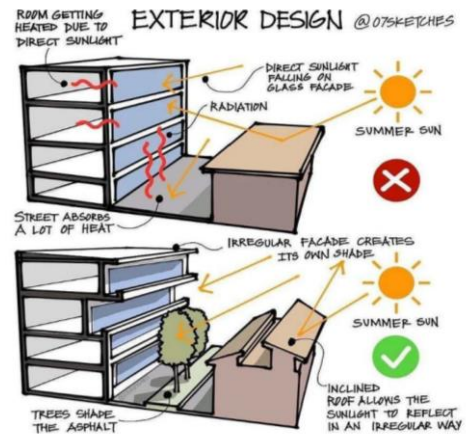
Introduction

Early-stage architectural design often relies on intuition, with environmental analysis applied too late in the process. This study investigates how AI parametric tools, combined with environmental simulation software, can enhance students' understanding of solar radiation and interactive climate response. Raven AI was used to generate parametric massing with exposed sliders for rotation, height, depth, and spacing, while Ladybug Tools provided solar radiation analysis using EPW data for Erbil Airport during peak summer months. Students could iteratively adjust parameters based on AI guidance and observe immediate environmental feedback. Results indicate that this workflow reduces cognitive load, promotes experimentation, and encourages evidence-informed design decisions. This approach demonstrates a framework for integrating AI into architectural education, enhancing both understanding and creativity in early-stage design.

Methodology

The study was conducted entirely in Rhino 3D and Grasshopper using Raven AI for parametric massing and Ladybug Tools for environmental simulation. The site was modeled using the Erbil Airport EPW file to provide accurate solar data. The analysis period was set from June 1 to August 31, 9 AM to 5 PM, representing peak summer conditions. These settings ensure realistic evaluation of solar exposure on building massing. Raven AI was used to generate early-stage building volumes with sliders for rotation, depth, height, and spacing. This allowed students to explore multiple configurations quickly without manually wiring Grasshopper definitions. The generated model served as the base geometry for environmental analysis as shown in Figure 1.

Figure 1. Passive cooling systems for sustainable architecture (Arch2O)

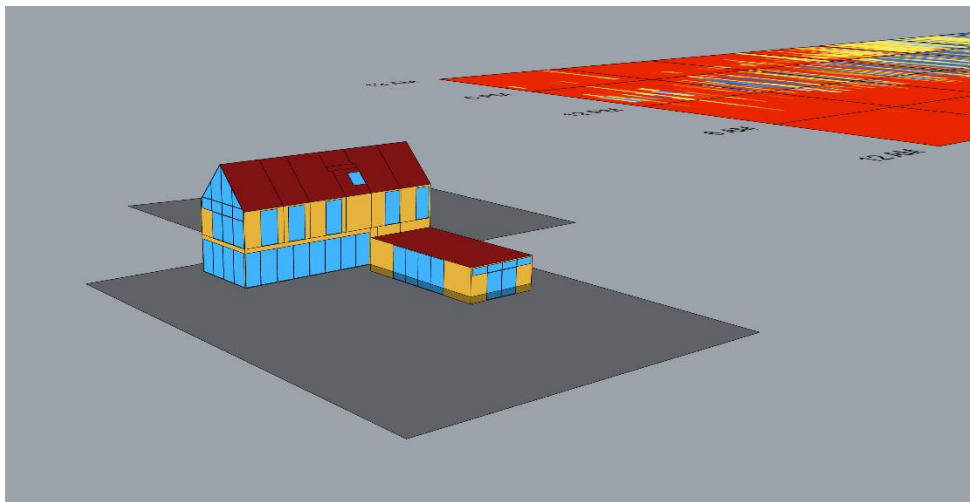


Results And Analysis

First, the 3D model of the building was created in Rhino software and then analyzed using Ladybug environmental analysis. The simulation outputs were organized into tables and charts to highlight the effects of the design variables on energy demand. The results are clear which is the aperture size, room adjacencies highly affect heating and cooling loads. AI workflows accelerated analysis and enable a rapid comparison of different situations, allowing further creativity in design that would be time consuming with manual methods alone, as shown in Figure 2.

This method clearly gives a visual interactive response of the climate on the building's performance, which is preferable by architecture students compared to the use of charts and data and manual hand calculations.

Figure 2. 3D model using Rhinoceros 3D (by researchers)



Mission Alignment

The overall mission of the 3rd AI International conference is to bring together creative ideas related to AI for enhancing the capabilities of the students, which is the purpose of this research paper, to enhance the understanding of the architecture students compared to classical methods of environmental impact study.

Conclusion

Environmental AI Tools improve both understanding and creativity. By visualizing and simulating environmental effects interactively, students can experiment and learn with multiple design options and gain insights of climate-responsive strategies that are difficult to comprehend when done manually. This approach transforms climate analysis from a passive evaluation step into an interactive, design driven process, enhancing comprehension and exploration in architectural education.

References

Arch2O. (n.d.). *Passive cooling systems for sustainable architecture: A guide to the best options*.
Ladybug Tools. (n.d.). *Ladybug Tools*. <https://www.ladybug.tools/>
Raven AI. (n.d.). *Raven AI*. <https://raven.ai/>

Agentic AI for Fostering Sustainable Hospitality Advancements Beyond Borders

Lot Essiedu
Sarah Essiedu
Faustina Sampson
University of Cape Coast (Cape Coast, Ghana)

Lydia Frimpong
University of Health and Allied Sciences (Ho, Ghana)

Dr. Amy J. Heston
Walsh University (Ohio, USA)
lydiafrimp105@gmail.com; lotessiedu@gmail.com; faustina.sampson@stu.ucc.edu.gh;
sarahessiedu0@gmail.com; aheston@walsh.edu

Project Overview

This project showcases ethically grounded, culturally responsive agentic AI systems to boost hotel efficiency, human social presence, human resource management, and collaboration. Aligned with the University of Cape Coast's community development focus and Walsh University's emphasis on human dignity and service, we propose the implementation of agentic AI for the hospitality industries in both Ghana and the USA. Enhancements include measurable time savings and improved customer satisfaction. Scalable models promote AI adoption for every community, fostering sustainable hospitality advancements beyond borders.

Project Details

In an era of rapid technological advancement, the hospitality industry stands to benefit from agentic AI systems that autonomously handle tasks while upholding ethical standards and cultural sensitivity. This project showcases the design of such systems to enhance hotel registration efficiency through automated check-ins and chatbots, strengthen human social presence via human-like interactions, support human resource management with predictive scheduling and training tools, and improve workplace collaboration using multi-agent frameworks for real-time communication.

Our approach is deeply aligned with the missions of partnering institutions: University of Cape Coast (UCC) in Ghana, which prioritizes community development and capacity building through innovative education and outreach, and Walsh University in Ohio, USA, which emphasizes human dignity, faith-informed leadership, and service to the common good. By incorporating diverse datasets to mitigate biases, ensuring data privacy compliance, and enabling explainable AI, these systems promote fair and inclusive outcomes.

Experimental trials with agentic AI, particularly using Grok in expert mode, revealed that this technology can act as an intelligent research collaborator within the hospitality industry. Through simulated hotel workflows and operational scenarios, Grok designed ethically grounded and culturally responsive AI strategies to improve registration efficiency, strengthen human social presence, support HR management, and enhance workplace collaboration.

These experimental insights led to the development of a structured five-step plan to inspire positive change in the hotel industry.

- First, organizations define human-centered goals to ensure AI supports rather than replaces staff.
- Second, pilot systems are introduced on a small scale to test functionality and identify challenges.
- Third, AI is integrated into human resource management to improve scheduling, employee development, and staff well-being.
- Fourth, agentic AI enables cross-department collaboration by improving communication and coordination.
- Finally, continuous evaluation, reflection, and adaptation ensure that the system remains effective, ethical, and aligned with cultural values and organizational needs.

Further trials demonstrated that this structured approach improves workflow efficiency, communication, and service delivery across hospitality operations. Overall, this research contributes to sustainable hospitality by empowering employees, enhancing guest experiences, and bridging borders between technological innovation and human-centered service. (Figure 1)

Mission Alignment

This project aligns with the mission of the University of Cape Coast by promoting community development, ethical innovation, and workforce capacity building through technology. It also reflects Walsh University's commitment to human dignity, service, and responsible leadership. By integrating human-centered AI into hospitality systems, this research supports inclusive innovation and strengthens global collaboration across diverse cultural contexts.

Figure 1: The application of agentic AI in hospitality and showing its role in improving hotel registration, supporting human resource management, and enhancing teamwork while maintaining human-centered service and ethical innovation. (ChatGPT)



Conclusion

This research demonstrates that Agentic AI can significantly enhance hospitality operations while preserving the human essence of service. By combining efficiency with personalization and ethical considerations, the system improves both employee experience and guest satisfaction. As student researchers, this work has strengthened our skills in AI applications, collaboration, and innovation, preparing us for future contributions in technology-driven environments.

References

- OpenAI. (2026). ChatGPT. <https://chat.openai.com>
- xAI. (2026). Grok AI. <https://x.ai>
- Davenport, T. H., & Ronanki, R. (2018). Artificial intelligence for the real world. *Harvard Business Review*, 96(1), 108–116.
- Huang, M.-H., & Rust, R. T. (2018). Artificial intelligence in service. *Journal of Service Research*, 21(2), 155–172. <https://doi.org/10.1177/1094670517752459>
- Floridi, L., et al. (2018). AI4People—An ethical framework for a good AI society. *Minds and Machines*, 28, 689–707. <https://doi.org/10.1007/s11023-018-9482-5>

Cross-Border Crisis Response: Agentic AI for Disaster Relief in Ghana and the USA

Minuman Nampiin
University of Cape Coast (Cape Coast, Ghana)

Dr. Amy J. Heston
Walsh University (Ohio, USA)
nampiinm@gmail.com; aheston@walsh.edu

Abstract

This project explores piloting free agentic AI tools like CrewAI and AIDR for disaster relief in Ghana and the USA. Collaborating with the University of Cape Coast and Walsh University, we aim to enhance real-time response in flood-prone and wildfire-prone areas through autonomous logistics and predictive modeling. By integrating low-cost, open-source platforms, the project fosters cross-continental knowledge exchange, serving the common good and building resilient communities against climate-driven crises.

Project Overview

This project harnesses accessible agentic AI technologies to strengthen disaster response capabilities in both resource-limited and technologically advanced settings. Through collaboration between Walsh University and the University of Cape Coast, the initiative demonstrates how open-source agentic AI can deliver faster, more equitable, and culturally appropriate relief during floods and wildfires.

Project Details

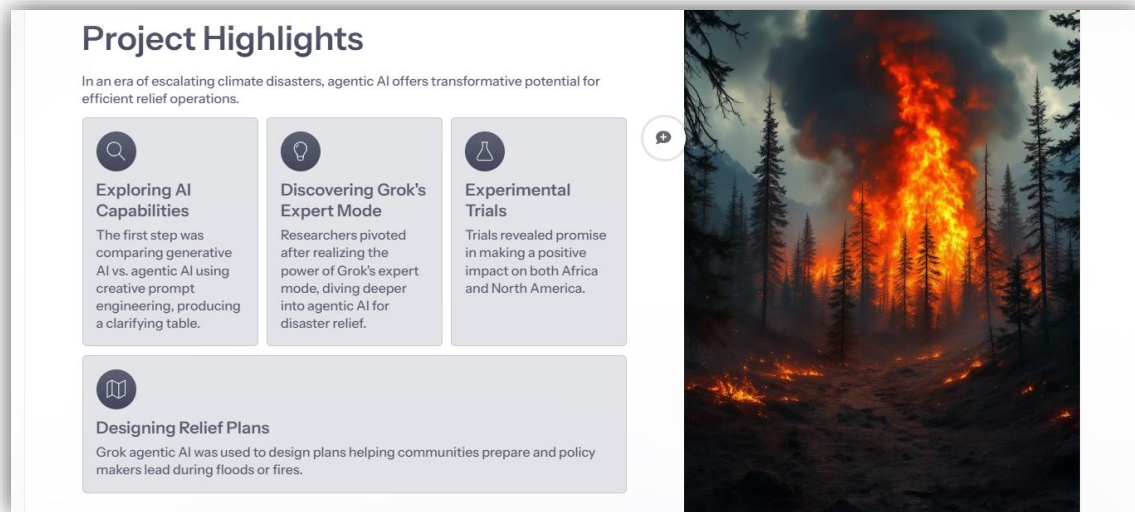
In an era of escalating climate disasters, agentic AI offers transformative potential for efficient relief operations. This research proposes a pilot program deploying free, open-source tools such as CrewAI for multi-agent orchestration, AIDR for social media crisis classification, and AutoGen for predictive modeling. The project aligns the University of Cape Coast's expertise in rural, resource-scarce African contexts with Walsh University's strengths in urban, technology-integrated strategies in North America.

Key objectives include assessing tool efficacy in real-time adaptation and resource coordination, developing context-specific 4-step implementation plans, evaluating infrastructure and ethical limitations through community input, and building scalable models via international collaboration.

The research follows a two-phase methodology. Phase 1 consists of stakeholder workshops and needs assessments in Cape Coast and Ohio. Phase 2 implements parallel pilots, using AIDR for community alerts in low-infrastructure zones in Ghana and AutoGen for data-driven evacuation planning in the United States. Mixed-methods analysis evaluates response times, aid distribution efficiency, and community feedback with emphasis on equity and cultural sensitivity.

Early experimental trials and prompt engineering work produced valuable project highlights, as illustrated in Figure 1. The visualization showcases key aspects of the research journey, including the exploration of AI capabilities through creative prompt engineering, the discovery of Grok’s Expert Mode for deeper agentic reasoning, promising results from experimental trials across both continents, and the successful design of practical 4-step relief plans for community leaders and policymakers facing floods or wildfires.

Figure 1. Agentic AI Capabilities, Experimental Trials, and Relief Plan Development (Gamma AI)



Mission Alignment

This project directly supports Walsh University’s mission by using AI innovation as a tool for service, justice, and the common good. By partnering across continents to address climate vulnerabilities that disproportionately affect marginalized communities, the work embodies responsible stewardship of technology. It promotes human dignity through equitable access to life-saving tools and demonstrates how faith-inspired education can drive meaningful global collaboration.

Conclusion

Piloting free agentic AI tools presents a practical and scalable solution for faster, more inclusive disaster response. Researchers gained invaluable experience in AI implementation, cross-cultural collaboration, and ethical technology deployment. This work not only advances humanitarian AI applications but also prepares the next generation of leaders to create technology that serves others in alignment with Walsh University’s values of faith-driven innovation and global solidarity.

References

Grok AI: grok.com
 ChatGPT: www.chatgpt.com
 Gamma AI: www.gamma.app

Orchestrating Survival: Real-Time AI Triage & Dynamic Resource Routing for Obstetric Emergencies

Nathaniel Laryea Ayerkain

Kennedy Asum

University of Cape Coast (Cape Coast, Ghana)

nathanielaryea77@gmail.com; asumkennedy@gmail.com

Introduction

Ghana has made steady progress in maternal health over the past two decades, yet the national maternal mortality ratio (MMR) remains unacceptably high at 310 per 100,000 live births (Cresswell, 2023). While this national figure is concerning, recent research at the Korle Bu Teaching Hospital (KBTH) indicates that the maternal mortality ratio has reached 801.3 per 100,000 live births based on data from 2021 to 2023. This figure, nearly three times the national average, signals a deep crisis hiding in plain sight. The fact that Ghana's flagship teaching hospital records such a high MMR suggests that systemic failures in emergency obstetric care are pervasive, even where the highest concentration of specialists and equipment exists.

Problem Statement: The Three Delays

Research examining maternal deaths at Korle Bu has identified the well-established "three delays" framework as the primary driver of these poor outcomes.

The first delay: "deciding to seek care", manifests in high rates of hypertensive-related deaths, indicating that many women and families fail to recognize early danger signs such as severe headache, blurred vision, or sudden swelling.

The second delay: "reaching a facility", is starkly evident in the finding that 44.4% of maternal deaths at KBTH involve women referred from lower-level district hospitals. These mothers were already dying before they arrived at the tertiary facility, suggesting failures in early recognition at peripheral centers and delays in transportation.

The third delay: "receiving adequate care at the facility", is perhaps the most damning. A significant proportion of deaths occur *inside* the hospital due to complications that were not managed in a timely manner, including delays in emergency response, lack of specialist staff availability, and critically, absence of blood for transfusion.

Across Ghana, current ambulance systems continue to route emergencies to the nearest facility by default, with no mechanism to check whether that facility actually has a bed, blood, or a surgeon. The result is misdirected referrals, wasted time, and preventable deaths.

The OB-AI Gateway

In response to these systemic failures, we propose the Obstetrics (OB)-AI Gateway, an AI system designed to eliminate the second and third delays in obstetric emergencies. The **aim** is to ensure that every mother experiencing an obstetric emergency is routed directly to a facility that is *capable* of providing the specific intervention she requires, within the shortest possible time (Figure 1).

The specific objectives are to:

- Triage obstetric emergencies using voice-based natural language processing (NLP) in local languages.
- Maintain and query a dynamic capability matrix of real-time bed, blood, and surgeon availability across referral facilities.
- Route ambulances to the optimal destination rather than merely the nearest.
- Deliver a pre-alert to receiving facilities, enabling them to prepare blood, theatre, and personnel before the mother's arrival.

Figure 1: Sample interface of the OB-AI Gateway



How the OB-AI Gateway Works

The OB-AI Gateway operates through a four-step workflow designed for low-bandwidth, offline-first environments.

Step One: A community health worker or family member initiates an emergency by recording a short voice note in a local language (Fante, Twi, Ewe, or English) using any basic mobile phone. The voice note is sent via SMS, a protocol that also works on 2G networks.

Step Two: The AI receives and processes the voice note and listens for emergency keywords like “bleeding heavily”, “seizure”, or “labor pains”. Based on the keywords detected, the AI assigns a triage level: Low, Medium, High, or Critical.

Step Three: The AI checks a local database that tracks three things for every hospital: available beds, blood in the fridge, and whether a surgeon is on duty. This information is updated every four hours by SMS from each hospital. Any hospital missing beds, blood, or a surgeon is automatically removed from consideration.

Step Four: The AI calculates the fastest route to the closest *capable* hospital, not just the nearest one. The ambulance dashboard shows the driver where to go. At the same time, an SMS pre-alert is sent to the hospital, telling them the mother's likely complication and arrival time.

The AI is advisory only. A human dispatcher makes the final call. Voice notes are deleted after 48 hours. Community consent is obtained.

Reference

Cresswell, J. (2023). *Trends in Maternal Mortality 2000 to 2020: Estimates by WHO, UNICEF, UNFPA, World Bank Group and UNDESA/Population Division* (1st ed). World Health Organization.

Bridging Belonging Gaps Through Agentic AI in Higher Education

Portia Opoku
University of Connecticut (Connecticut, USA)

Dr. Amy J. Heston
Walsh University (Ohio, USA)
portia.opoku@uconn.edu; aheston@walsh.edu

Project Overview

This research project explored agentic AI's potential in student affairs to enhance first-generation college student success, retention, and belonging. Researchers examined gaps in ethical AI integration, proactive student support tools, and holistic approaches to student engagement. Through experimental trials using generative AI (ChatGPT) and agentic AI (Grok), the project explored how AI-driven strategies may support student affairs practitioners in improving communication, engagement, and retention while maintaining ethical and student-centered implementation practices.

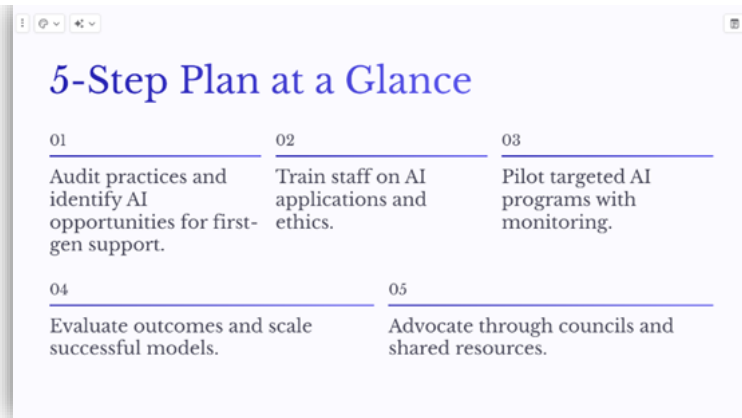
Project Details

Agentic AI, with its autonomous decision-making capabilities, holds transformative promise for student affairs in higher education, particularly for supporting first-generation college students who often face barriers to retention and belonging. This project addressed key gaps in current applications, including limited empirical studies on long-term outcomes, ethical governance, and holistic student support integration. By focusing on underrepresented student populations, the project explored how AI-driven tools may provide personalized mentoring, early intervention for disengagement, and improved cross-unit coordination within higher education institutions.

Researchers conducted experimental trials using both generative AI (ChatGPT) and agentic AI (Grok) to evaluate practical applications for student affairs settings. Results produced a five-step practitioner framework: (1) assess current practices through audits and stakeholder engagement; (2) educate staff through workshops on ethical AI use and bias mitigation; (3) pilot targeted implementations such as AI chatbots for orientation support and retention alerts; (4) evaluate outcomes related to belonging and retention; and (5) foster advocacy through interdisciplinary collaboration and open-access sharing.

As shown in Figure 1, the framework demonstrates how institutions can strategically integrate ethical AI practices while maintaining student-centered support systems.

Figure 1. Five Step Practitioner Framework (Gamma AI)



Experimental findings also highlighted differences between generative and agentic AI outputs. While both ChatGPT and Grok produced useful recommendations, Grok demonstrated stronger capabilities in generating action-oriented institutional strategies and comparative implementation models. ChatGPT provided broader contextual explanations and reflective responses related to student support and belonging. Researchers also found that AI-supported systems may reduce practitioner workload while improving proactive outreach, personalized communication, and cross-unit coordination for first-generation students.

Figure 2. Comparative Outputs from Generative and Agentic AI Trials (Gamma AI)

AI-Driven Plan Comparison		
Grok vs. ChatGPT: How the Plans Differ		
Grok emphasizes assessment, training, piloting, evaluation, and advocacy, centering iterative, practitioner-led adoption . ChatGPT prioritizes ethics first, then specific AI agents for first-gen support and ongoing evaluation.		
Aspect	Grok Plan	ChatGPT Plan
Advantages	Iterative, scalable, and strengthened by training and advocacy.	Proactive, tool-specific, and designed for quick impact.
Disadvantages/Limitations	Slower rollout; less specific on tools.	Assumes readiness; less adaptable without broad training.
Overall Trends	Both support ethical AI for holistic student support and fair treatment.	

Researchers further recognized that although AI technologies offer promising opportunities for innovation, institutions must carefully address concerns related to privacy, accessibility, algorithmic bias, and overreliance on automation. Human oversight remains essential to ensuring

that AI-supported student affairs practices remain relational, inclusive, and responsive to student needs.

By connecting perspectives from institutions in the United States and Ghana, the project also emphasized the importance of global collaboration in advancing equitable AI innovation within higher education. Figure 3 illustrates the broader institutional and global alignment of AI-supported student affairs practices and their contribution to educational equity and student success initiatives.

Figure 3. Global and Institutional Mission Alignment for AI-Driven Student Support Initiatives (Gamma AI)

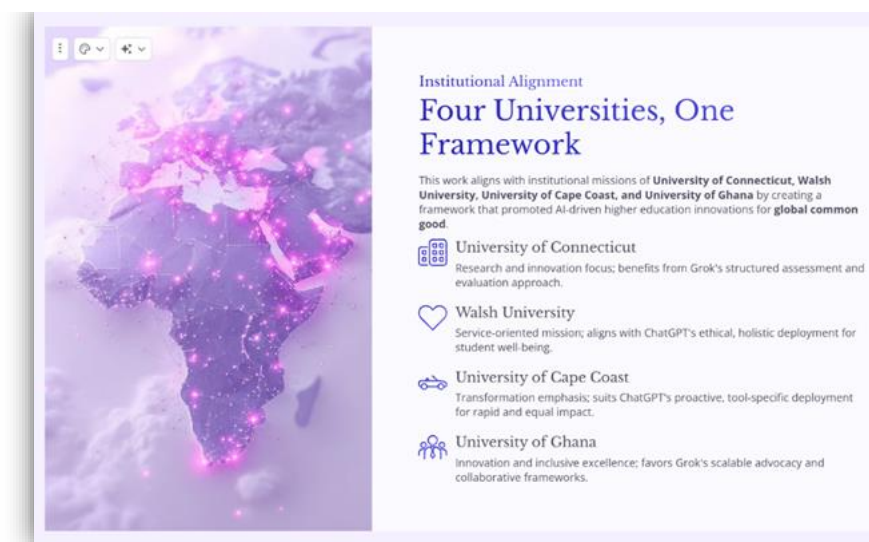


Figure 3 highlights the broader institutional and global alignment of AI-supported student affairs practices and their potential contribution to educational equity, student belonging, and collaborative innovation across higher education contexts. The visual emphasizes how institutions can integrate ethical AI practices while remaining committed to inclusion, service, and student-centered support. It also reflects the project's emphasis on international collaboration and the use of emerging technologies to advance the common good in higher education.

Mission Alignment

This project aligns closely with the missions of the University of Connecticut and Walsh University by promoting innovation, inclusion, ethical leadership, and service through education. The work reflects a commitment to advancing equitable student support practices while preparing institutions to responsibly engage emerging technologies. Through the integration of AI and student affairs practice, this research contributes to ongoing conversations about how technology can serve the common good while supporting student success and belonging across diverse educational contexts.

Conclusion

Agentic AI presents significant opportunities for transforming student affairs practices in higher education, particularly for first-generation students who may experience barriers to retention and belonging. This project demonstrated how AI tools can support proactive, ethical, and scalable approaches to student engagement while reinforcing the importance of human-centered implementation. The research also provided valuable opportunities for interdisciplinary collaboration, international partnership, and the development of AI literacy skills among student researchers. Ultimately, this work contributes to growing conversations surrounding faith-driven and equity-centered AI innovation in higher education.

References

ChatGPT: <https://www.chatgpt.com>

Gamma AI: <https://gamma.app>

Grok AI: <https://grok.com>

Agentic AI and Continuous Glucose Monitoring: Advancing Personalized Nutrition for the Common Good

George D. Hicks
Alex Heeg
Dr. Amy J. Heston
Walsh University (Ohio, USA)

Michael Soueidi
Dr. Jouliana El Khoury
Notre Dame University-Louaize (Zouk Mosbeh, Lebanon)
ghicks3@walsh.edu; aheeg1@walsh.edu; aheston@walsh.edu;
mssoueidi@ndu.edu.lb; jkhoury@ndu.edu.lb

Project Overview

This research explores how agentic AI can transform continuous glucose monitoring (CGM) into a proactive nutrition-support tool. By integrating CGM data, meal composition, and personal context, agentic AI empowers individuals to manage glycemic health. The faith-focused project highlights ethical and scalable approaches aligned with public health goals and institutional missions focused on human dignity and service.

Project Details

Continuous Glucose Monitoring (CGM) enables individuals to observe glucose fluctuations in real time and understand how nutrition, physical activity, stress, sleep, and daily habits influence metabolic health. Unlike traditional monitoring methods that provide isolated readings, CGM produces continuous data that can reveal patterns in glycemic responses. However, many CGM platforms remain passive: they display information but require users, especially new users, to interpret complex patterns and decide independently how to respond. As a result, useful health data may not lead to meaningful behavioral change. This project examines how Agentic Artificial Intelligence (AI) can bridge this gap by transforming CGM from a monitoring tool into a personalized nutrition support system. Figure 1 conceptually illustrates this shift by depicting a healthcare professional using an AI-enabled digital dashboard to interpret health data and support informed decisions.

Agentic AI differs from traditional AI because it can pursue goals, learn from context and prior outcomes, and adapt its guidance over time. Rather than providing static alerts, an agentic system can evaluate changing conditions and support users in reaching personalized health objectives. When combined with Explainable AI, this support becomes more transparent because the system can provide clear reasons for its recommendations. In glucose management, explainable AI could help users understand why certain meals result in different glucose responses, how lifestyle factors affect glycemic patterns, and what adjustments may support improved outcomes. Together, agentic and explainable AI promote education, empowerment, and sustained behavior change rather than merely displaying data.

Figure 1. AI-Supported Glucose Data Interpretation and Personalized Health Guidance (Gamma AI)

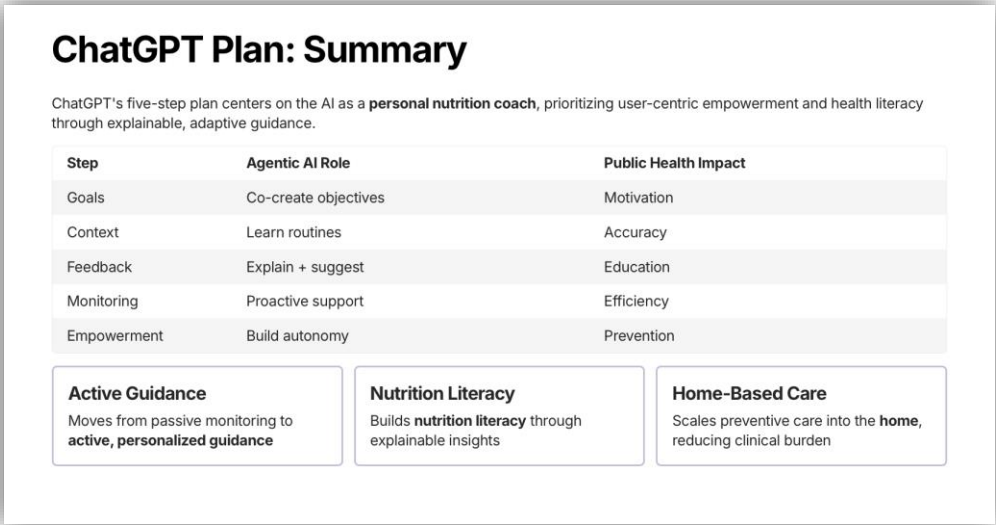


This project proposes a five-step framework for positive public health change: personalized goal setting, continuous context awareness, explainable feedback, adaptive monitoring, and user empowerment. The AI first helps individuals establish measurable goals, such as reducing post-meal glucose spikes or increasing time within a target glucose range identified with appropriate medical guidance. These goals can account for personal values, dietary preferences, and cultural food practices. The system then analyzes CGM data alongside meals, activity, sleep, and stress, adapting its guidance as routines and health needs change.

To demonstrate practical implementation, ChatGPT and Grok AI were used as research collaborators to develop frameworks for glucose management and nutrition literacy. ChatGPT proposed a model in which AI functions as a personal nutrition coach through goal setting, context awareness, understandable feedback, monitoring, and empowerment. As summarized in Figure 2, ChatGPT's framework connects each AI role with a potential public health impact, including motivation, education, efficiency, and prevention.

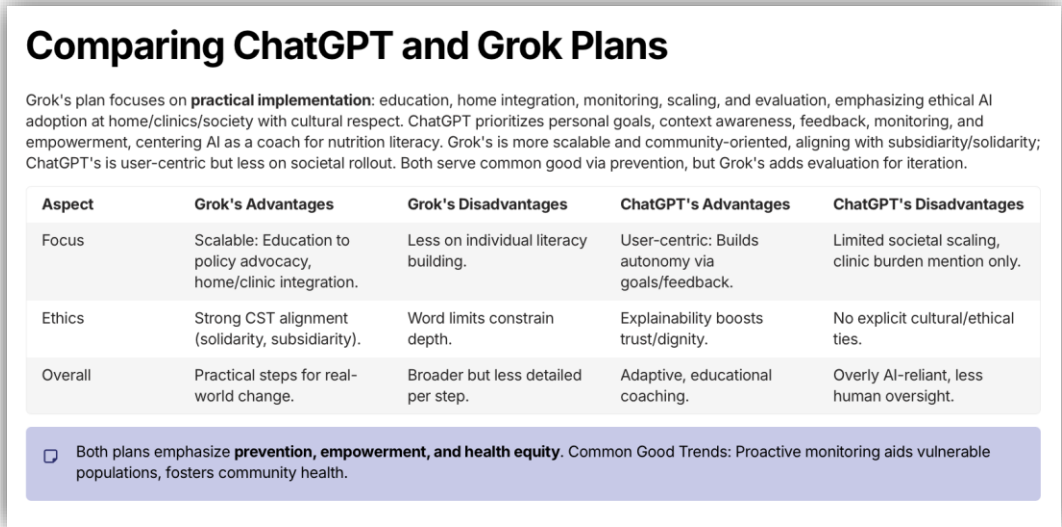
Grok AI proposed the Ethical Glucose Guidance System (EGGS), an explainable framework emphasizing transparency, human dignity, and ethical decision-making. EGGS integrates CGM readings, meal logs, physical activity, stress, and cultural dietary preferences to generate individualized guidance while explaining why specific behaviors may influence glucose responses. Its framework also emphasizes broader implementation through education, community engagement, policy advocacy, and ongoing evaluation.

**Figure 2. Summary of ChatGPT’s Agentic AI Nutrition-Coaching Framework
(Gamma AI, based on ChatGPT output)**



The comparison presented in Figure 3 shows that both plans emphasize prevention, empowerment, and health equity, although their priorities differ. ChatGPT focuses on individualized coaching and nutrition literacy, whereas Grok emphasizes ethics, cultural sensitivity, community implementation, and scalability. Together, these approaches demonstrate the potential of AI-supported CGM to move beyond passive monitoring and strengthen informed decision-making, preventive care, and long-term self-management.

Figure 3. Comparison of ChatGPT and Grok AI Frameworks for AI-Supported Glucose Management (Gamma AI, based on ChatGPT and Grok output)



Mission Alignment

This framework reflects the missions of both Notre Dame University-Louaize and Walsh University by promoting ethical technology that serves people rather than replacing human decision-making. The proposed system emphasizes human dignity by empowering individuals to better understand and manage their own health through transparent and explainable AI. It also supports responsible innovation by prioritizing accessibility, cultural sensitivity, and ethical design principles. Through its focus on preventive healthcare and equitable access to health information, the framework contributes to service of the common good at both the individual and community levels.

Conclusion

In conclusion, this project demonstrates how agentic AI can transform Continuous Glucose Monitoring from a passive monitoring tool into an active system for personalized nutrition support and preventive health. By combining real-time glucose data with information such as diet, physical activity, sleep, and daily habits, these systems can improve health literacy and support informed decision-making. This work also aligns with the missions of Notre Dame University-Louaize and Walsh University through its focus on human dignity, ethical innovation, and service to the common good. As research in nutrition science, digital health, and AI ethics continues to grow, agentic AI offers a promising model for accessible, scalable, and responsible healthcare solutions.

References

ChatGPT: www.chatgpt.com
Gamma: gamma.ai
Grok AI: grok.com

Using AI to Re-imagine Traditional Kurdish Architecture

Hardi Wahab Ahmed

Sawen Asghar Yousif

Catholic University in Erbil (Erbil, Kurdistan Regional Government, Iraq)

hardi@cue.edu.krd; cuear21013@cue.edu.krd

Project Overview

The integration of Artificial Intelligence (AI) into architectural design offers a new pathway for cultural preservation. Rather than simply imitating historical forms, AI allows architects to analyze the "DNA" of Kurdish architecture, its logic, patterns, and climatic intelligence and evolve it into contemporary forms. This research outlines three specific AI methodologies to enhance cultural value.

Project Details

To re-imagine and protect vernacular architecture, this research implements three computational workflows that translate traditional Kurdish design intelligence into modern architectural forms. The first methodology is Neural Style Transfer for Ornamentation, specifically exploring the "Kilim" Facade. Traditional Kurdish architecture relies heavily on texture, from the weaving patterns of Kilims to the intricate laying of limestone. By utilizing style transfer algorithms via tools like Midjourney and Stable Diffusion, a high-contrast image of a traditional Kurdish rug can be analyzed. The AI converts these geometric color values into technical depth data, generating a perforated "Mashrabiya" screen. This computational screen provides essential climate shading while dynamically projecting traditional cultural patterns as shadows inside modern spaces.

The second strategy, Generative Topography, applies "Citadel" Logic to steep mountain terrains. Iconic Kurdish settlements like Amedi and Akre (Figure 1) are fundamentally defined by their symbiotic, stacked relationship with steep topography. By inputting modern constraints such as slope angles, solar paths, and view lines, into evolutionary solvers like Grasshopper with Galapagos, the AI generates thousands of massing iterations. These iterations perfectly mimic the organic, stacked orientation of a traditional citadel while guaranteeing modern structural stability and minimizing environmental excavation. This produces a striking "Pixelated Mountain" aesthetic that feels completely native to the land.

Figure 1. Akre area in Newroz celebration (Kurdistan24 Channel)



Thirdly, Bio-Climatic Courtyard Optimization re-imagines the traditional "Hosh" (courtyard), which historically serves as the social and climatic lung of the Kurdish home. By processing fluid dynamics simulations through Ladybug, Honeybee, and SimScale, AI evaluates wind flow and thermal performance across 365 days of the year. The algorithm morphs the standard square courtyard into an aerodynamic form that accelerates cooling summer breezes and captures winter warmth, scientifically proving the structural superiority of vernacular wisdom.

Figure 2. 3D Generated hotel design in Hawraman, Kurdistan (Gemini)



These frameworks were directly validated through site-specific case studies. For example, an architectural intervention for the Akre Newroz resort used generative prompt codes to design a mountainside hotel framed by the historic line of Newroz fire flames. Similarly, in the snowy mountainside of Hawraman is shown in Figure 2. The generative workflows replicated the "Ziggurat-style" dry-stone stacked masonry where the roof of one room serves as the courtyard for the home built above it. These methods were also deployed to simulate authentic yellow-brick configurations for the Erbil Citadel (Hawler Qalat) and rough-hewn masonry restorations for Dukan Castle (Pasha Kora) as shown in Figure 3.

A critical component of this methodology is mitigation against AI "hallucination". Artificial intelligence generators frequently default to generic Middle Eastern or "Orientalist" stereotypes, improperly placing features like domes where they do not historically belong. To correct this, the architect must transition from a passive prompter to an active "curator". Instead of inputting generic terms like "Kurdish Building," prompts must explicitly specify technical material descriptions and precise contexts, such as "rough-hewn limestone masonry, dry-stack construction, and Zagros Mountain context".

Figure 3. Re-imagining ruined castle in Dukan area (Pasha Kora Castle) (Gamma AI)



Mission Alignment

This project directly reflects a commitment to global education, international collaboration, and ethical technological stewardship by leveraging cutting-edge tools to protect human heritage. By establishing an academic bridge between the Catholic University in Erbil and Walsh University, this research demonstrates how global partnerships can elevate local cultures. Utilizing artificial intelligence to restore and reinterpret vulnerable architectural histories aligns with a faith-driven mission to serve others, preserve community identities, and steward the built environment responsibly.

Conclusion

By training generative systems on the precise structural logic of Kurdish stone masonry and steep mountain topographies, architects can successfully preserve vernacular heritage in contemporary developments. This research shows that traditional Kurdish architecture is not merely an antique aesthetic, but a highly sophisticated, sustainable system equipped for the future. Ultimately, this student research opportunity has provided invaluable career preparedness, advanced our technical software skills, and deepened our application of impactful, purpose-driven innovation.

References

ChatGPT: www.chatgpt.com
Claude: <https://claude.ai>
Gemini: <https://gemini.google.com>

How AI-Based Tools Can Improve Clinical Decision-Making Skills in Dental Students

Emy Mazin Maqdisy
University of Kurdistan Hewlêr, S.O.M
(Erbil, Kurdistan Region, Iraq)
emymaqdisy@gmail.com

Introduction

Clinical decision-making is a crucial skill in dentistry, involving diagnosis, interpretation of clinical data, and treatment planning. Dental students usually face difficulties developing these skills due to limited clinical exposure and the risk associated with making errors on patients. Traditional theoretical teachings do not always provide essential feedback or case variety to fully prepare students for clinical practice. AI-based tools, particularly diagnostic AI tools and clinical decision-support systems, are widely used in dentistry. These tools help detect dental radiographs and clinical data to identify pathologies such as caries, bone loss, and lesions. For dental students, AI serves as a learning aid by offering objective analysis that can be compared with their own judgments.

Methodology

This study adopts a comparative study design involving undergraduate dental students in their training years. Participants are divided into two groups: a control group using the traditional teaching method and another group that uses AI-based diagnostic and clinical decision-support tools. (Image 1-2) Both groups are assessed using clinical cases and radiographic interpretations. Performance is evaluated based on accuracy, precision, and appropriateness of treatment and decision-making.

Image 1. Dental Image Reported by U.S. Department of Veterans Affairs

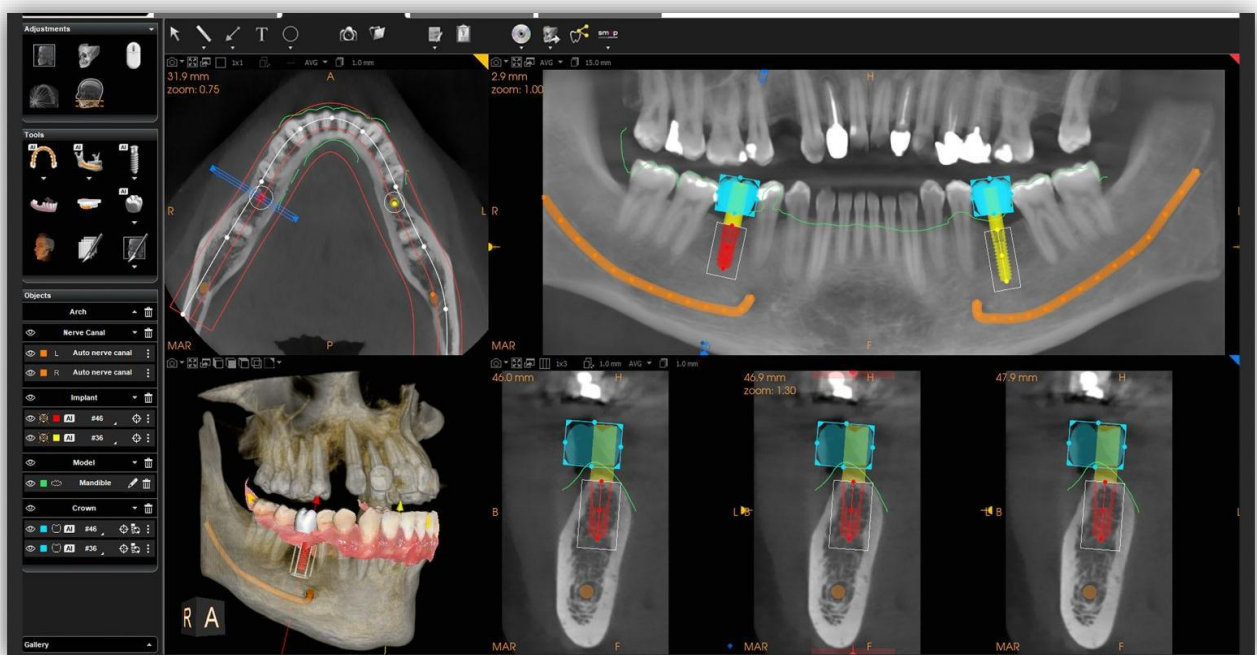
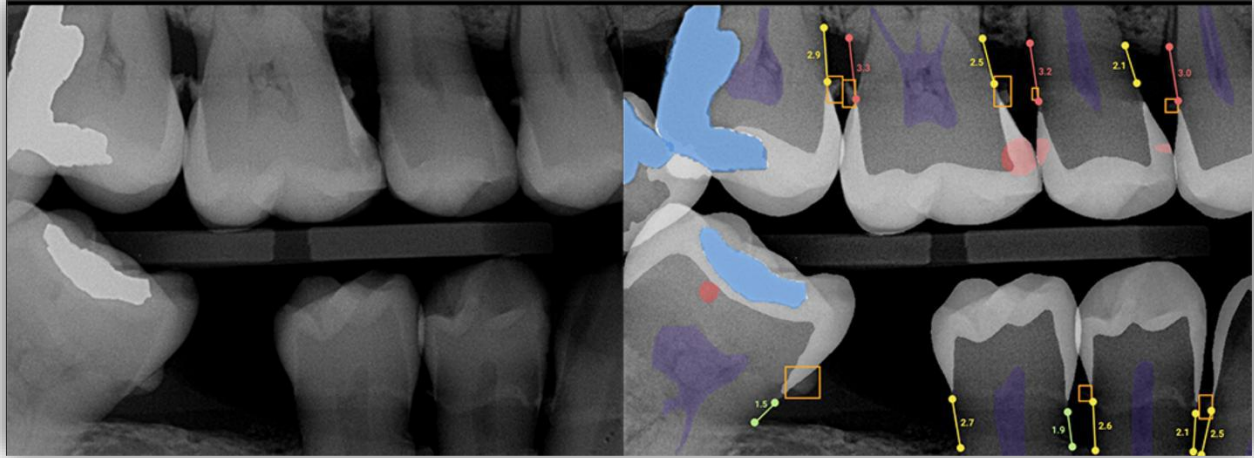


Image 2. Dental Image Reported by Digital Dentistry Society



Results

The results indicate that dental students who used AI-based tools demonstrated higher diagnostic accuracy and more consistent treatment planning compared to those relying solely on conventional methods. The AI-based tools showed improved ability to identify pathological conditions and reduced decision-making errors. Survey responses also revealed increased confidence and faster reasoning among students exposed to AI-based learning.

Conclusion

To conclude, the study highlights the potential of AI-based tools to enhance clinical decision-making skills in dental students. By providing objective feedback, improving diagnostic accuracy, and supporting clinical reasoning, AI contributes to more effective learning outcomes. However, AI should be integrated as a complementary tool under proper supervision to avoid overreliance. When used responsibly, AI can strengthen dental education and better prepare students for practice.

References

- OpenAI. (n.d.). *ChatGPT* [Large language model]. <https://chatgpt.com/>
- U.S. Department of Veterans Affairs. (2024, April 10). *GLA embarks on first-of-its-kind dental AI research*. VA Greater Los Angeles Health Care. <https://www.va.gov/greater-los-angeles-health-care/stories/gla-embarks-on-first-of-its-kind-dental-ai-research/>
- Digital Dentistry Society. (2025, October 15). *Carestream Dental launches CS 3D Imaging Premium: AI-powered imaging for smarter, faster dentistry*. DDS News. <https://news.digital-dentistry.org/news/carestream-dental-launches-cs-3d-imaging-premium-ai-powered-imaging-for-smarter-faster-dentistry/>

Youth Empowerment and AI: Leveraging Technology for a Brighter Future in African American Churches

Dr. Kelley Bolden Bailey

Dr. April Ivery

Florida Agricultural and Mechanical University (Florida, USA)

kelly.bailey@famu.edu; april.ivery@famu.edu

Abstract

Artificial intelligence is reshaping how young people learn, communicate, and prepare for work. For Black youth, however, growing AI exposure exists alongside enduring inequities in device ownership, broadband access, and formal digital instruction. This article argues that African American churches can respond by serving as community-based AI learning infrastructures. Through trusted ministries, churches can expand access, strengthen digital and ethical literacy, and support youth as learners, creators, and leaders. Church-based AI formation is most effective when it joins technological opportunity with equity, accountability, and the Black church's historic mission of educational uplift.

Keywords: African American churches; youth empowerment; artificial intelligence; digital equity; AI literacy; Black church

Introduction

Artificial intelligence now shapes how adolescents search for information, write, create media, and imagine future careers. Recent national studies show that large numbers of teens use generative AI for school and everyday problem solving, with comparatively high use among Black and Hispanic youth (Madden et al., 2024; Sidoti et al., 2025). Yet use alone does not equal empowerment. Without reliable access, guided instruction, and ethical support, AI may deepen existing inequality rather than reduce it. This article contends that African American churches can function as community-based AI learning infrastructures that help Black youth translate exposure to AI into intellectual growth, civic responsibility, and economic opportunity.

Digital Inequality and AI Readiness

Any serious discussion of AI empowerment must begin with structural inequality. Educational access to computers, broadband, and skilled guidance remains uneven across race and income, and those disparities shape who can benefit from emerging technologies (Pierce & Cleary, 2024). Brookings similarly argues that digital literacy and inclusion are prerequisites for AI readiness (Turner Lee & Du, 2025). The stakes are not only academic. McKinsey warns that generative AI may widen racial gaps in employment and wealth if Black communities remain excluded from high-opportunity digital pathways (Brown et al., n.d.). AI readiness, therefore, requires more than curiosity; it depends on infrastructure, mentorship, and community institutions capable of sustaining both.

African American Churches as Community Learning Infrastructures

Within this context, African American churches remain uniquely important. Historically, the Black church has advanced literacy, leadership, political organizing, and mutual aid, making it a credible setting for digital learning and social innovation. Research on Black church leaders suggests openness to technology adoption, even as many congregations face bandwidth constraints, limited funding, and dependence on volunteer labor (Thompson et al., 2024). These realities mean that church-based AI initiatives must be practical, low-cost, and rooted in existing ministries. Current efforts such as Black Churches 4 Digital Equity demonstrate that congregations can organize around broadband advocacy, digital opportunity, and workforce preparation while preserving community trust (Black Churches 4 Digital Equity, 2025; Ingleton, 2024).

Youth Engagement and Equitable AI Formation

The case for church-based AI programming also rests on youth engagement. Ojo et al. (2024) found strong support for the view that technology increases youth participation in church life, strengthens relevance for younger generations, and helps bridge generational divides. Building on that insight, an equity-centered model for AI ministry can be organized around four commitments: access, ability, agency, and accountability. Access includes devices, broadband, and safe learning space. Ability focuses on AI literacy, critical thinking, and practical skills. Agency encourages youth to use AI for storytelling, entrepreneurship, and community problem solving. Accountability emphasizes privacy, bias awareness, and responsible use. These priorities also respond to widely documented risks of generative AI, including misinformation, plagiarism, and unfair bias (Gallent-Torres et al., 2023; Tlili et al., 2024; UNESCO, 2023).

Conclusion

African American churches are well positioned to help transform AI from a source of exclusion into a platform for empowerment. By combining digital access, skill formation, creative practice, and ethical guidance, churches can support Black youth as learners, creators, and leaders in a changing technological economy. Such work does not depart from the church's historic mission; it extends that mission into the digital age.

References

- Black Churches 4 Digital Equity. (2025). 2025 Juneteenth digital opportunity Bible study. <https://www.blackchurches4digitalequity.com/digital-bible-study-2025>
- Brown, J. S., Korgaonkar, N., Perkins, C., Finney, M., & McMillan, M. (n.d.). The impact of generative AI on Black communities. McKinsey & Company. <https://www.mckinsey.com/institute-for-economic-mobility/our-insights/the-impact-of-generative-ai-on-black-communities>
- Gallent-Torres, C., Zapata-Gonzalez, A., & Ortego-Hernando, J. L. (2023). The impact of generative artificial intelligence in higher education: A focus on ethics and academic integrity. RELIEVE, 29(2), Article M5. <https://doi.org/10.30827/relieve.v29i2.29134>

- Ingleton, J. (2024). Black churches 4 digital equity heeds call to bridge the digital gap. Word In Black. <https://wordinblack.com/2024/07/black-churches-4-digital-equity-heeds-call-to-bridge-the-digital-gap/>
- Madden, M., Calvin, A., Hasse, A., & Lenhart, A. (2024). The dawn of the AI era: Teens, parents, and the adoption of generative AI at home and school. Common Sense Media. https://www.commonsensemedia.org/sites/default/files/research/report/2024-the-dawn-of-the-ai-era_final-release-for-web.pdf
- Ojo, S. O., Adelaja, I. J., Adio, T. O., & Afolaranmi, A. O. (2024). Assessing the impact of technology on church services and youth engagement. *British Journal of Computer, Networking and Information Technology*, 7(3), 58-72. <https://doi.org/10.52589/BJCNIT-BR3RLAIL>
- Pierce, G. L., & Cleary, P. F. (2024). The persistent educational digital divide and its impact on societal inequality. *PLOS ONE*, 19(4), e0286795. <https://doi.org/10.1371/journal.pone.0286795>
- Sidoti, O., Park, E., & Gottfried, J. (2025, January 15). About a quarter of U.S. teens have used ChatGPT for schoolwork-double the share in 2023. Pew Research Center. <https://www.pewresearch.org/short-reads/2025/01/15/about-a-quarter-of-us-teens-have-used-chatgpt-for-schoolwork-double-the-share-in-2023/>
- Thompson, G., Otoo, N., Fisher, J. C., Sibi, I., Smith, A. D. R., & Ogbonnaya-Ogburu, I. F. (2024). Technology use in the Black church: Perspectives of Black church leaders preliminary findings. In *Companion of the 2024 Computer-Supported Cooperative Work and Social Computing (CSCW Companion '24)* (pp. 223-227). ACM. <https://doi.org/10.1145/3678884.3681855>
- Tlili, A., Shehata, B., Adarkwah, M. A., Bozkurt, A., Hickey, D. T., Huang, R., & Agyemang, B. (2024). Challenges and opportunities of generative AI in education: A comprehensive review. *PeerJ Computer Science*, 10, e2105. <https://doi.org/10.7717/peerj-cs.2105>
- Turner Lee, N., & Du, M. (2025, September 19). Why AI readiness requires digital literacy and inclusion. Brookings. <https://www.brookings.edu/articles/why-ai-readiness-requires-digital-literacy-and-inclusion/>
- UNESCO. (2023). Guidance for generative AI in education and research. <https://www.unesco.org/en/articles/guidance-generative-ai-education-and-research>
- Youth empowerment and AI in the Black Church [PowerPoint slides]. (n.d.). <https://www.genspark.ai/api/files/s/ZyNkjbas>

Agentic AI Tutoring for Economics Excellence: Innovation for Global Impact

Gideon Aidoo-Young
Etornam Livingstone Asilevi
Yussif Osman
Bismark Nyarko
University of Cape Coast (Cape Coast, Ghana)

Dr. Amy J. Heston
Walsh University (Ohio, USA)

aidooyounggideon@gmail.com; livingstone.asilevi@stu.ucc.edu.gh;
yussif.osman@stu.ucc.edu.gh; bismark.nyarko003@stu.ucc.edu.gh; aheston@walsh.edu

Project Overview

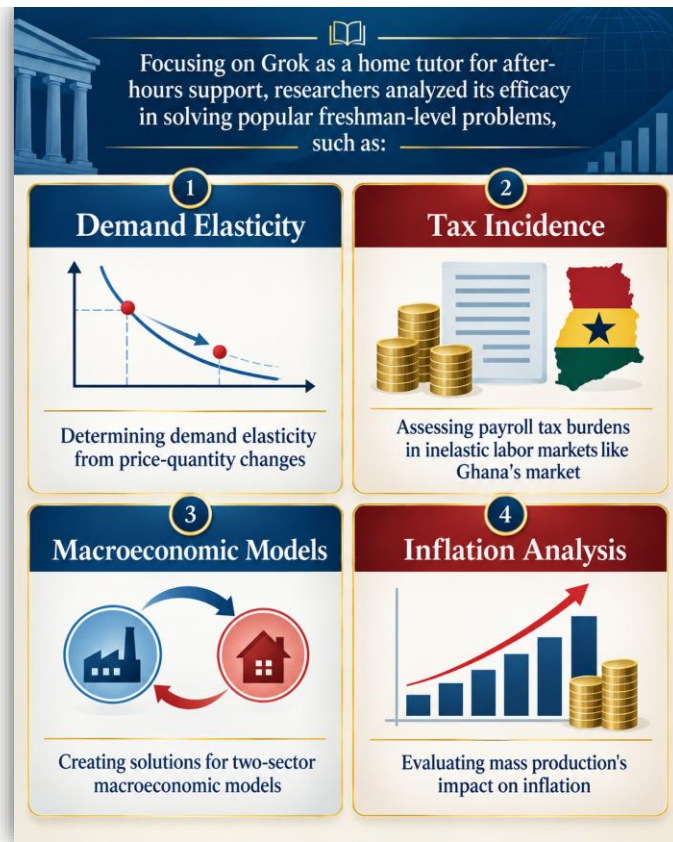
This student-led research explored the power of agentic AI, specifically Grok in expert mode, as an after-hours tutor for college economics students. Researchers addressed common freshman-level challenges, demand elasticity, tax incidence in Ghana's labor market, two-sector macroeconomic models, and inflation. The project compared Grok's performance against ChatGPT's teaching agent mode and researcher answer keys. Results demonstrated Grok's strengths in mathematical precision, real-time relevance, relatable explanations, and structured pathways. The work aligns with the missions of University of Cape Coast and Walsh University by promoting equal access to quality education, serving the common good through faith-driven innovation, and empowering students worldwide to succeed "notwithstanding their circumstances."

Project Details

In an era where educational disparities persist, this student-driven research investigated the power of agentic AI to enhance learning in undergraduate education in economics. Focusing on Grok as a home tutor for after-hours support, researchers analysed its efficacy in solving popular freshman-level problems, such as determining demand elasticity from price-quantity changes, assessing payroll tax burdens in inelastic labour markets like Ghana's market, creating solutions for two-sector macroeconomic models, and evaluating mass production's impact on inflation. (Figure 1)

Through structured prompts, step-by-step pathways, and comparisons with ChatGPT's teaching mode, we demonstrated Grok expert mode's superior capabilities in real-time data integration, mathematical precision, and engaging explanations, enabling independent learning without traditional tutoring access.

Figure 1. Evaluating Grok AI as a home tutor for economics students



Created with assistance from ChatGPT (OpenAI, 2026) using researcher-provided text and design specifications.

Our research methods involved collaborative sessions where researchers envisioned tutoring scenarios, evaluated AI responses against answer keys, and highlighted discrepancies (e.g., correcting exponential signs in differential equations). Results indicated that Grok outperformed in fostering critical thinking and global perspectives with tables illustrating its benefits.

This work serves the common good by bridging resource gaps, empowering all students, particularly in developing areas in Ghana, to achieve academic excellence. The project is based on faith-driven initiatives to benefit the Ghanaian community, other African countries, and beyond, as well as promoting peer support via free AI tools that reduce barriers for all learners. By integrating AI with human research, it inspires a model for global collaborations (Figure 2) to enhance learning beyond borders and supports “everyone can become great, notwithstanding their circumstances.”

Figure 2. Research model supports global collaborations (Gamma AI)



Research Methods

The GLYB (Gideon, Livingstone, Yussif, Bismark) team from UCC and Dr. Heston from Walsh University created a faith-driven research collaboration. Our team developed a detailed, repeatable prompt that instructed the AI to (1) solve each economics problem in freshman-friendly language with relatable analogies, (2) provide a clear 2–4 step independent learning pathway, (3) compare its solution directly to the researcher-provided answer key, and (4) generate two practical tables showing agentic AI’s value for after-hours tutoring and broader educational innovation.

Identical prompts were used in two trials: one with Grok 4 in expert mode (December 2025) and one with ChatGPT 5.1 in teaching agent mode. Responses were evaluated for accuracy, clarity, depth of explanation, mathematical correctness (especially the differential equation), engagement, and alignment with the project’s vision. Researchers also documented strengths, limitations, and alignment with Ghana Tertiary Education Commission (GTEC) standards for tertiary economics education.

Demonstrating Grok’s Superior Capabilities

Grok excelled in several key areas. For the two-sector macroeconomic model, both AIs identified the system as unstable and noted a sign error in the answer key’s exponential term. However, Grok provided a more transparent step-by-step derivation using the integrating factor method and a clearer stability analysis. Across all questions, Grok delivered concise yet

engaging explanations with culturally relevant examples (e.g., Ghana’s labor market) and effectively used tables to summarize benefits.

Grok’s agentic features, including real-time knowledge, strong mathematical reasoning, and tool integration potential, produced more dynamic and globally aware responses compared to ChatGPT’s more verbose but highly structured teaching-agent output.

Results

Results showed Grok outperforming in mathematical precision, critical thinking support, and global perspective integration. Grok’s superior performance is highlighted in Figure 3. Both AIs aligned closely with the answer key on Questions 1, 2, and 4, but Grok offered superior scaffolding for independent student work through its bullet-point pathways and relatable analogies. Tables generated by Grok effectively visualized how agentic AI can serve as a 24/7 tutor, supporting personalized learning, error-checking, and motivation, particularly valuable for students in resource-limited settings. Overall, these outcomes confirm agentic AI’s potential to reduce educational barriers and complement traditional tutoring centres.

Figure 3. Grok’s agentic AI mode outperformed ChatGPT in several areas (Gamma AI)



Mission Alignment

This project serves the common good by bridging resource gaps and empowering students, particularly in developing regions like Ghana, to achieve academic excellence in economics. (Figure 4) It aligns with the University of Cape Coast’s commitment to quality tertiary education, critical thinking, and societal impact under GTEC standards, as well as Walsh University’s inspired mission of values-based education and service to others. Faith principles of justice, solidarity, and human dignity guide our work, fostering inclusive learning opportunities that reflect the belief that all students can thrive with the right support, regardless of their circumstances.

Figure 4. Our research in AI innovation empowers college students as they move forward (Gamma AI)



Conclusion

Agentic AI, particularly Grok in expert mode, offers a powerful, scalable solution for after-hours economics tutoring that promotes independent learning and academic success. This student-led research not only validated Grok's effectiveness but also created a replicable framework for integrating AI into education across disciplines and borders. As researchers, we gained invaluable experience in AI evaluation, international collaboration, and faith-driven innovation. Ultimately, this work advances our shared vision that everyone can become great notwithstanding their circumstances, by making quality education more accessible and equitable worldwide.

References

ChatGPT: <https://openai.com/chatgpt>
Grok AI: grok.com
Gamma AI: <https://gamma.app>

Preparing Global Leaders: A Cross-Cultural Exploration of Agentic AI in Management Education

Eleanor Agbeshie
Theodore Kpordzo
Eric Sarfo
Lydia Owusu-Ansah
Yussif Osman
University of Cape Coast (Cape Coast, Ghana)

Amy J. Heston, Ph.D.
Walsh University (Ohio, USA)

eleanor.agbeshie@stu.ucc.edu.gh; theodore.kpordzo@stu.ucc.edu.gh;
eric.sarfo4198@gmail.com; lydiaowusuansah.01@gmail.com; yussif.osman@stu.ucc.edu.gh;
aheston@walsh.edu

Project Overview

This project explores how free or low-cost agentic AI tools can strengthen leadership, organization, and teaching in business settings and college classrooms while advancing the common good. Through experimental trials, researchers from University of Cape Coast evaluated agent-supported workflows for decision-making, team coordination, and formative feedback. (Figure 1) Results highlighted culturally responsive, ethically grounded practices and scalable strategies for responsible adoption in management and business education.

Figure 1. Agentic AI for Collaboration (Gamma AI)



Project Details

Agentic AI is rapidly reshaping how organizations coordinate work, make decisions, and develop leaders. Yet many business managers and business faculty lack practical, ethical, and culturally responsive pathways to pilot agentic AI in real-world settings, especially when budgets are limited and institutional missions prioritize human dignity and the common good. This project investigates how free or low-cost agentic AI tools can improve leadership effectiveness, organizational workflow, and instructional practices in the college business classroom through a mission-aligned partnership between University of Cape Coast (Ghana) and Walsh University (USA).

Experimental trials showed promise for generative AI to support AI adoption in the business setting and to support student success. Diving deeper, agentic AI (Grok) gave interesting results upon creative prompting that resulted in designing a research-backed pilot for agentic AI in (1) business management leadership/organization and (2) the college business classroom. Next, researchers used more prompting with the agentic AI to reveal free tools that could be implemented. The researchers' goals were to make a positive impact on both the business professional workplace and teaching business in higher education.

Overall, the project's outcome focused on ethical implementation across Ghanaian and U.S. contexts. Ultimately, this work advances agentic AI not as a replacement, but as a responsible partner for leadership development, educational excellence, and mission-centered service. (Figure 2)

Research Methods

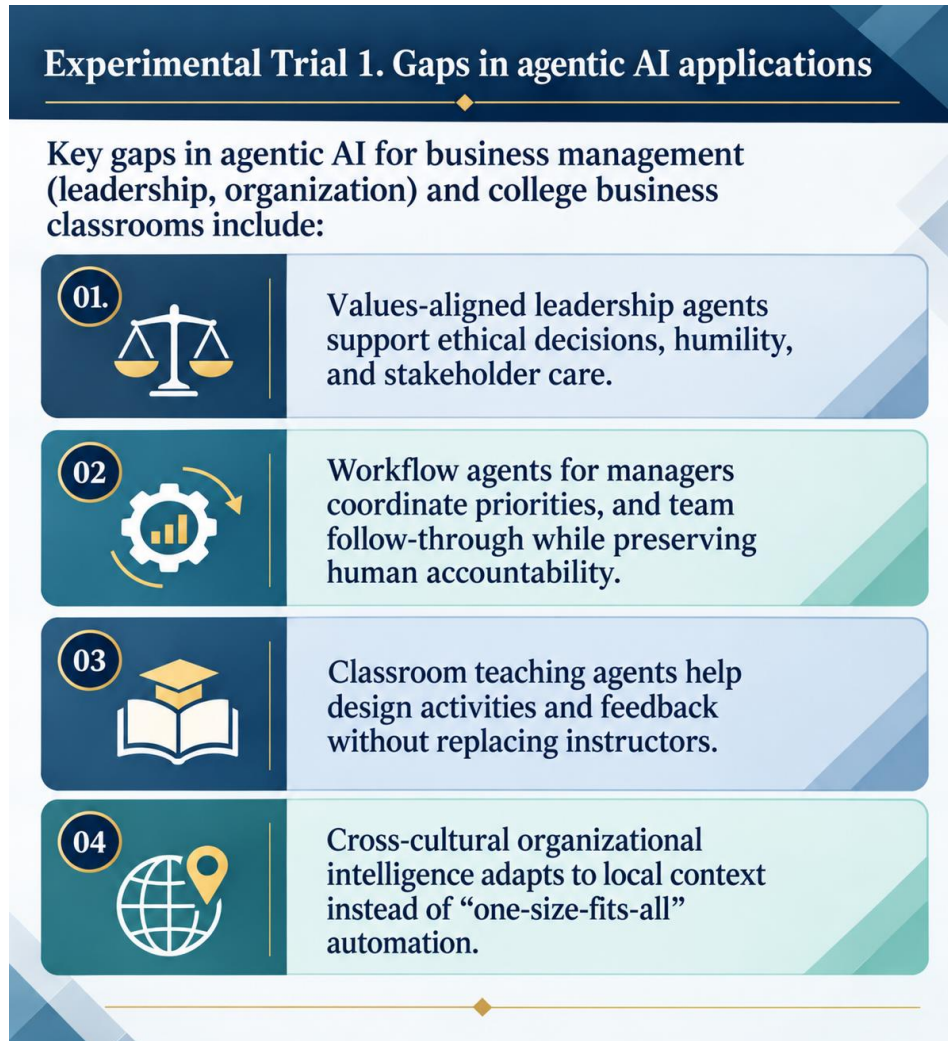
Researchers used ChatGPT Deep Research to identify gaps and generate an initial 5-step plan. Then, they deployed Grok in expert/agentic mode to design research-backed pilots and a practical implementation framework. Outputs from both platforms were compared, and free agentic tools were evaluated for accessibility in Ghanaian and U.S. contexts. All stages maintained strong emphasis on ethics, cultural relevance, and service to the common good.

Key Findings & Plans

Both ChatGPT and Grok produced complementary 5-step plans. ChatGPT emphasized mission-centered use cases, safe playbooks, and leadership formation. Grok focused on readiness assessment, scalable pilots with metrics, and reskilling. Grok's approach showed stronger quantitative backing and tool integration (e.g., CrewAI), while ChatGPT excelled in ethical reflection and values alignment.

Free tools such as AutoGPT, CrewAI, and Google Workspace Studio were identified as immediately usable for pilots.

Figure 2. Gaps in Agentic AI Applications (ChatGPT)



Created with assistance from ChatGPT (OpenAI, 2026) using researcher-provided text and design specifications.

Mission Alignment

This cross-cultural research project aligns closely with the mission of both University of Cape Coast and Walsh University by promoting ethical innovation, leadership development, and service to the common good. Through the exploration of agentic AI in business management and higher education, the project demonstrates how emerging technologies can strengthen decision-making, improve learning experiences, and support organizational growth while maintaining human dignity and accountability. The collaboration between Ghanaian and United States researchers also reflects a commitment to global partnerships, culturally responsive research, and knowledge sharing that benefits both academic institutions and the wider community. By focusing on affordable and responsible AI adoption, the project advances educational excellence and prepares students, educators, and business leaders to engage thoughtfully with transformative technologies.

Conclusion

This study demonstrates that agentic AI can serve as a responsible and ethical partner in both business management and higher education when implemented with appropriate safeguards and human oversight. The cross-cultural collaboration between University of Cape Coast and Walsh University highlights the value of international research partnerships in developing scalable, mission-centered AI solutions that support leadership, learning, and organizational effectiveness. The project also strengthened the research, collaboration, and AI application skills of the student researchers by providing hands-on experience with emerging technologies and ethical innovation. Ultimately, the study contributes to ongoing discussions about how AI can advance education, support the common good, and promote culturally responsive technological development.

References

Grok AI: grok.com

ChatGPT: www.chatgpt.com

Agentic AI in Nursing Care and the Future of Human-Centered Healthcare Innovation

Yongling Jimenez
Dr. Amy J. Heston
Walsh University (Ohio, USA)

Raymond Owusu Ansah
Moses Tetteh Larnyoh
University of Cape Coast (Cape Coast, Ghana)

yjimenez1@walsh.edu; aheston@walsh.edu; raymond.owusuansah@stu.ucc.edu.gh;
mosestetteh988@gmail.com

Abstract

This research project explores how agentic AI can enhance hospital-based nursing care by improving communication, workflow efficiency, and ethical decision-making while preserving empathy and human dignity. Grounded in faith, the project highlights free agentic AI tools and applications for supporting patient-centered care beyond borders. Overall, this technology advances healthcare innovation for serving the common good.

Project Overview

As healthcare systems increasingly adopt artificial intelligence, there is growing concern that these efficiency-driven technologies may unintentionally harm the relational and ethical foundations of nursing practice. This project examines how agentic AI, a system capable of autonomous goal-setting, reasoning, and adaptation, can be designed and implemented to support, rather than replace, the empathetic and communicative role of hospital nurses.

Focusing on hospital settings and patients across all ages, this research explores nurse-guided agentic AI applications that enhance communication, reduce cognitive overload, and improve workflow efficiency while safeguarding human dignity. During the team's experimental trials, particular attention is given to gaps in current AI adoption, including limited nurse agency in AI oversight, insufficient cultural and emotional sensitivity, and disparities between U.S. and global healthcare contexts. The project positions nurses as moral agents and co-designers of AI, ensuring technology aligns with patient values, ethical care standards, and serves the common good.

Using free or open agentic AI tools, the study proposes a five-step implementation framework for hospitals that emphasizes values-based adoption, nurse-led experimentation, reflective evaluation, and ethical scaling. The work aligns with faith-informed and mission-driven institutions, including Walsh University, by integrating innovation, service, and moral responsibility.

This research contributes a practical and ethical roadmap for agentic AI in nursing, offering scholars, educators, and healthcare leaders a model for compassionate, human-centered AI integration in healthcare systems worldwide.

Project Details

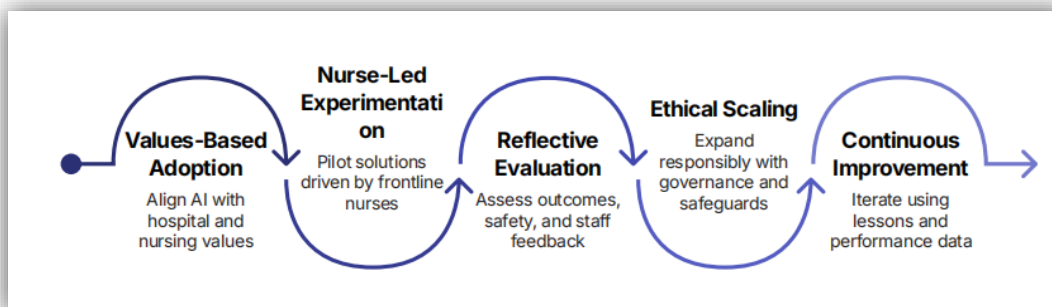
The foundation of this project is the recognition that artificial intelligence should function as a supportive partner in healthcare rather than a replacement for human caregivers. Healthcare is an embodied practice, and nursing is built upon communication, empathy, ethical reasoning, and patient advocacy. While modern AI systems can improve efficiency and automate repetitive tasks, there is concern that excessive reliance on technology may weaken the interpersonal relationships that are central to nursing practice. Therefore, this project investigates how agentic AI can be intentionally designed to strengthen these human-centered aspects of care.

A key focus of the study was the identification of challenges associated with current AI adoption in healthcare environments. During exploratory evaluations, three major gaps emerged. First, nurses often have limited involvement in decisions regarding AI implementation despite being the primary users of many healthcare technologies. Second, many AI systems lack sufficient cultural and emotional sensitivity, reducing their ability to respond appropriately to diverse patient populations. Third, significant disparities exist between healthcare systems in highly resourced settings and those in low-resource environments, creating barriers to equitable access and implementation.

To address these concerns, the project proposes a five-step implementation framework for agentic AI in nursing practice. The first step, values-based adoption, emphasizes aligning AI tools with patient dignity, ethical standards, and institutional missions before deployment. The second step, nurse-led experimentation, encourages frontline nurses to actively test and shape AI applications in clinical settings. The third step, reflective evaluation, examines whether the technology genuinely improves communication, empathy, workflow efficiency, and patient outcomes. The fourth step, ethical scaling, focuses on expanding successful AI applications while preserving ethical safeguards and cultural relevance. Finally, continuous improvement ensures that AI systems evolve based on user feedback, performance data, and changing healthcare needs.

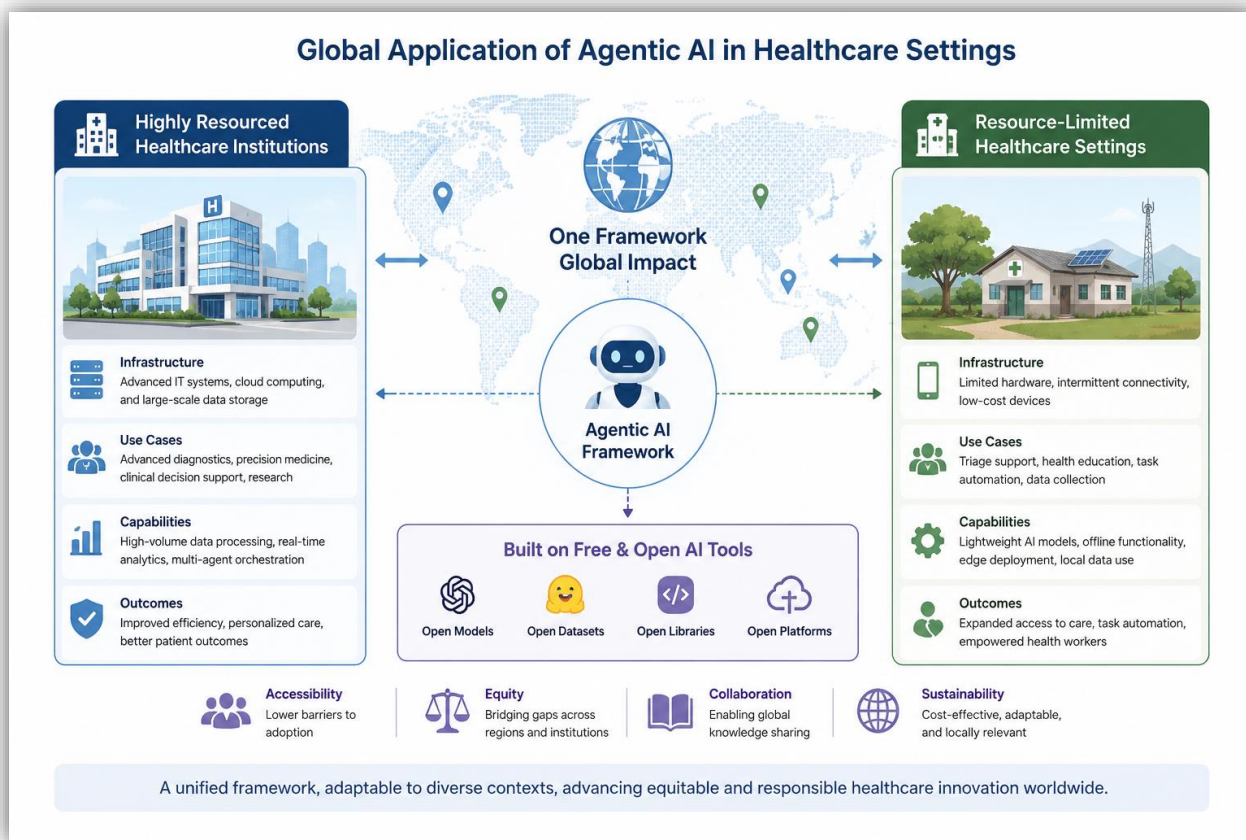
Figure 1 illustrates the proposed five-step implementation framework that places nurses at the center of AI adoption and governance. The framework demonstrates how healthcare organizations can integrate innovation while maintaining patient-centered values.

Figure 1. Five-Step Implementation Framework for Agentic AI in Nursing:
A conceptual framework showing the progression from values-based adoption through continuous improvement, emphasizing nurse leadership, ethical oversight, and patient-centered care. (Gamma AI)



The project's global perspective is particularly important because healthcare environments differ significantly across regions. As shown in Figure 2, the framework was designed to be applicable in both highly resourced healthcare institutions and resource-limited settings. By emphasizing free and open AI tools, the framework promotes accessibility and equity in healthcare innovation.

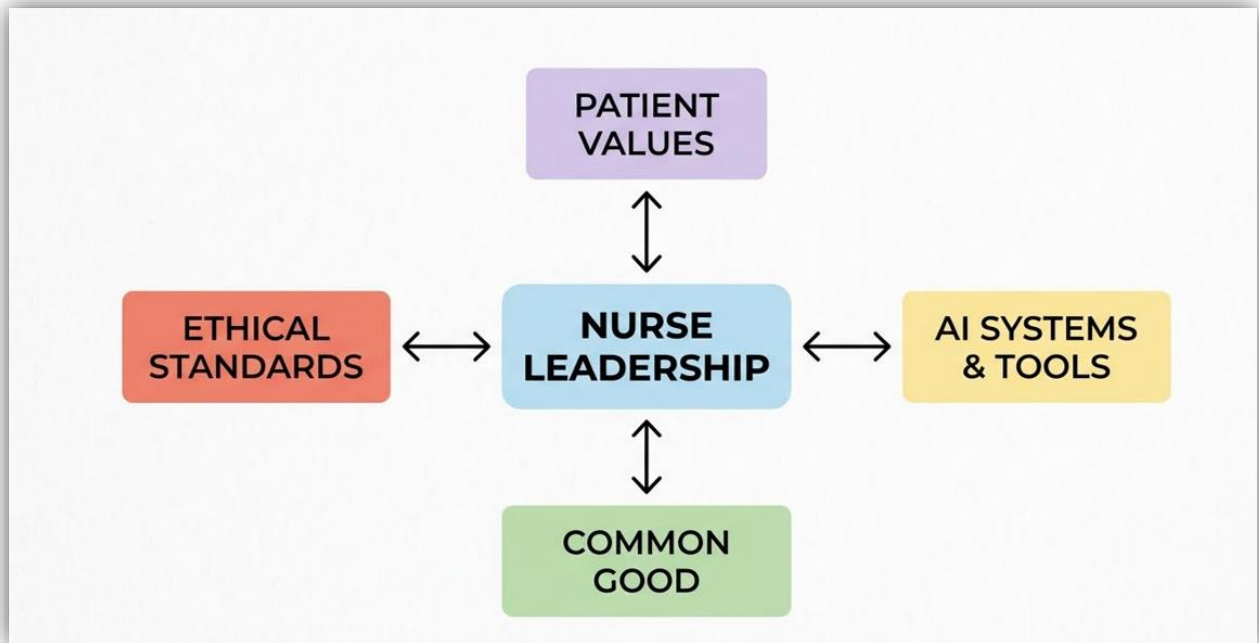
Figure 2. Global Application of Agentic AI in Healthcare Settings:
Illustration demonstrating how free and open agentic AI tools can support nursing care across diverse healthcare systems, including hospitals in the United States and healthcare facilities in Ghana. (ChatGPT)



Another major finding of this project is the importance of preserving nurse agency. Figure 3 highlights the concept of nurses as moral agents and co-designers of AI systems. Rather than functioning solely as end users, nurses should actively participate in the design, implementation, evaluation, and governance of healthcare technologies.

Figure 3. Nurses as Moral Agents and Co-Designers of AI:

Conceptual representation showing the relationship between nursing expertise, ethical decision-making, patient values, and responsible AI implementation. (ChatGPT)



Mission Alignment

This project strongly aligns with the mission of faith-informed institutions by demonstrating how technological innovation can serve humanity while preserving dignity, compassion, and ethical responsibility. The framework emphasizes service to the common good by ensuring that AI adoption remains patient-centered and accessible across diverse healthcare environments. By promoting free and open AI tools, the project supports healthcare equity and expands opportunities for underserved communities. The work further reflects the values of stewardship, collaboration, and responsible innovation that guide mission-driven healthcare education and practice.

Conclusion

Agentic AI has significant potential to improve healthcare delivery when implemented in ways that strengthen rather than replace the human dimensions of nursing care. This project provides a practical and ethical framework that prioritizes communication, empathy, nurse leadership, and patient dignity throughout the AI adoption process. Beyond its contribution to healthcare innovation, the research provided valuable opportunities for interdisciplinary collaboration, international partnership, and the development of AI literacy and research skills among student

researchers. Ultimately, the work demonstrates how technology can be guided by ethical principles to advance healthcare for the common good.

References

ChatGPT. <https://chatgpt.com>

Grok. <https://grok.com>

Gamma. <https://gamma.app>

AI for Enhancing Geography Education: Increasing Student Success and Faculty Support Through Faith-Based Innovation

Victoria Yeboah
Kingsley Opirim Quansah
Lily Gyasiwaa Osei
Emmanuel Affenyi
Yussif Osman
University of Cape Coast (Cape Coast, Ghana)

Dr. Amy J. Heston
Walsh University (Ohio, USA)

oseigyasiwaalily@gmail.com; affeniemmanuel1997@gmail.com;
yeboahvictoria495@gmail.com; kingsleyquansah63@gmail.com;
yussif.osman@stu.ucc.edu.gh; aheston@walsh.edu

Project Overview

This project explores how agentic AI can positively impact geography education and career preparation through adaptive simulations, autonomous learning support, and real-time technological intelligence. Grounded in a shared faith commitment to the common good, the work evaluates classroom pilots that empower students, reduce faculty workload, and prepare learners for careers in Geographic Information Systems, diplomacy, and social advocacy. Our efforts align with the missions of University of Cape Coast and Walsh University.

Project Details

As geographic challenges grow more complex, including climate change, migration, urbanization, and global diplomacy, higher education must prepare students with tools that are adaptive, ethical, and purpose-driven. This research project investigates the application of agentic AI to transform geography education and career readiness while serving the common good. Agentic AI systems differ from traditional tools by autonomous reasoning, planning, and acting in response to real-world data and learner input.

The project evaluates classroom and research pilots in which agentic AI supports adaptive geographic simulations, faculty workflow optimization, and student career preparation. Simulations dynamically respond to student decisions in areas such as disaster response, spatial justice, and environmental planning, fostering systems thinking and moral accountability. Faculty-facing agents assist with assessment, feedback, and curriculum design, allowing educators to focus on mentorship and classroom activities. Career-oriented agents help students explore pathways in Geographical Information Systems (GIS), humanitarian mapping, diplomacy, and social advocacy, integrating technical skill development with values, vocation, and service.

The project is intentionally grounded in faith and ethics, aligning with the missions of University of Cape Coast in Ghana and Walsh University in the United States. Both institutions emphasize human dignity, leadership, and societal impact including principles embedded into the design and evaluation of agentic AI use. This work contributes to emerging scholarship on responsible AI, geographic education, and global collaboration, offering a model for innovation that advances both academic excellence and the common good. (Figure 1)

Figure 1. Promoting Academic Excellence in Education (Gamma AI)



Research Methods

Researchers first used ChatGPT's Deep Research mode to identify gaps in agentic AI for geography careers and generate a 5-step classroom implementation plan. Identical prompts were then used with Grok in expert/agentic mode to create a parallel operational plan. Outputs were compared for structure, ethical depth, scalability, and alignment with university missions and the common good. Free agentic tools (SuperAGI, AutoGen, OpenAI Swarm) were also identified for immediate classroom piloting. All stages emphasized faith-informed reflection and service to Ghana and the United States. (Figure 2)

Figure 2. Global Impact on Geography Careers (Gamma AI)



Demonstrating Grok's Superior Capabilities

Grok's plan excelled in operational scalability, beginning with needs assessment and ending with campus-wide sustainability. It prioritized inclusive access for resource-limited settings and provided measurable metrics. ChatGPT's plan offered stronger immediate pedagogy and vocational discernment with explicit stewardship language. Both plans strongly integrated faith, ethics, and global responsibility. (Figure 3)

Results

Both plans promote ethical, adaptive AI use for student success and faculty efficiency. Grok performed better in systematic implementation and suitability for Ghana's context, while ChatGPT excelled in direct classroom integration ideal for U.S. settings. Free tools such as SuperAGI (best overall) enable immediate pilots. Overall, Grok demonstrated stronger agentic decision-making capabilities.

Figure 3. Emphasizing Collaboration and Global Responsibility (Gamma AI)



Mission Alignment

This project serves the common good by bridging resource gaps and empowering students in geography through ethical agentic AI. It aligns with the University of Cape Coast's commitment to quality education, spatial problem-solving, national development, and ethical leadership, as well as Walsh University's Catholic-inspired mission of service to the common good, global engagement, and vocation-centered education. Faith principles of human dignity, justice, and stewardship guide our innovation, fostering inclusive learning that helps every student thrive notwithstanding their circumstances.

Conclusion

Agentic AI offers a powerful pathway to transform geography education by enabling adaptive simulations, supporting faculty, and preparing purpose-driven professionals. This student-led research validates the value of comparing tools like Grok and ChatGPT while highlighting free, accessible options for immediate impact. As researchers, we gained skills in prompt engineering, comparative analysis, and faith-driven innovation. Ultimately, this work advances our shared vision of accessible, ethical education that serves the common good across Ghana, the United States, and beyond.

References

Grok: <https://grok.x.ai>

ChatGPT: <https://openai.com/chatgpt>

Faith-Guided Agentic Artificial Intelligence in Data Analytics Education: Enhancing Student Success in Ghana and Global Contexts

Joseph Addai
University of Cape Coast (Cape Coast, Ghana)

Dr. Amy J. Heston
Walsh University (Ohio, USA)
addaijoseph750@gmail.com; aheston@walsh.edu

Project Overview

This research compares the educational capabilities of ChatGPT (research agent mode) and Grok (expert mode) in advancing data analytics education guided by faith and ethical responsibility. Using analysis of both agents' outputs, researchers evaluated best practices for utilizing agentic AI, its potential to enhance learning, and the project's alignment with institutional missions at University of Cape Coast and Walsh University. Findings highlight pedagogical strengths, problem-solving capabilities, and personalized learning.

Project Details

In an era of rapid technological advancement, this project investigates the transformative potential of agentic AI in data analytics education, with a faith-based framework to guide ethical and purposeful learning. By focusing on Grok AI as an expert tool, this research between University of Cape Coast (UCC) in Ghana and Walsh University in Ohio, USA, aligns with their missions of innovative, values-driven education and service to the common good.

The core objective is to enhance student engagement and mastery in data analytics by leveraging AI for solving common analytical problems, providing tailored study tips, and connecting concepts to personal life, Ghanaian community challenges (e.g., agriculture, health equity), and practical applications. A detailed stepwise plan for researchers includes introductory workshops, foundational skill-building, hands-on projects, life-community integration, career exploration, assessments, and ongoing support. This approach emphasizes long-term benefits like critical thinking, ethical decision-making, and career versatility across disciplines such as healthcare, finance, and environmental science.

Methodologically, the study will deploy tables and explanations to demonstrate Grok's capabilities, including leveled conceptual breakdowns (from undergraduate to Ph.D.) and comparative impacts in Ghana, other African regions, and the USA. Faith integration promotes reflection on data as a tool for stewardship and justice, ensuring moral responsibility.

Expected outcomes include improved learning outcomes, research publications on AI's educational efficacy, and scalable models for global adoption. By bridging cultural contexts, Ghana's focus on community development and Walsh's Catholic emphasis on service, this initiative fosters inclusive, innovative education that prepares students as ethical leaders in a data-driven world.

Comparative Analysis of Two Leading AI Systems

This study compared two agentic artificial intelligence systems, the research agent mode of ChatGPT and the expert mode of Grok, in supporting teaching and learning. The findings show that both systems use structured output evaluation and pedagogical alignment frameworks, which reflects the growing use of AI to improve instructional design in higher education (Zawacki-Richter et al., 2019).

ChatGPT was found to be effective in giving clear, multilevel explanations of concepts and supporting academic understanding through structured responses. This supports earlier research that large language models can improve explanation quality and student learning support (Kasneci et al., 2023). Grok AI, on the other hand, showed stronger performance in personalized instruction and adaptive responses, helping to meet individual learner needs more directly. This aligns with studies that emphasize the importance of personalization in improving student engagement and learning outcomes (Luckin et al., 2016).

Overall, both systems improved understanding, engagement, and learning outcomes when used appropriately in teaching. This supports the view that artificial intelligence, when used responsibly, can enhance teaching and learning in higher education (Tlili et al., 2023).

Best Practices Identified Across Both AI Systems

The comparison of the two AI systems identified several best practices that can improve teaching and learning in data analytics education. (Figure 1) These include scaffolding learning, where knowledge is built gradually through structured support; values-guided analytics, which integrates ethical and faith-based principles into data analysis; localized Ghanaian case applications that make learning more relevant through regional examples; and interdisciplinary career preparation, which equips students with skills for diverse professional opportunities. Overall, these practices highlight how AI-supported instruction can be designed to be more structured, contextual, ethical, and career-focused in higher education.

ChatGPT's Output Characteristics

The data revealed that ChatGPT produced outputs characterized by deeper structural reasoning, strong project design support, and comprehensive analytical frameworks that help in organizing complex academic content. In contrast, Grok generated outputs that were more focused on personalized feedback and motivational framing, often incorporating a spiritually grounded tone that supports learner encouragement and engagement. Overall, both systems demonstrate different but complementary strengths in enhancing learning and academic support.

Figure 1. AI to support data analytics education (Gamma AI)



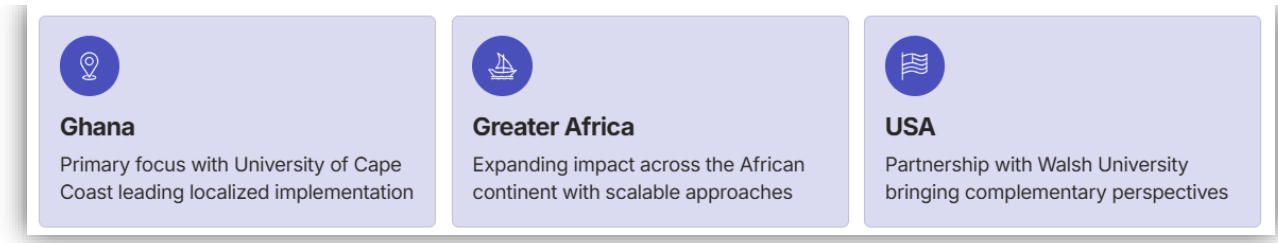
Grok's Output Characteristics

The outputs of Grok were characterized by strong personalized feedback, a spiritually grounded motivational tone, and a focus on individual student engagement. The system tended to tailor responses to learners' specific needs, offering encouragement and reflective guidance that supported motivation and sustained learning interest. Overall, Grok's output style is more learner-centered, with emphasis on emotional support and individualized academic engagement.

AI-Supported Instruction

The study explores best practices for AI-supported instruction in data analytics education from the 100 level to doctoral studies, focusing on the integration of agentic AI tools such as ChatGPT and Grok into curriculum design, the enhancement of student learning outcomes through technology, the promotion of cross-cultural collaboration, and the maintenance of ethical and faith-based values in AI implementation. The overall impact of this innovation is described in Figure 2.

Figure 2. Geographic scope of impact (Gamma AI)



Mission Alignment

The analysis of both AI systems shows that agentic AI can be used to improve teaching and learning in higher education. (Figure 3) Both ChatGPT and Grok support better student engagement, improved understanding, and more structured academic support. The study also shows that their use aligns with the institutional goals of University of Cape Coast and Walsh University, particularly in promoting quality education, ethical practice, and the development of digital and analytical skills. Overall, the findings suggest that agentic AI can contribute meaningfully to innovative and learner-centered education when applied responsibly.

Figure 3. Faith-based AI innovation to enhance higher education (Gamma AI)



Conclusion

This faith-driven innovative research explored the potential of agentic artificial intelligence to improve student success in data analytics and strengthen students' understanding of real-life applications. The findings show that the use of AI tools such as ChatGPT and Grok can support more effective and engaging learning experiences when properly integrated into teaching. The rise of agentic AI presents a clear opportunity to enhance data analytics education, especially in mission-driven institutions that emphasize ethical technology use, academic excellence, and community service. Overall, the study highlights that when AI is used responsibly and within a values-based framework, it can meaningfully strengthen teaching, learning, and student outcomes in higher education.

References:

Grok AI: grok.com

ChatGPT: www.chatgpt.com

Gamma: www.gamma.com

- Kasneci, E., Sessler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Günnemann, S., Hüllermeier, E., Krusche, S., Kutyniok, G., Michaeli, T., Nerdel, C., Pfeiffer, F., Poquet, O., Sailer, M., Schmidt, A., Seidel, T., ... Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences*, 103, 102274. <https://doi.org/10.1016/j.lindif.2023.102274>
- Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed: An argument for AI in education*. Pearson.
- Tlili, A., Shehata, B., Adarkwah, M. A., Bozkurt, A., Hickey, D. T., Huang, R., & Agyemang, B. (2023). What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education. *Smart Learning Environments*, 10(1), 15. <https://doi.org/10.1186/s40561-023-00237-x>
- Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education—Where are the educators? *International Journal of Educational Technology in Higher Education*, 16(1), 39. <https://doi.org/10.1186/s41239-019-0171-0>

Global Partnership, Local Impact: Ethical Agentic AI Innovation for Transforming Cocoa Processing in Ghana

Godwin Kwame Botchway
Ebenezer Isaac Brew
Elizabeth Amoah
University of Cape Coast (Cape Coast, Ghana)

Justice Hanson
Family Office Access (North Carolina, USA)

Dr. Amy J. Heston
Walsh University (Ohio, USA)

botchwaygodwinkwame@gmail.com; brewebenezerisaac@gmail.com
amoahelizabeth122@gmail.com; just.hanson1@gmail.com; aheston@walsh.edu

Project Overview

Our research project explores how agentic artificial intelligence can transform cocoa-processing operations in Ghana by enabling autonomous, adaptive machine workflows that enhance efficiency, quality, and workforce collaboration. Grounded in a bi-national partnership between University of Cape Coast and Walsh University, the project explores ethical, economic, and human-centered implications of AI-driven industrial innovation that serves the common good across Ghana and the USA.

Project Details

Cocoa remains a cornerstone of Ghana's economy, yet much of its value creation occurs outside the country due to limited automation and processing capacity. This research investigates the potential of agentic artificial intelligence (AI)—autonomous systems capable of planning, adapting, and acting—to support cocoa-processing operations through intelligent machine coordination, human-AI collaboration, and ethical supply-chain integration. Unlike traditional automation, agentic AI can dynamically adjust processing parameters, anticipate maintenance needs, and coordinate multi-stage workflows such as fermentation, drying, roasting, and grinding.

The study is grounded in a collaborative partnership between University of Cape Coast (Ghana) and Walsh University (USA), aligning technological innovation with community development, ethical leadership, and the common good. Using pilot simulations and laboratory-based scenarios, researchers will evaluate open-source agentic AI frameworks that are accessible to resource-constrained environments while remaining scalable for industrial contexts. Particular attention is given to workforce transformation—examining how AI agents can augment rather than displace human expertise through supervisory, interpretive, and decision-support roles.

Research Findings and Data

Experimental trials using ChatGPT deep research and Grok agentic AI revealed key gaps in the current application of agentic AI for cocoa processing in Ghana. Five critical gap areas were identified: limited machine-to-machine coordination, absence of locally contextualized AI models, underdeveloped human-AI collaboration frameworks, weak economic impact assessment, and insufficient integration into ethical supply chains. These gaps were documented through structured prompt engineering and serve as the foundation for this study's research agenda. ChatGPT identified the following gap areas as shown in Table 1, which illustrates research opportunities across these five dimensions. To address these gaps, researchers applied a five-step implementation plan developed through AI-assisted research, as summarized in Table 2.

Grok agentic AI further elaborated on the design, evaluation, and iteration of autonomous agents tailored to Ghana's conditions, including humid climates, limited electricity, and labor-intensive processing stages. The Grok analysis projected a potential 20-30% efficiency gain and up to \$500,000 in annual savings per mid-sized processing plant, alongside a targeted 15% yield increase in premium cocoa exports. These findings support the scalability and economic viability of this research model.

Free and open-source agentic AI tools were also identified to enable practical piloting of this work, as summarized in Table 3. SuperAGI was recommended for overall value, CrewAI for the Ghana context due to its ease of configuration, and Microsoft AutoGen for scalable industrial applications in the USA.

Mission Alignment

This research is deeply aligned with the missions of both University of Cape Coast and Walsh University. Moreover, University of Cape Coast is committed to community development, innovation, and workforce readiness—values that are directly advanced through the local capacity-building and economic empowerment that agentic AI can bring to Ghana's cocoa industry. Walsh University's mission of faith-informed education, ethical leadership, and service to others is reflected in the project's emphasis on ethical AI deployment, international partnership, and the common good. Together, these institutions model how technology and values can work in harmony to serve both local and global communities. This collaboration exemplifies how faith-driven innovation can cross borders, advance shared goals, and create lasting, human-centered impact.

Table 1. Research Gaps in Agentic AI Applications for Cocoa Processing in Ghana (ChatGPT)

Gap Area	Description	Research Opportunity
Autonomous Coordination	Limited AI-driven machine collaboration	End-to-end agentic workflows
Local Context	Few Ghana-trained AI models	Context-aware agents
Human-AI Roles	Operator support underdeveloped	Augmentation frameworks
Economic Impact	Weak macro/micro analysis	Job & GDP modeling
Ethical Supply Chains	Limited AI traceability	Fair-trade automation

Table 2. Five-Step Plan for Agentic AI Implementation in Cocoa Processing (ChatGPT & Grok AI)

Step	Focus	Outcome
1	Process Mapping	Targeted AI use
2	Pilot Agents	Adaptive automation
3	Workforce Integration	Skilled collaboration
4	Impact Metrics	ROI & value creation
5	Ethical Scaling	Sustainable growth

Table 3. Free Agentic AI Tools Recommended for Piloting (ChatGPT)

Tool	Free/Open-Source	Best Use	Notes
SuperAGI	Free	Overall value	Build autonomous workflows
CrewAI	Free	Ghana context	Team-based agents
Microsoft AutoGen	Free	USA industry	Scalable, modular agents
OpenAI Swarm	Free (experimental)	Multi-agent orchestration	Early-stage tool
AiAgent.app	Freemium	Simple agents	Low barrier to entry

Conclusion

This research demonstrates that agentic AI holds meaningful promise for transforming cocoa processing in Ghana through autonomous coordination, ethical supply-chain integration, and human-centered workforce development. By grounding the work in a bi-national partnership between the University of Cape Coast and Walsh University, the project provides a replicable model for responsible AI innovation that serves the common good in both Ghana and the United States. This research experience has also significantly advanced the student researchers' skills in AI technology, international collaboration, and faith-driven inquiry. It has prepared us for careers at the intersection of innovation, ethics, and service.

Author Contributions

Godwin Kwame Botchway led the experimental trials using ChatGPT deep research (Trial 1) and contributed to the Project Details and Research Findings sections. Ebenezer Isaac Brew conducted the Grok agentic AI trials (Trial 2) and contributed to the comparative analysis and five-step plan development. Elizabeth Amoah contributed to the Mission Alignment and Conclusion sections and coordinated the free tools research (Trial 4). Dr. Amy J. Heston designed the Heston AI Innovation Research Model, guided the research process, and contributed to all sections through editorial review and strategic framing. Justice Hanson contributed to the economic impact analysis and the university mission alignment table. Equal participation was maintained throughout the research and writing process.

References

Grok AI: grok.com

ChatGPT: www.chatgpt.com

SuperAGI: superagi.com

CrewAI: crewai.com

Microsoft AutoGen: microsoft.github.io/autogen/

**Serving the Common Good:
Faith-Informed Agentic AI for Quality and Efficiency in Public Health Laboratories**

Wonder Ablordeppey
Ghana Institute of Management and Public Administration (GIMPA) (Accra, Ghana)

Amy J. Heston, Ph.D.
Walsh University (Ohio, USA)

wonderablor@gmail.com; aheston@walsh.edu

Project Overview

Research trials with Grok (expert mode) created a 5-step plan describing the positive impacts that agentic AI has in today's clinical laboratories in Ghana and the USA. The plan, tailored for lab managers, promoted agentic AI's potential for improving clinical procedures. Grounded by faith and mission alignment, researchers revealed free agentic AI systems that served the common good by strengthening public health outcomes.

Project Details

Public health laboratories play a critical role in safeguarding population health, yet many face persistent challenges related to data quality, workflow inefficiencies, and resource constraints. This project investigated how agentic AI can address these challenges in an ethical, accessible, and mission-driven manner.

Mission Alignment

Grounded in Catholic and Christian principles of human dignity and service to the common good, the project focuses on the use of free agentic AI tools to identify quality control discrepancies, automate routine verification tasks, and support error correction within laboratory workflows. Rather than replacing laboratory professionals, agentic AI is intended as a supportive partner that enhances professional judgment, transparency, and accountability. Our work emphasizes that human oversight and direction should not be replaced in times of technological advancement.

Experimental Trials & Results

Researchers conducted several trials. First, ChatGPT's deep research mode was used to identify gaps in agentic AI applications including how agentic AI helps to identify discrepancies in quality control and increase efficiency in lab testing. Then, focusing on AI in action, both ChatGPT (deep research) and Grok expert mode (agentic AI) were able to describe a 5-step plan to create positive change in the clinical laboratory that can be given to lab managers to promote agentic AI to improve workflow, efficiency, etc. (Image 1) Upon evaluation, a detailed comparison of both plans was noted including common trends. Another data table described free AI tools that can work best for clinical lab science and public health laboratories, particularly for Ghana. The project's alignment with the mission statements for Ghana Institute of Management

and Public Administration (Accra, Ghana) and Walsh University (Ohio, USA) was organized in a separate data table.

By integrating ethical reflection, technical innovation, and applied public health practice, this research contributed an inspiring pathway for other researchers to follow. Researchers suggest that it could serve as a faith-informed AI initiative for public health. Essentially, research findings can guide lab managers, educators, and policymakers in responsibly utilizing agentic AI to strengthen public health systems and serve society, both locally in Ghana and abroad to the USA.

Image 1. The AI-Driven Plan for Promoting Agentic AI (Grok)



Image created with ChatGPT (GPT-5.6 Sol), using OpenAI image generation, September 2026.

Agentic AI shows particular promise as a quality-assurance partner rather than a replacement for trained scientists within clinical laboratory settings. (Image 2) With the continuous cross-checking of test results, flagging inconsistencies in quality-control data, and automating repetitive verification steps, these tools free lab staff to focus on judgment-intensive work such as interpreting borderline results and troubleshooting equipment. This innovation, in both Ghana

and the United States, translates into reduced turnaround times, fewer manual transcription errors, and stronger documentation trails for regulatory review.

Image 2. Agentic AI for the Clinical Laboratory Setting (Gamma AI)



Conclusion

This innovation can benefit both Ghana and the United States. Essentially, this translates into reduced turnaround times, fewer manual transcription errors, and stronger documentation trails for regulatory review. In summary, free or low-cost agentic AI tools offer an accessible path toward more consistent, transparent, and accountable diagnostic workflows for any resource-constrained public health laboratories.

References:

Grok AI: grok.com

ChatGPT: www.chatgpt.com

Gamma AI: <https://gamma.app>

Balancing Autonomy and Accountability: Ethical Integration of Agentic AI in Human Resource Management

Yousif Mohammed
University of Cape Coast (Cape Coast, Ghana)

Dr. Amy J. Heston
Walsh University (Ohio, USA)

yousifmohammed055@gmail.com; aheston@walsh.edu

Project Overview

This project explores how agentic AI can ethically support human resource (HR) management while preserving human dignity, fairness, and accountability. Researchers examined free and accessible agentic tools that HR managers can pilot to improve workflows such as onboarding, communication, training, and conflict resolution. Grounded in best practices and a human-AI balance, the study highlights career readiness and practical safeguards. This work aligns with the mission statements of both University of Cape Coast and Walsh University because it serves the common good.

Project Details

Agentic AI, AI systems capable of planning, coordinating tasks, and taking goal-directed action, offers emerging opportunities for human resource (HR) professionals to improve efficiency, strengthen communication, and enhance workplace wellbeing. However, the use of agentic AI in HR also raises urgent ethical concerns, including increased bias, privacy risks, reduced transparency, and the potential erosion of human dignity in high-impact decisions. This project investigates how HR leaders can responsibly pilot agentic AI tools while maintaining human oversight and supporting equitable outcomes.

First, researchers identified gaps in current HR applications of agentic AI by using ChatGPT. The AI organized information in a table for reference. (Table 1) Next, researchers decided to test the potential of agentic AI through the expert mode of Grok, a free AI tool available for everyone. Experimental trials evaluated the potential of agentic AI for improving HR in the workforce. The next step was to discover practical implementation strategies. Researchers focused on finding free AI tools that could be a good fit for both Ghana and the USA. Then, further trials explored free and accessible agentic tools that managers can utilize to improve onboarding, communication, training, and conflict resolution. The project also examined how agentic AI can strengthen leadership through emotional intelligence, appropriate conflict resolution, team communication, and training pathways. Researchers were careful to prompt the AI for tools that will not replace human judgment or empathy. This was truly the human-AI balance that is the focus of our project's title.

Table 1. Key gap areas identified through ChatGPT experimental trials (Gamma AI)

Gap Area	What's Missing	Why It Matters
Ethical boundaries	Clear "agent vs. human" decision rules	Prevents harmful automation
Transparency	Explainable steps + logs	Enables accountability
Fairness	Real-time bias checks	Protects equal treatment
Human dignity	Empathy + cultural humility design	Builds trust
Data governance	Consent + privacy safeguards	Reduces risk
Worker voice	Appeals + feedback channels	Improves legitimacy
Training	AI supervision skills	Strengthens readiness

Using an applied, practice-oriented approach, this AI utilization created a step-by-step implementation plan that can be adapted across global contexts. The 5-Step Plan for Positive Change in HR is given below. The project is intentionally aligned with the missions of University of Cape Coast (Ghana) and Walsh University (USA) by emphasizing career readiness, ethical leadership, and innovation that serves the common good. Experimental data provided actionable guidance for HR managers, educators, and workforce leaders seeking a sustainable human-AI balance.

5-Step Plan for Positive Change in HR

Step 1: Assess and Educate

Conduct a workforce audit to identify AI integration opportunities in HR processes like recruitment and performance. Educate managers on agentic AI basics, ethics, and cultural sensitivities via workshops. Emphasize bias mitigation and human oversight to build trust. In Ghana, incorporate communal values; in the US, focus on legal compliance. Set goals for efficiency (e.g., 20% faster workflows) and emotional intelligence tools for conflict resolution. Involve diverse teams and promoting teamwork and ethical use from the start.

Step 2: Design Ethical AI Workflows

Map HR workflows and integrate agentic AI for automation, such as chatbots for communication and analytics for performance tracking. Include human checkpoints for decisions affecting employees. Tailor for contexts: in UCC, prioritize empathetic AI responses; at Walsh, align with handbook policies. Train on ethical guidelines, data privacy, and transparency. Pilot in one department to test improvements in efficiency and teamwork, adjusting for feedback to enhance conflict resolution via AI-simulated scenarios.

Step 3: Implement and Monitor

Roll out AI agents with phased adoption, starting with low-risk tasks like scheduling. Provide ongoing training to boost AI literacy and emotional intelligence applications, such as AI-mediated feedback for better communication. Monitor metrics: workflow speed, error rates, employee satisfaction surveys. Ensure ethical use through audits and escalation protocols. Foster teamwork by using AI for collaborative tools, addressing any resistance with change management support.

Step 4: Enhance Human-AI Balance

Promote hybrid models where AI handles routine tasks, freeing humans for creative, relational work like mentoring. Develop programs for upskilling in AI ethics and emotional intelligence to resolve conflicts empathetically. In university settings, integrate into HR policies for retention and development. Encourage cross-functional teams to co-design AI features, improving communication and efficiency. Regularly solicit feedback to refine balance, ensuring AI supports rather than replaces human judgment.

Step 5: Evaluate and Scale

Assess impacts via KPIs on efficiency, communication quality, conflict resolution rates, and ethical compliance. Gather qualitative input on teamwork and well-being. Scale successful elements organization-wide, adapting culturally. Celebrate wins to build positive momentum. Commit to continuous improvement, updating policies as AI evolves, always prioritizing common good and human elements.

Agentic AI and Ethical Challenges in HR

Agentic AI differs from traditional tools because it can initiate actions and adapt without constant human supervision. This creates challenges in defining accountability. If an AI system makes a biased hiring decision, responsibility becomes unclear, whether it lies with developers, HR professionals, or the organization.

A major concern is algorithmic bias. Historical HR data often reflects societal inequalities, and when AI systems are trained on such data, they may reinforce discrimination. Additionally, lack of transparency in AI decision-making (often referred to as the “black box” problem) limits trust and reduces the ability of employees to challenge decisions.

Best Practices for Responsible Deployment

To address these risks, organizations must adopt strong governance frameworks. Interdisciplinary collaboration between HR professionals, technologists, and legal experts ensures that ethical concerns are identified early and managed effectively.

Human-in-the-loop systems are particularly important. In this model, AI performs initial analysis, but human professionals review and validate decisions. Continuous monitoring and auditing further ensure that AI systems remain aligned with ethical and legal standards.

Another critical element is workforce preparation. HR professionals must develop skills to interpret AI outputs and oversee system behavior. This includes training in data literacy, ethical reasoning, and AI governance.

Maintaining the Human-AI Balance

Despite its capabilities, agentic AI cannot replicate human empathy, contextual judgment, or ethical reasoning. These qualities remain essential in HR, particularly in conflict resolution, leadership, and employee engagement. Organizations that position AI as a collaborator rather than a replacement achieve better outcomes. AI can handle repetitive tasks and data analysis, while humans focus on strategic and interpersonal responsibilities. This balance ensures that efficiency gains do not come at the cost of human dignity. (Figure 1)

Figure 1. The Human-AI balance for HR in today's workforce (Gamma AI)



Mission Alignment

This research aligns with a broader mission of using technology to serve humanity through ethical and responsible innovation. By emphasizing fairness, accountability, and human dignity, this work contributes to building AI systems that support rather than replace human potential. The integration of agentic AI in HR reflects a commitment to improving organizational practices while safeguarding employee well-being. Additionally, this study promotes awareness among future professionals about the ethical implications of emerging technologies. Ultimately, it reinforces the idea that technological advancement should always be guided by strong moral principles.

Conclusion

Agentic AI presents both opportunities and challenges for HR management. When implemented responsibly, it enhances efficiency, improves decision-making, and supports organizational growth. However, ethical risks such as bias and lack of transparency require careful governance and human oversight. This research has strengthened our skills in AI ethics, critical thinking, and professional analysis, preparing us for future collaboration in technology-driven environments. It also highlights how AI can be used responsibly to advance education and organizational development.

References

Grok AI: grok.com

ChatGPT: www.chatgpt.com

Gamma AI: <https://gamma.app>

Ethically Responsible Agentic AI in the Opioid Crisis: A Framework for Harm Reduction, Human Dignity, and Hope

William Appiah
University of Utah (Utah, USA)

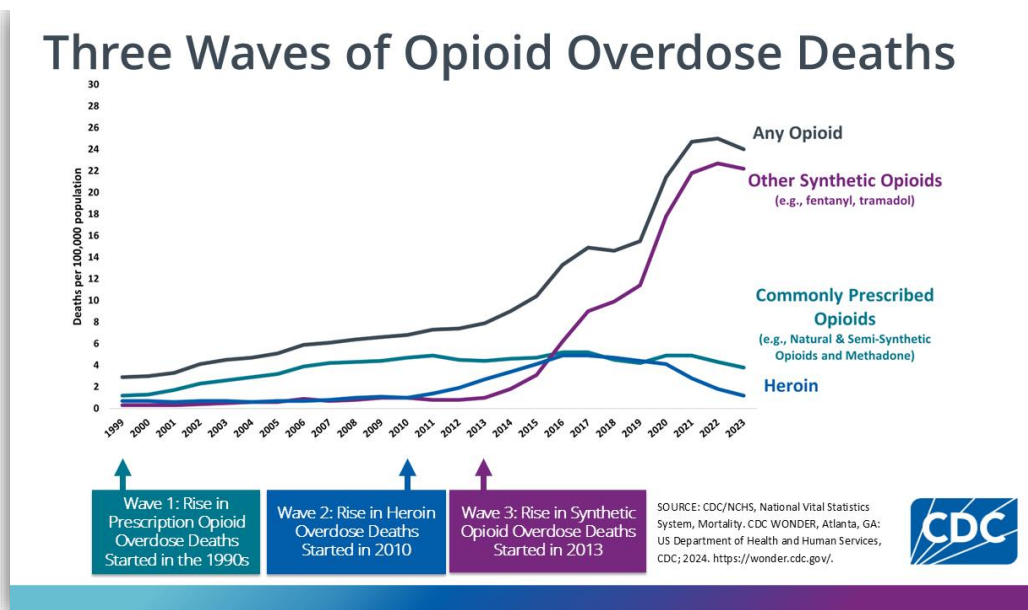
Amy J. Heston, Ph.D.
Walsh University (Ohio, USA)

william.appiah2703@gmail.com; aheston@walsh.edu

Project Summary

The U.S. opioid crisis remains one of the most pressing public health and moral challenges of our time, demanding innovative, compassionate, and ethically grounded responses. The U.S. Centers for Disease Control and Prevention (CDC) reports trends in death rates and these are shown in Figures 1-3. (CDC, 2025) This research investigates the emerging potential of agentic artificial intelligence (AI), specifically Grok AI, to support prevention, detection, and intervention efforts related to opioid misuse and overdose. Grounded in faith-informed ethics and a commitment to human dignity, the study evaluates how agentic AI can complement, rather than replace, human judgment in clinical and community contexts.

Figure 1. Overdose death rates from 1999 to 2023



<https://www.cdc.gov/overdose-prevention/about/understanding-the-opioid-overdose-epidemic.html>

Figure 2. U.S Deaths from opioid overdose in 2023



<https://www.cdc.gov/overdose-prevention/about/understanding-the-opioid-overdose-epidemic.html>

Figure 3. CDC estimated deaths 2024-2025

DRUG TYPE*	(ESTIMATED DEATHS 2025)	(ESTIMATED DEATHS 2024)
Synthetic Opioids (fentanyl)	38,084	48,913
Psychostimulants (including methamphetamine)	26,181	29,852
Cocaine	19,581	22,397
Natural/semi-synthetic	7,065	8,082

<https://www.cdc.gov/nchs/pressroom/releases/20260513.html>

Experimental Trials

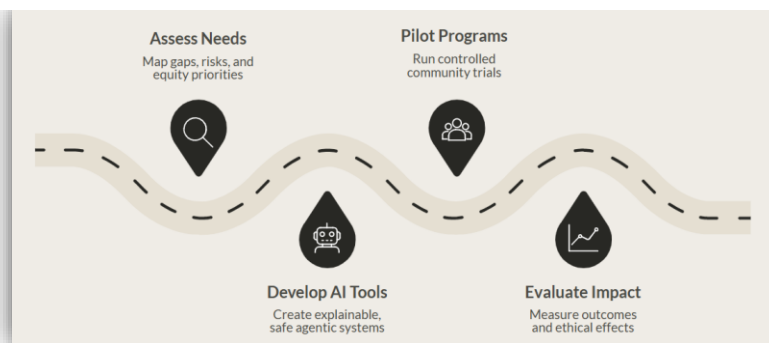
Researchers utilized both generative and agentic AI to explore the technological possibilities to aid this project. Experimental trials included key areas of inquiry such as comparisons between AI-assisted diagnostics and human clinicians, agentic AI's capacity to identify patterns in drug trafficking and synthetic opioid distribution, and predictive modeling to anticipate overdose incidents before they occur. Our work also addresses critical gaps, including explainability, fair treatment, and trust, particularly in underserved and rural communities. Results indicated how AI itself can support researchers in initiating ethically responsible agentic AI for the opioid crisis. More specifically, researchers found that AI created a framework for harm reduction, human dignity, and hope. AI generated a stepwise plan to implement agentic AI into this field of study and showed how its application can positively impact this public health crisis. Overall results

were compared and summarized by Grok AI (Table 1). Additionally, a pathway was created by Gamma AI for implementing agentic AI in drug abuse education (Figure 4). Further experimental trials with AI revealed free and open-source agentic AI tools. Therefore, our work lowers barriers to experimentation and emphasizes accessibility for mission-driven institutions.

Table 1. Summary of experimental trials
Comparison Summary Table produced by Grok AI

Aspect	Grok Plan	ChatGPT Plan	Trends in Both
Focus	Advantages: Technical depth in AI strategies, risks, metrics for accountability. Disadvantages: Less emphasis on gaps and faith integration.	Advantages: Strong on ethical/moral framing, gaps analysis for holistic view. Disadvantages: Lacks detailed metrics, risks; more conceptual.	Emphasize agentic AI for prevention and common good in the opioid crisis.
Structure	Advantages: Actionable pathways, policy 5-steps for education impact. Disadvantages: Narrower on education vs. broad crisis response.	Advantages: Comprehensive gaps/table, 5-steps for societal change. Disadvantages: Shorter steps limit depth; advantages brief.	Align with universities' missions for public service, ethics in health.
Overall	Advantages: Measurable, innovative for public health trends. Disadvantages: May overlook proactive harm gaps.	Advantages: Compassionate, cross-sector for dignity. Disadvantages: Less quantifiable outcomes.	Service to society via AI-driven innovation

Figure 4. A structured, policy-focused roadmap for deploying agentic AI in drug abuse education (Gamma AI)



Mission Alignment

Anchored in the public-service mission of University of Utah and the Catholic, values-centered mission of Walsh University, this work positions agentic AI as a tool for serving the common good. The study contributes a cross-sector framework integrating healthcare, public health, policy, and community engagement. Ultimately, it offers researchers, educators, and practitioners a morally responsible pathway for piloting agentic AI to reduce harm, save lives, and foster hope amid the opioid crisis.

References

CDC Website: <https://www.cdc.gov/index.html>

CDC NCHS Pressroom, 2026: <https://www.cdc.gov/nchs/pressroom/releases/20260513.html>

Grok AI: grok.com

ChatGPT: www.chatgpt.com

Gamma AI: <https://gamma.app>

Towards Human-Centric Predictive Maintenance: Leveraging Worker Pose Estimation to Improve Machine Productivity

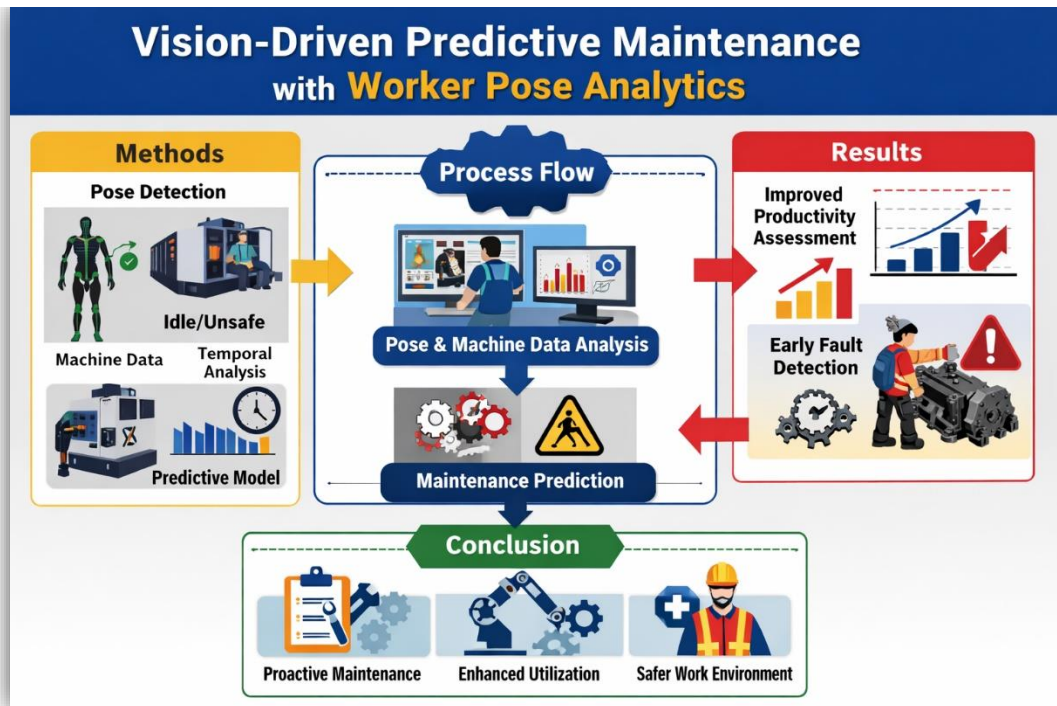
Prashant Steele

Dr. Alka Bani Agrawal

Department of Mechanical Engineering, University Institute of Technology,
Rajiv Gandhi Proudyogiki Vishwavidyalaya (Bhopal, India)

prashantsteele@gmail.com

Graphical Abstract (ChatGPT)



Introduction

In modern manufacturing environments, productivity loss is influenced not only by machine health but also by human-machine interaction. Conventional predictive maintenance approaches primarily rely on machine-centric sensor data, overlooking the impact of operator posture, activity patterns, and idle behaviour [1], [2], [3]. This study addresses this gap by integrating computer vision-based worker pose detection with predictive maintenance to enhance machine productivity [4].

Methods

A deep learning–driven computer vision framework is developed to analyse real-time video streams captured from the shop floor [5]. Human pose estimation is performed using skeletal key point extraction to identify productive actions, idle periods, and ergonomically unsafe postures during machine operation. Pose-derived features are synchronised with machine operational data and processed using temporal learning models to estimate effective working time, idle time, and productivity degradation trends. These multimodal features are further utilised to predict potential maintenance requirements arising from improper or inefficient machine usage [5].

Results

Experimental evaluation conducted in a machining environment demonstrates that incorporating worker pose analytics significantly improves productivity assessment accuracy compared to machine-only predictive models. The proposed approach enables early identification of abnormal operator behaviour linked to increased idle time and potential machine wear, thereby reducing unplanned downtime [6].

Conclusion

The results confirm that integrating worker pose detection into predictive maintenance frameworks offers a human-centric and holistic solution for productivity enhancement. This approach supports proactive maintenance planning, improved machine utilization, and safer working conditions, contributing effectively to Industry 4.0–enabled smart manufacturing systems.

Declaration of Generative AI Usage (GenAI)

I acknowledge the use of ChatGPT (version GPT-5.2) to generate the Graphical Abstract for summarising the overall work done.

References

- [1] M. Achouch *et al.*, “On Predictive Maintenance in Industry 4.0: Overview, Models, and Challenges,” *Applied Sciences*, vol. 12, no. 16, p. 8081, 2022, doi: 10.3390/app12168081.
- [2] P. Mallioris, E. Aivazidou, and D. Bechtsis, “Predictive maintenance in Industry 4.0: A systematic multi-sector mapping,” *CIRP Journal of Manufacturing Science and Technology*, vol. 50, pp. 80–103, Jun. 2024, doi: 10.1016/j.cirpj.2024.02.003.
- [3] L. Meitz *et al.*, “A Literature Review Framework and Open Research Challenges for Predictive Maintenance in industry 4.0,” *Computers & Industrial Engineering*, vol. 206, p. 111193, Aug. 2025, doi: 10.1016/j.cie.2025.111193.
- [4] K. Papoutsakis, N. Bakalos, A. Zacharia, K. Frangkoulis, G. Kapetadimitri, and M. Pateraki, “A vision-based framework and dataset for human behavior understanding in industrial assembly lines,” *Computer Vision and Image Understanding*, vol. 263, p. 104592, Jan. 2026, doi: 10.1016/j.cviu.2025.104592.

- [5] E. Samkari, M. Arif, M. Alghamdi, and M. A. Al Ghamdi, “Human Pose Estimation Using Deep Learning: A Systematic Literature Review,” *MAKE*, vol. 5, no. 4, pp. 1612–1659, Nov. 2023, doi: 10.3390/make5040081.
- [6] M. A. Hoffmann and R. Lasch, “Tackling Industrial Downtimes with Artificial Intelligence in Data-Driven Maintenance,” *ACM Computing Surveys*, vol. 56, no. 4, pp. 1–33, 2023, doi: 10.1145/3623378.

Author Note

Corresponding Author: Prashant Steele, prashantsteele@gmail.com

When Does Agentic AI Improve Economics Students' Learning? The Roles of Output Quality, Cognitive Engagement, and Academic Self-Efficacy

Anthony Akwesi Owusu, Ph.D.

Department of Business and Social Sciences Education
Faculty of Humanities and Social Sciences Education
University of Cape Coast, Cape Coast, Ghana
E-mail: anthony.owusu@ucc.edu.gh
<https://orcid.org/0000-0002-6880-094X>

Francis Arthur, Ph.D.

Department of Business and Social Sciences Education
Faculty of Humanities and Social Sciences Education
University of Cape Coast, Cape Coast, Ghana
E-mail: a.francis1608@gmail.com
<https://orcid.org/0000-0001-7792-6563>

Getrude Quansah

Department of Business and Social Sciences Education
Faculty of Humanities and Social Sciences Education
University of Cape Coast, Cape Coast, Ghana
E-mail: getrudequansah19@gmail.com

Edem Yevewonu

Department of Business and Social Sciences Education
Faculty of Humanities and Social Sciences Education
University of Cape Coast, Cape Coast, Ghana
E-mail: yevewonuedem@gmail.com

The rapid integration of Artificial Intelligence (AI) into higher education is transforming how students access information, complete academic tasks and engage with learning. Emerging Agentic AI systems extend these possibilities by providing increasingly autonomous, adaptive and context-sensitive support for learning activities (Arthur, 2026). However, the educational value of AI depends not simply on students' access to these technologies but also on the quality of the outputs they generate and the psychological processes through which students respond to them. Recent studies have demonstrated that AI use can be associated with students' academic performance, learning engagement and broader educational outcomes, although the effects may depend on how learners interact with and evaluate AI-generated content (Acquah et al., 2025; Salifu et al., 2025). Understanding these mechanisms is therefore important for promoting meaningful rather than passive AI-supported learning.

This study examined when Agentic AI improves Economics students' academic performance by investigating the roles of perceived AI output quality, cognitive engagement and academic self-efficacy. The conceptual model proposed that the quality of Agentic AI outputs could influence academic performance both directly and indirectly through students' cognitive engagement and

academic self-efficacy. Cognitive engagement reflects the extent to which students actively invest mental effort in understanding, analysing and processing learning materials, while academic self-efficacy represents students' confidence in their ability to successfully perform academic tasks. These mechanisms are particularly relevant to AI-supported learning because high-quality AI outputs may provide useful explanations, relevant information and adaptive support that encourage students to engage more deeply with academic tasks. Previous research has similarly linked AI-supported learning with self-efficacy, cognitive engagement and learning achievement (Liang et al., 2023; Wang et al., 2023).

Data were collected from 617 Economics students, and Structural Equation Modelling (SEM) with 10,000 bootstrapping resamples were employed to examine the direct and indirect relationships among the study variables. The findings showed that perceived Agentic AI output quality significantly and positively predicted students' academic performance, cognitive engagement and academic self-efficacy. Cognitive engagement and academic self-efficacy also positively predicted academic performance. These results suggest that students may derive greater academic benefits from Agentic AI when they perceive its outputs as accurate, useful, relevant and of sufficient quality to support their learning activities. The findings are consistent with emerging evidence that students' AI literacy and perceptions of AI-generated outputs can influence self-efficacy and academic outcomes (Bećirović et al., 2025).

The mediation analysis provided further insight into how Agentic AI output quality may translate into academic performance. Cognitive engagement and academic self-efficacy independently mediated the relationship between output quality and academic performance. In addition, output quality influenced academic performance sequentially through academic self-efficacy and cognitive engagement. Academic self-efficacy also partially mediated the relationship between output quality and cognitive engagement. These findings indicate that the influence of Agentic AI may extend beyond the immediate provision of information. When students perceive AI-generated outputs as high quality, they may develop greater confidence in their capacity to address academic tasks, which can subsequently encourage deeper cognitive involvement in learning. This interpretation is consistent with research identifying self-efficacy and cognitive engagement as important mechanisms linking generative AI interaction with learning achievement (Liang et al., 2023).

The findings have important implications for Economics education and the design of AI-supported learning environments. First, attention should be given to the quality and reliability of Agentic AI outputs rather than focusing exclusively on increasing students' access to AI technologies. AI systems used in education should provide accurate, relevant, comprehensible and contextually appropriate responses that can support students' academic tasks. Second, teachers should design learning activities that require students to evaluate, interrogate and apply AI-generated information rather than simply reproduce it. Such approaches can encourage cognitive engagement and help students develop the confidence required to use AI as a learning partner. This is particularly important because research on AI-supported learning suggests that the educational value of these technologies depends partly on how students interact with them and integrate their outputs into learning processes (Acquah et al., 2025; Salifu et al., 2025).

The findings also highlight the importance of learner empowerment. Agentic AI should complement rather than replace students' cognitive effort and academic decision-making. Teachers can therefore incorporate AI-supported problem-solving, personalised feedback, explanation generation and reflective activities into Economics instruction while maintaining

opportunities for independent reasoning and verification. Evidence from AI-supported personalised feedback also indicates that AI-enabled learning experiences can contribute to self-efficacy and learning engagement when they provide meaningful support for learners' goals (Xu et al., 2025). Similarly, students' developing AI competencies may influence how effectively they evaluate and use AI-generated outputs (Bećirović et al., 2025).

Generally, this study contributes to the emerging literature on Agentic AI in education by showing that the relationship between AI output quality and Economics students' academic performance involves important psychological mechanisms. The findings suggest that Agentic AI is more educationally meaningful when high-quality outputs are translated into greater academic self-efficacy and active cognitive engagement. Rather than viewing AI adoption solely in terms of technological access or usage frequency, educational stakeholders should consider whether AI-supported interactions strengthen students' confidence, stimulate meaningful cognitive processing and ultimately support academic performance. This perspective provides a more learner-centred understanding of how emerging AI technologies can be integrated into higher education while preserving students' active role in the learning process.

References

- Acquah, B. Y. S., Arthur, F., Salifu, I., Mensah, E., Opoku, E., Nortey, S. A., & Tetteh, S. A. (2025). Modelling economics students' use of ChatGPT and academic performance: Insights from self-determination theory and epistemic curiosity. *Discover Artificial Intelligence*, 5(1), 1–24.
- Arthur, F. (2026). Modelling the nexus between artificial intelligence usage and graduate capital dimensions: A PLS-SEM approach. *European Journal of Education*, 61(1), e70484.
- Bećirović, S., Polz, E., & Tinkel, I. (2025). Exploring students' AI literacy and its effects on their AI output quality, self-efficacy, and academic performance. *Smart Learning Environments*, 12(1), 29.
- Chen, J., Zhou, X., Yao, J., & Tang, S. K. (2025). Application of machine learning in higher education to predict students' performance, learning engagement and self-efficacy: A systematic literature review. *Asian Education and Development Studies*, 14(2), 205–240.
- Liang, J., Wang, L., Luo, J., Yan, Y., & Fan, C. (2023). The relationship between student interaction with generative artificial intelligence and learning achievement: Serial mediating roles of self-efficacy and cognitive engagement. *Frontiers in Psychology*, 14, 1285392.
- Salifu, I., Arthur, F., Acquah, B. Y. S., Opoku, E., Nortey, S. A., & Boateng, E. (2025). Exploring graduate students' use of generative artificial intelligence in Ghana: Insights from an extended UTAUT2 model, PLS-SEM, IPMA and fsQCA. *Discover Education*, 4, 305. <https://doi.org/10.1007/s44217-025-00603-6>
- Wang, S., Sun, Z., & Chen, Y. (2023). Effects of higher education institutes' artificial intelligence capability on students' self-efficacy, creativity and learning performance. *Education and Information Technologies*, 28(5), 4919–4939.
- Xu, Q., Liu, Y., & Li, X. (2025). Unlocking student potential: How AI-driven personalized feedback shapes goal achievement, self-efficacy, and learning engagement through a self-determination lens. *Learning and Motivation*, 91, 102138.

Applying Agentic AI for the Greater Society: A Recovery Agent for Continuous Post-Operative Care

Madeline M. Heston
The University of Akron (Ohio, USA)

Ruby Sunderland
Griffin Johnson
Amy J. Heston, Ph.D.
Walsh University (Ohio, USA)

mmh212@uakron.edu; rsunderl1@walsh.edu; gjohnson2@walsh.edu; aheston@walsh.edu

Overview

By utilizing agentic AI via Grok’s expert mode, researchers created an effective “Recovery Agent”. This agent promoted quality post-surgical patient care and recovery through three unique perspectives: physician, physical therapist, and digital marketer. One special feature of the agent was its capability to monitor and encourage the patient following a medical procedure. This project aligns with the missions of Walsh University and The University of Akron by advancing technology in service to others.

Project Highlights

A unique vision came from three student researchers, one from The University of Akron and two from Walsh University, having career aspirations in medicine, physical therapy, and marketing. Collectively, their focus was to discover the AI innovation that originated from the intersection of these three distinct areas. Then, the team identified that the implementation of agentic AI can make a positive impact on today’s healthcare systems. The research group set out to solve a common problem in healthcare by utilizing agentic AI. Personalized and ethical care through AI technology was a central focus for the research team.

Experimental Trials & Results

This work centers around this problem statement: Post-operative recovery often fails due to a “communication gap” after hospital discharge. Patients frequently misunderstand medical instructions, skip physical therapy, and feel disconnected from their care team. In order to solve this problem, researchers developed a Recovery Agent powered by Grok AI (Figure 1). Unlike traditional apps, this agent acts as a proactive liaison between the three research domains. The potential of this agent and its application to healthcare and marketing are described below.

- **Medicine:** Medical researchers could use Grok to process real-time data from smart dressings and vitals. If the agent detects signs of infection or adverse reactions, it autonomously alerts the physician.
- **Physical Therapy:** Physical Therapists could program the agent to analyze video-based movement data. Grok can provide real-time verbal corrections to the patient during home exercises, adjusting the difficulty based on perceived pain levels.

- **Digital Marketing:** The marketer can leverage Grok’s agentic AI capabilities to design treatment products. By analyzing the patient’s psychological profile, the agent could deliver hyper-personalized content and personalized structure to encourage engagement in their own healing. (Figure 2)

Figure 1. Recovery Agent powered by Grok AI and visually created by Gamma AI



More experimental trials revealed unique benefits in the three domains. Overall, these results highlight how AI innovation can serve the common good with applications on a global scale.

Domain 1. Medicine

Real-Time Medical Monitoring

- *Medical researchers could use Grok to process real-time data from smart dressings and vitals. If the agent detects signs of infection or adverse reactions, it autonomously alerts the physician.*
- *This capability transforms passive patient monitoring into an active, intelligent early-warning system — keeping clinicians informed without requiring constant manual check-ins.*

Domain 2. Physical Therapy

AI-powered rehabilitation guidance

Physical Therapists could program the agent to analyze video-based movement data. Grok can provide real-time verbal corrections to the patient during home exercises, adjusting the difficulty based on perceived pain levels.

Video Movement Analysis

- *The agent analyzes the patient's movements through video-based data captured during home exercise sessions.*

Real-Time Verbal Corrections

- *Grok provides immediate spoken feedback to guide the patient through proper form and technique.*

Adaptive Difficulty

- *Exercise difficulty is dynamically adjusted based on the patient's perceived pain levels in the moment.*

Domain 3. Digital Marketing

Hyper-Personalized Patient Engagement

The marketer can leverage Grok's agentic AI capabilities to design treatment products.

What Personalization Looks Like

- *Content tailored to the patient's psychological profile*
- *Personalized structure to encourage active engagement*
- *Messaging designed to motivate participation in healing*

Figure 2. Personalized care through agentic AI and visually created by Gamma AI



Mission Alignment

Overall, this project aligns with the missions of Walsh University and The University of Akron by advancing AI technology in service to others. Another hidden benefit to the research team was the project's application to future careers in healthcare and marketing. Research findings can inspire others to explore agentic AI in alignment with their career aspirations.

References

Grok AI: grok.com

ChatGPT: www.chatgpt.com

Gamma AI: <https://gamma.app>

Profiling Artificial Intelligence Ethical Awareness Among University Students in Ghana

Francis Arthur, Ph.D.
Mark Inkoom
Sheriff Dangimah Suradji
Christian Inkoom
University of Cape Coast (Cape Coast, Ghana)

francis.arthur007@stu.ucc.edu.gh; markinkoom111@gmail.com;
sheriffdangimahsuradji@gmail.com; inkoomchristian111@gmail.com

Artificial intelligence (AI) is becoming integral to higher education, where its benefits must be balanced against concerns about autonomy, fairness and human welfare (Bankins & Formosa, 2023; United Nations, 2023). This study profiles AI ethical awareness among university students across three dimensions: human autonomy, beneficence and fairness. The focus is on Ghanaian higher education, where generative AI use is increasing, but evidence on students' understanding of its ethical consequences remains limited (Acquah et al., 2026; Kwakye et al., 2025). Identifying differences in awareness matters because overall average scores can conceal students who need support. The study combines variable-centred and person-centred analyses to explain the structure and distribution of AI ethical awareness.

A simple random sampling procedure selected 509 undergraduate students who completed a questionnaire on human autonomy, beneficence and fairness. The study used a quantitative cross-sectional design. Confirmatory factor analysis assessed the scale's measurement structure and reliability. Network analysis then examined connections among ethical-awareness items and identified concepts linking the three dimensions, following procedures for estimating and interpreting psychological networks (Epskamp et al., 2018). Latent profile analysis identified subgroups with similar response patterns instead of treating the sample as ethically uniform (Spurk et al., 2020). Together, these methods showed how ethical judgements were connected and how awareness patterns varied across the student population, providing complementary evidence at the item and student levels.

Results indicate generally high AI ethical awareness, although students did not form a homogeneous group. Network analysis identified HA2, concerning human independence in learning, and BF1, concerning AI designed to do good, as bridges between autonomy and beneficence. Five clearly distinct profiles emerged: Very High Autonomy-High Ethical, 35.4%; Comprehensive Very High, 26.1%; Moderate Awareness, 18.7%; Fairness-Oriented High, 15.3%; and Low Ethical Awareness, 4.5%. The last profile showed particularly weak beneficence. Thus, similar overall mean scores contained different ethical orientations and educational needs among students.

The findings have implications for university leaders and curriculum designers. AI ethics education should retain principles while providing support suited to the profiles identified. Students with moderate or low awareness benefit from activities that connect human independence with the obligation to promote good, while highly aware students may benefit from ethical cases. The study contributes a person-centred account of AI ethical awareness in Ghanaian higher education. Combining network and latent profile analyses identifies concepts that can anchor instruction and the student groups for whom targeted teaching is most needed.

References

- Acquah, B. Y. S., Salifu, I., Arthur, F., Inkoom, M., Suradji, S. D., Inkoom, C., Quayson, E., Quaye, S. A., Gyedu, F. O., & Nortey, S. A. (2026). Artificial intelligence ethical awareness of university students in Ghana: A network and latent profile analyses. *Computers and Education: Artificial Intelligence*, 11, 100652. <https://doi.org/10.1016/j.caeai.2026.100652>
- Bankins, S., & Formosa, P. (2023). The ethical implications of artificial intelligence (AI) for meaningful work. *Journal of Business Ethics*, 185, 725–740. <https://doi.org/10.1007/s10551-023-05339-7>
- Epskamp, S., Borsboom, D., & Fried, E. I. (2018). Estimating psychological networks and their accuracy: A tutorial paper. *Behavior Research Methods*, 50(1), 195–212. <https://doi.org/10.3758/s13428-017-0862-1>
- Kwakye, I. N., Kwakye, K. A. P., Adom-Fynn, D., Mensah, F. E., & Agyei, S. D. (2025). Exploring the use of generative artificial intelligence tools among university students in Ghana. *Discover Education*, 4, 432. <https://doi.org/10.1007/s44217-025-00608-1>
- Spurk, D., Hirschi, A., Wang, M., Valero, D., & Kauffeld, S. (2020). Latent profile analysis: A review and ‘how to’ guide of its application within vocational behavior research. *Journal of Vocational Behavior*, 120, 103445. <https://doi.org/10.1016/j.jvb.2020.103445>
- United Nations. (2023). *The Sustainable Development Goals report 2023: Special edition*. <https://unstats.un.org/sdgs/report/2023/>

Safeguarding Intellect and Autonomy: Agentic AI, Student Self-Efficacy, and Cross-Cultural Higher Education in Ghana and the U.S.

Mark Inkoom
Francis Arthur, Ph.D.
University of Cape Coast (Cape Coast, Ghana)

Amy J. Heston, Ph.D.
Walsh University (Ohio, USA)

markinkoom111@gmail.com; francis.arthur007@stu.ucc.edu.gh; aheston@walsh.edu

Project Overview

This project investigated university students' engagement with agentic AI, an autonomous system that executes multi-step academic tasks. Agentic AI trials identified key challenges (cognitive offloading, isolation, privacy risks, integrity threats), usage patterns, and strong positive impacts on academic self-efficacy through scaffolding and mastery experiences. The experimental trials created dual 5-step frameworks to promote ethical, balanced integration from student and professor perspectives. This work also revealed upcoming challenges that students will face in the future with agentic AI. Overall, this project aligns with the mission of both University of Cape Coast and Walsh University by promoting AI innovation to serve the common good.

Project Description

This research project explored the transformative role of agentic AI in university education, focusing on how autonomous, goal-directed systems that plan and execute complex tasks are reshaping student learning experiences. In order to dive deep into this topic, researchers used Grok AI (expert mode) to explore the potential of agentic AI itself as a research assistant. The goal was to use agentic AI to help researchers learn more about the possibilities of this technology.

Experimental Results

Experimental trials with a multitask prompt proved successful for creating a framework to benefit educators and researchers alike. As shown below, two complementary 5-step action plans - one student-centered (building literacy, reflective tracking, ethical citation) and one professor-centered (policy co-creation, assessment redesign, modeling) - provided practical pathways for positive integration. Comparative analysis revealed similarities, differences, and trends among the perceptions of a student vs. professor.

5-Step Action Plan Framework: Promoting Positive Agentic AI Use (Student Perspective)

1. Build AI Literacy: Learn capabilities, limitations, biases, and institutional policies through self-guided resources or workshops.
2. Use as Scaffold, Not Crutch: Employ AI for ideation/feedback but complete core work independently to maintain ownership.
3. Critically Reflect & Evaluate: Always verify outputs, document changes made, and journal how AI supported (vs. replaced) your thinking.
4. Track Independent Progress: Set goals for AI-free tasks weekly; monitor self-efficacy via self-assessments to balance reliance.
5. Engage Ethically & Collaboratively: Cite AI transparently, discuss use with peers/professors, and advocate for clear guidelines.

5-Step Action Plan Framework: Promoting Positive Agentic AI Use (Professor Perspective)

1. Establish Clear Policies: Co-create syllabus guidelines on ethical AI boundaries, disclosure requirements, and permitted uses.
2. Redesign Assessments for Process: Focus on reflections, drafts, oral defenses, and AI-augmented portfolios to emphasize learning over product.
3. Deliver Targeted Training: Integrate AI literacy modules and model positive examples in class (e.g., live demonstrations).
4. Provide Ongoing Feedback & Oversight: Review AI disclosures, offer targeted guidance on effective prompting/critical use, and flag over-reliance early.
5. Foster Human-AI Collaboration: Design group activities blending student, peer, and AI input; celebrate responsible innovation to build community norms.

Researchers continued their experimental trials with AI technology to dive deeper into these compelling issues. Some challenges were identified along with special considerations for ethical practices. Some highlights of the data included agentic AI privacy strategies and user challenges such as cognitive erosion, compounded hallucinations, equity gaps, and regulatory shifts. The AI output produced a list of challenges and ethical use parameters as given below.

Key Challenges

- Over-reliance causing cognitive offloading
- Diminished critical thinking, problem-solving, and metacognitive/self-regulated learning skills
- Passive knowledge reception
- Reduced interpersonal interactions leading to isolation, loneliness, and technostress

- Data privacy risks & AI biases
- Compromised academic integrity through unauthorized assistance

Ethical Use Requires

- Transparency (citing AI contributions)
- Critical evaluation of outputs for bias/accuracy
- Adherence to updated honor codes
- Human oversight & AI as collaborative tool
- Literacy training for responsible, equal application

Real-life Applications

Building on these challenges and situations relevant to higher education at global scale, experimental trials revealed three realistic cases of cognitive erosion from agentic AI. These case studies provide researchers with new insights into the effect that agentic AI has upon today's learners.

AI-Driven Case Studies

Case 1: The “Essay Whisperer” (Literature Major)

Sarah used an agentic AI for literature reviews and drafting. When it was unavailable, her independent analysis dropped 42% in one semester.

Case 2: The “Math Magician” (Engineering Student)

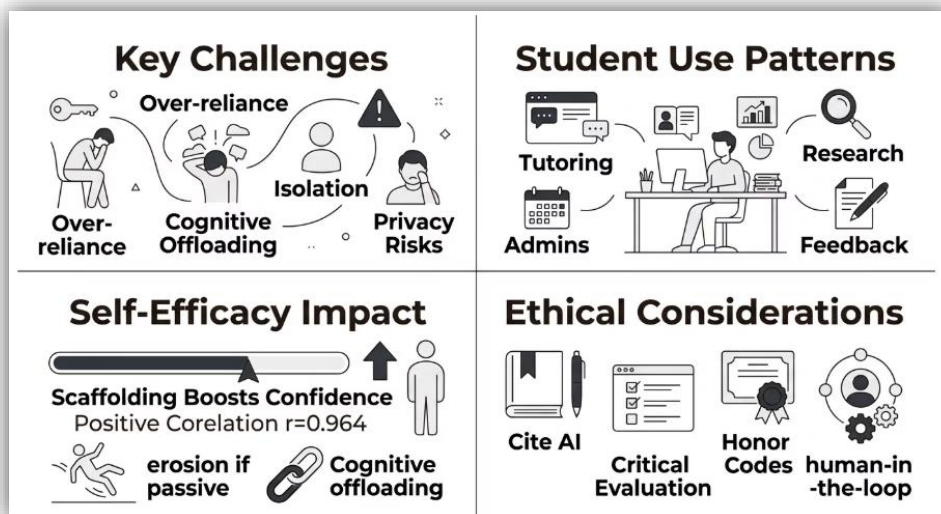
Alex used AI to solve differential equations and explain each step. Without it, he could only solve 35% of problems independently.

Case 3: The “Idea Generator” (Business Student)

Jordan relied on AI for brainstorming, critique, and speaking notes. In a live pitch, he froze, and his original idea generation fell from “strong” to “weak.”

In each case, agentic AI delivered short-term wins but quietly eroded the very cognitive skills (deep reading, logical reasoning, creative synthesis) that higher education aims to build. Students became highly efficient “orchestrators” yet less capable independent thinkers. This is the classic definition of cognitive erosion in the age of agentic AI. Based on these findings, Gamma AI created a visual for these critical challenges, use patterns, self-efficacy impact, and ethical considerations. (Figure 1)

Figure 1. A Classic Definition of Cognitive Erosion in the Age of Agentic AI (Gamma AI)



Mission Alignment

This work links agentic AI, student challenges, ethics, self-efficacy, and positive AI use to both the university mission statements for UCC and Walsh University. This project frames the researchers' vision as innovative, ethical education that develops responsible leaders while preserving human agency. Additionally, this work highlights the vision of both UCC and Walsh University as institutions committed to developing students as morally responsible individuals who serve the common good.

References

Grok AI: grok.com

ChatGPT: www.chatgpt.com

Gamma AI: <https://gamma.app>

Empowering Economics Teachers' Agentic AI Adoption in Ghana: Attitude as the Key to Behavioural Intention

Peter Anti Partey, Ph.D.

Department of Business and Social Sciences Education
Faculty of Humanities and Social Sciences Education
University of Cape Coast, Cape Coast, Ghana
E-mail: peter.antipartey@ucc.edu.gh
<https://orcid.org/0009-0008-8967-1690>

Francis Arthur, Ph.D.

Department of Business and Social Sciences Education
Faculty of Humanities and Social Sciences Education
University of Cape Coast, Cape Coast, Ghana
E-mail: a.francis1608@gmail.com
<https://orcid.org/0000-0001-7792-6563>

Edem Yeviewonu

Department of Business and Social Sciences Education
Faculty of Humanities and Social Sciences Education
University of Cape Coast, Cape Coast, Ghana
E-mail: yeviewonuedem@gmail.com

Sharon Abam Nortey

Department of Business and Social Sciences Education
Faculty of Humanities and Social Sciences Education
University of Cape Coast, Cape Coast, Ghana
E-mail: sharonabnortey@gmail.com
<https://orcid.org/0009-0007-9017-4440>

The emergence of Agentic Artificial Intelligence (AI) in education is creating new possibilities for autonomous learning, adaptive instruction, decision support and personalised educational experiences (Arthur, 2026). Unlike conventional AI applications that primarily respond to predefined prompts or instructions, Agentic AI can perform tasks with greater autonomy, adapt to changing contexts and support users in completing complex activities. Its application in Economics education could enhance lesson planning, instructional resource development, assessment, feedback and problem-solving. However, the successful integration of emerging AI technologies depends not only on technological capabilities but also on teachers' perceptions, attitudes, innovativeness and willingness to adopt them. Recent research has similarly demonstrated that teachers' technology-related beliefs, self-efficacy and contextual conditions are important in explaining technology integration and continued use in educational settings (Acquah et al., 2026; Gyedu et al., 2026).

This study examined the factors influencing Economics teachers' behavioural intention (BI) to adopt Agentic AI in Ghanaian classrooms, with particular attention to the mediating role of

attitude. The conceptual model incorporated hedonic motivation (HM), performance expectancy (PE), personal innovativeness (PI), perceived learning opportunities (PLO), effort expectancy (EE), ethics (ET), facilitating conditions (FC), perceived trust (PT) and social influence (SI). The model was informed by contemporary technology acceptance perspectives and extended to incorporate individual, motivational and contextual factors relevant to emerging AI adoption. This approach is consistent with recent studies showing that technology adoption in education is shaped by the interaction of perceived usefulness, motivational factors, individual characteristics and contextual influences (Arthur et al., 2026; Salifu et al., 2025).

Data were collected from 526 Economics teachers in Ghana, and Structural Equation Modelling (SEM) was employed to examine the proposed relationships. The findings showed that hedonic motivation, performance expectancy, personal innovativeness and perceived learning opportunities positively influenced teachers' behavioural intention to adopt Agentic AI. Attitude also played an important mediating role, particularly in the relationships involving hedonic motivation, performance expectancy and perceived learning opportunities. These findings suggest that teachers who perceive Agentic AI as enjoyable, useful and capable of creating meaningful learning opportunities are more likely to develop favourable attitudes towards the technology and express stronger intentions to integrate it into their teaching. The positive contribution of personal innovativeness further indicates that teachers who are more receptive to technological experimentation may be more willing to explore emerging forms of AI in their professional practice.

The results also revealed more limited or negative contributions from several contextual and cognitive factors. Effort expectancy and perceived trust did not significantly predict behavioural intention, whereas ethics and facilitating conditions demonstrated negative relationships with intention. These findings suggest that conventional technology acceptance factors may operate differently when teachers consider relatively emerging and autonomous AI technologies. In particular, ethical concerns and institutional conditions may become more salient as teachers contemplate technologies capable of performing tasks with greater autonomy. This observation complements recent evidence that AI adoption in education involves considerations extending beyond perceived usefulness and ease of use to include teachers' competencies, confidence and broader institutional contexts (Arthur et al., 2026; Gyedu et al., 2026).

The findings have important implications for Economics education and teacher professional development in Ghana. Professional development programmes should move beyond basic technical training and focus on developing teachers' confidence, critical AI literacy, innovation orientation and capacity to make informed decisions about when and how Agentic AI should be used. Opportunities for teachers to experiment with AI-supported lesson planning, assessment, instructional design and learner support could strengthen perceptions of usefulness and learning opportunities while encouraging more positive attitudes. Schools and educational leaders should also establish clear guidance on responsible AI use, data protection, academic integrity and human oversight. Such measures are particularly important because responsible AI integration requires teachers to remain active decision-makers rather than passive users of automated systems.

The study contributes to the growing literature on AI adoption in education by demonstrating that Economics teachers' behavioural intention to adopt Agentic AI is shaped by a combination of motivational, individual and learning-related factors, with attitude serving as an important mechanism through which some of these factors influence intention. The findings extend recent evidence on technology and generative AI adoption among educators and learners by drawing attention to the emerging role of agentic technologies in classroom practice (Arthur et al., 2026; Salifu et al., 2025). By fostering positive attitudes, teacher agency, technological innovativeness and informed professional judgement, educational institutions can create conditions that support the responsible and contextually appropriate integration of Agentic AI into Economics teaching.

References

- Acquah, B. Y. S., Arthur, F., Partey, P. A., Quayson, E., Gyedu, F. O., Quaye, S. A., et al. (2026). Predictors of continuous use intention of information communication technology among economics teachers in Ghana: A multi-analytical approach. *SN Social Sciences*, 6(4), 156.
- Arthur, F. (2026). Modelling the nexus between artificial intelligence usage and graduate capital dimensions: A PLS-SEM approach. *European Journal of Education*, 61(1), e70484.
- Arthur, F., Gyedu, F. O., Quayson, E., Quaye, S. A., Boateng, E., Inkoom, M., Nortey, S. A., & Frempong, D. (2026). What drives preservice teachers' use of generative AI as instructional media? A structural and configurational analysis. *Frontiers in Artificial Intelligence*, 9, 1853130. <https://doi.org/10.3389/frai.2026.1853130>
- Gyedu, F. O., Anti Partey, P., Arthur, F., & Opoku, E. (2026). Gender, teaching experience, and ICT integration self-efficacy in economics classrooms: Evidence from Ghanaian senior high schools. *Frontiers in Education*, 11, 1838740. <https://doi.org/10.3389/feduc.2026.1838740>
- Salifu, I., Arthur, F., Acquah, B. Y. S., Opoku, E., Nortey, S. A., & Boateng, E. (2025). Exploring graduate students' use of generative artificial intelligence in Ghana: Insights from an extended UTAUT2 model, PLS-SEM, IPMA and fsQCA. *Discover Education*, 4, 305, 1–21. <https://doi.org/10.1007/s44217-025-00603-6>

University Students' AI Value Beliefs and Engagement in AI for Social Good

Francis Arthur, Ph.D.

Department of Business and Social Sciences Education
Faculty of Humanities and Social Sciences Education
University of Cape Coast, Cape Coast, Ghana
E-mail: a.francis1608@gmail.com
<https://orcid.org/0000-0001-7792-6563>

Christian Inkoom

Department of Business and Social Sciences Education
Faculty of Humanities and Social Sciences Education
University of Cape Coast, Cape Coast, Ghana
Email: inkoomchristian111@gmail.com
<https://orcid.org/0009-0009-9251-4220>

Mark Inkoom

Department of Business and Social Sciences Education
Faculty of Humanities and Social Sciences Education
University of Cape Coast, Cape Coast, Ghana
Email: markinkoom111@gmail.com
<https://orcid.org/0009-0008-2797-6712>

Sheriff Dangimah Suradji

Department of Business and Social Sciences Education
Faculty of Humanities and Social Sciences Education
University of Cape Coast, Cape Coast, Ghana
Email: sheriffdangimahsuradji@gmail.com
<https://orcid.org/0009-0005-1350-2493>

Introduction

The rapid integration of Artificial Intelligence (AI) into higher education has expanded opportunities for students to use AI not only for academic purposes but also to address broader social and community challenges. AI for social good (ASG) refers to the application and development of AI in ways that contribute to addressing societal problems and promoting community wellbeing. Its growing relevance reflects increasing recognition that the value of AI should not be considered solely in terms of technological advancement or individual utility but also in relation to its ethical and societal implications (Hasas et al., 2024; Häußermann & Lütge, 2022). Consequently, understanding the factors associated with students' orientation towards socially beneficial AI use is increasingly important in higher education.

Students' value beliefs may provide an important motivational basis for understanding their engagement with AI for social good. Expectancy-value perspectives suggest that individuals' engagement with an activity can be related to the value they attach to that activity. In the context of AI, intrinsic value reflects the extent to which students find AI interesting or enjoyable, utility value reflects its perceived practical usefulness, and attainment value reflects the importance attached to AI in relation to one's goals or sense of self. At the same time, perceived ethical cost

may capture concerns about the ethical implications or potential negative consequences associated with AI use. Recent research has demonstrated the relevance of value beliefs to AI-related engagement and use. For example, Arthur et al. (2026) showed that expectancy-value beliefs were associated with students' generative AI use and self-regulated learning. Similarly, Zhang et al. (2026) highlighted the relevance of perceived value dimensions in understanding individuals' intentions towards AI products.

Against this background, this study examined the associations between four AI value beliefs, namely attainment value, intrinsic value, perceived ethical cost, and utility value, and university students' orientation toward AI for social good (ASG). The study specifically considered whether students who attach greater intrinsic, ethical, or practical value to AI also report stronger orientations towards socially beneficial AI engagement.

Method

Data were obtained from 509 university students. Structural Equation Modelling (SEM) was employed to examine the proposed associations between attainment value, intrinsic value, perceived ethical cost, utility value, and orientation toward AI for social good. The analysis focused on both the statistical significance and magnitude of the relationships between the value-belief dimensions and ASG.

Findings

The findings showed that intrinsic value, perceived ethical cost, and utility value were positively and significantly associated with orientation toward AI for social good. Specifically, intrinsic value demonstrated a positive association with ASG ($\beta = 0.289, p < .001$), followed by perceived ethical cost ($\beta = 0.193, p < .001$) and utility value ($\beta = 0.166, p = .004$). In contrast, attainment value was not significantly associated with ASG ($\beta = 0.015, p = .407$).

The relatively stronger association observed for intrinsic value suggests that students' interest in and enjoyment of AI may be particularly relevant to their orientation towards socially beneficial applications. This finding is consistent with the broader argument that meaningful engagement with AI may depend not only on instrumental considerations but also on students' personal interest and motivational involvement. Arthur et al. (2026) similarly demonstrated the relevance of value beliefs in understanding students' engagement with generative AI.

The significant association between perceived ethical cost and ASG is also noteworthy. Rather than indicating that ethical concerns necessarily discourage socially beneficial AI engagement, the finding suggests that greater recognition of the ethical implications associated with AI may coexist with stronger orientations towards using AI for socially beneficial purposes. This interpretation is consistent with Häußermann and Lütge's (2022) argument that responsible AI development requires attention to pluralistic values and ethical considerations. It also aligns with Hasas et al. (2024), who emphasised the importance of socially oriented applications of AI for community development.

Utility value was likewise positively associated with ASG. Students who perceived AI as practically useful may therefore also report stronger orientations towards applying AI to socially beneficial purposes. This finding corresponds with value-based perspectives on technology engagement and recent evidence that perceived value dimensions are relevant to individuals' AI-related intentions (Zhang et al., 2026).

In contrast, attainment value was not significantly associated with ASG. This suggests that viewing AI as personally important or relevant to one's goals, by itself, may not be sufficient to distinguish students' orientations towards socially beneficial AI engagement. The finding highlights the possibility that different dimensions of value beliefs may have distinct relationships with AI-related orientations rather than contributing uniformly.

Implications

The findings have implications for higher education institutions seeking to promote socially responsible AI engagement. First, AI education could incorporate activities that stimulate students' curiosity and intrinsic interest in AI while connecting technological learning to authentic societal challenges. Second, ethical reflection should form an integral component of AI education. Students can be encouraged to examine issues such as fairness, privacy, accountability, bias, sustainability, and the potential social consequences of AI applications. Such approaches are consistent with the view that responsible AI requires consideration of multiple stakeholder values and broader societal interests (Häußermann & Lütge, 2022).

Third, educators could demonstrate how AI can be applied to practical community and societal problems. Connecting AI competencies with authentic social challenges may help students recognise the practical utility of AI beyond conventional academic or individual applications. This is particularly relevant to the broader objective of developing AI users who can consider both technological possibilities and social consequences (Hasas et al., 2024).

The findings also support the relevance of socially oriented AI education. Sanusi et al. (2024), for example, demonstrated the relevance of social-good considerations to educators' orientations towards AI education. Together with the present findings, this suggests that higher education can provide opportunities for students to consider how AI can contribute to social and community development while also critically evaluating its ethical implications.

Conclusion

This study examined the associations between AI value beliefs and university students' orientation toward AI for social good. Intrinsic value, perceived ethical cost, and utility value were positively and significantly associated with ASG, whereas attainment value was not significantly associated with the outcome. The findings indicate that students' interest in AI, recognition of its practical usefulness, and attention to its ethical implications may be relevant to their orientation towards socially beneficial AI engagement. The study therefore highlights the importance of combining motivational, practical, and ethical dimensions in higher education AI education. Given the cross-sectional nature of the study, the findings should be interpreted as

associations rather than causal relationships. Future research could examine these relationships longitudinally and across different educational and cultural contexts.

References

- Arthur, F., Opoku, E., Inkoom, C., Suradji, S. D., & Inkoom, M. (2026). Where there is will, there is AI: Linking expectancy-value beliefs, generative AI use and self-regulated learning among Economics students. *European Journal of Education*, 61(3), e70743.
- Hasas, A., Hakimi, M., Shahidzay, A. K., & Fazil, A. W. (2024). AI for social good: Leveraging artificial intelligence for community development. *Journal of Community Service and Society Empowerment*, 2(2), 196–210.
- Häußermann, J. J., & Lütge, C. (2022). Community-in-the-loop: Towards pluralistic value creation in AI, or why AI needs business ethics. *AI and Ethics*, 2(2), 341–362.
- Sanusi, I. T., Ayanwale, M. A., & Chiu, T. K. (2024). Investigating the moderating effects of social good and confidence on teachers' intention to prepare school students for artificial intelligence education. *Education and Information Technologies*, 29(1), 273–295.
- Zhang, H., Li, B., Hu, B., & Ai, P. (2026). Exploring the role of personal innovativeness on purchase intention of artificial intelligence products: An investigation using social influence theory and value-based adoption model. *International Journal of Human–Computer Interaction*, 42(2), 752–766.

Toward Artificial General Intelligence: A New Pathway in Undergraduate AI Research at Walsh University

Wellington Mukahiwa
Amy J. Heston, Ph.D.
Walsh University (Ohio, USA)
wmukahiwl@walsh.edu; aheston@walsh.edu

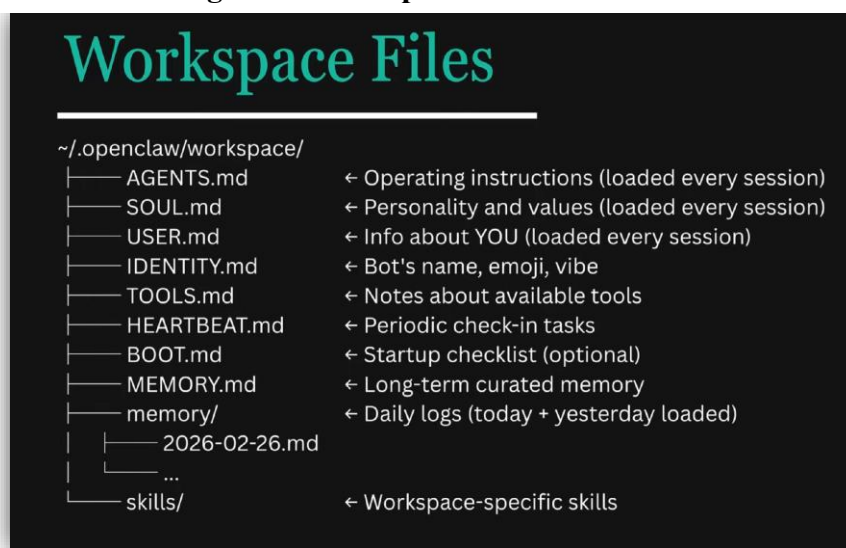
Overview

This undergraduate research explores a pathway that pushes agentic artificial intelligence toward more general operation. Rather than treating artificial general intelligence (AGI) only as a property of a larger model, the project asks whether greater generality can emerge from the architecture built around a capable model. The student researcher created a system that runs continuously on personal hardware, maintains memory across sessions, delegates work across specialized roles, monitors its own outputs, and can take machine-level action without a user present. Built on the open-source OpenClaw agentic runtime, the work examines what becomes possible when memory, continuity, delegation, scheduling, and system access are composed into one operating environment (Wang et al., 2024; OpenClaw Foundation, n.d.).

Project Highlights

The AGI project began with three questions: Can generality be composed rather than trained? What architecture is required for continuous operation over days and weeks? Where does useful autonomy end and human judgment remain necessary? The system was designed to address these questions through a working deployment rather than a purely theoretical model. A layered workspace separates operating instructions, values, user context, tool notes, scheduled tasks, memory, and skills. (Figure 1) This separation matters because each type of information changes at a different pace. Durable instructions can remain stable while daily memory continues to grow, making the system easier to maintain over extended use.

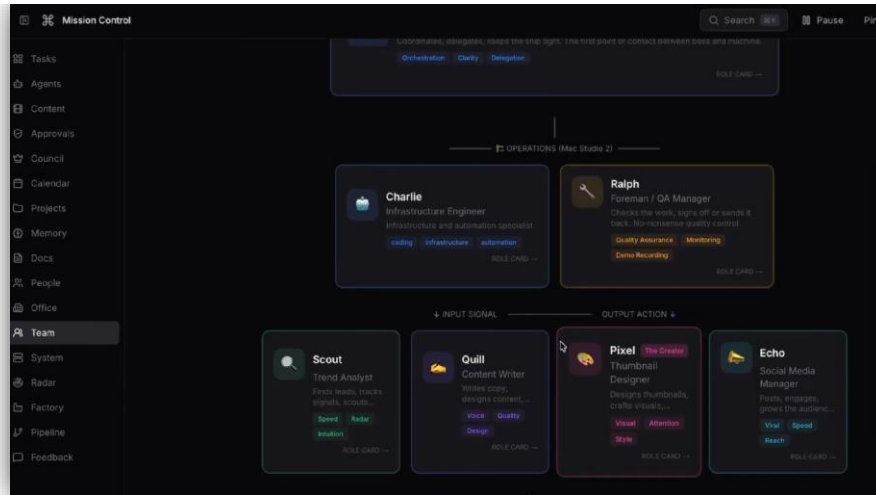
Figure 1. Workspace file architecture



Experimental Trials

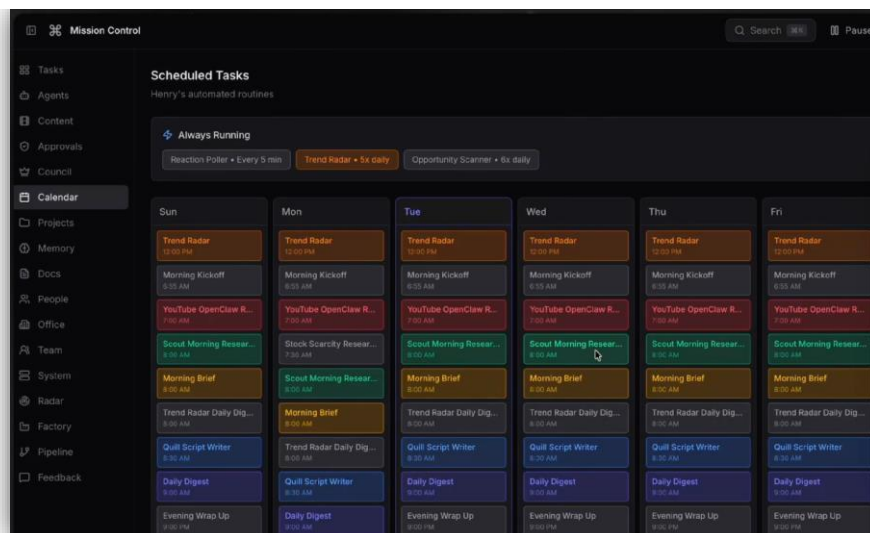
Work is distributed across specialized roles rather than handled by one general agent. An orchestration role delegates tasks, while other roles focus on infrastructure, research, content production, distribution, and quality assurance. (Figure 2) The independent quality-assurance role is especially important because it reviews completed work before release instead of allowing the producing agent to grade itself.

Figure 2. Delegated role structure



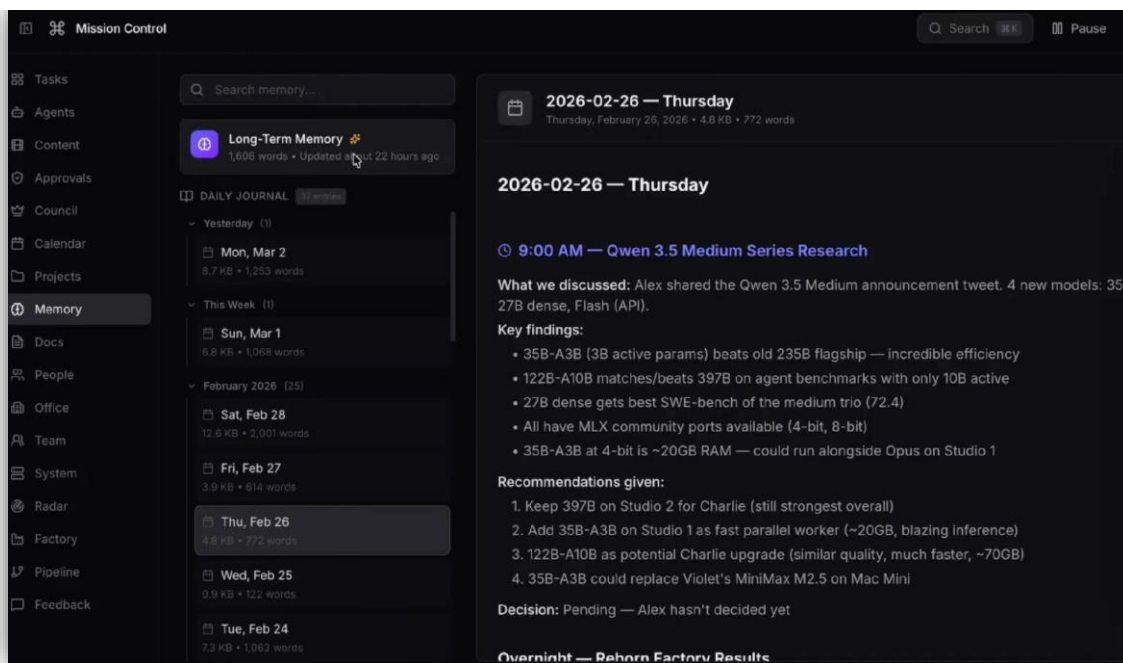
The system also operates on a schedule. Continuous pollers watch for changing conditions, research sweeps gather information several times each day, and a daily cycle moves from an early-morning kickoff through research, briefing, content production, review, and an evening wrap-up. These stages feed one another, allowing work to continue whether or not a person is present. (Figure 3)

Figure 3. Scheduled task layer



Persistent memory supports continuity across sessions through two levels: a curated long-term store and a dated daily journal. (Figure 4) The journal records what was discussed, found, recommended, and still undecided. This allows the system to resume work rather than repeatedly restart without context (Zhang et al., 2024).

Figure 4. Two-tier memory structure



Results

The deployment demonstrated continuous unattended operation, persistent cross-session state, cross-domain execution, delegated multi-role work, independent quality review, and direct machine control. At the same time, sustained use revealed important failure modes, including context drift, silent failures, cascading problems, and memory accumulation. These results show that monitoring and curation are not optional parts of continuous agentic operation.

The researchers also remain careful about the limits of the work. The system has not been evaluated against a benchmark suite, longer-term production reliability remains untested, and the deployment has operated at individual scale rather than under institutional or multi-user load. The project therefore proposes an architectural pathway toward greater generality rather than claiming that general intelligence has been established.

Mission Alignment and Serving Others

This AGI project aligns with Walsh University's values-based mission and the conference theme of AI innovation guided by faith to serve others. Continuous autonomy raises a question that technical capability alone cannot answer: what should a system be permitted to decide when no person is watching? The researchers propose a practical principle that unattended autonomy should be bound by reversibility, not merely by capability. Actions that can be safely undone may be reasonable candidates for automation; actions involving irreversible consequences,

external communication, financial activity, deletion, or effects on other people should remain under human judgment (UNESCO, 2022).

Accountability also does not transfer to the machine. Responsibility remains with the person who configured the system, granted access, and allowed it to operate. In this view, monitoring, logging, and quality assurance are not simply engineering features but practices of stewardship.

Conclusion

Our work in AGI shows how an undergraduate researcher can build and study a continuously operating, memory-persistent, multi-role agentic system on personal hardware. Its contribution is both technical and human-centered, particularly documenting what such architecture can do while asking how autonomy should be governed in service of others. The work invites continued research on measurement, reliability, access, and the boundaries of responsible delegation.

References

- OpenClaw Foundation. (n.d.). *OpenClaw* [Computer software]. GitHub.
<https://github.com/openclaw/openclaw>
- UNESCO. (2022). *Recommendation on the ethics of artificial intelligence*.
<https://unesdoc.unesco.org/ark:/48223/pf0000381137>
- Wang, L., Ma, C., Feng, X., Zhang, Z., Yang, H., Zhang, J., Chen, Z., Tang, J., Chen, X., Lin, Y., Zhao, W. X., Wei, Z., & Wen, J. (2024). A survey on large language model based autonomous agents. *Frontiers of Computer Science*, 18, 186345.
<https://doi.org/10.1007/s11704-024-40231-1>
- Zhang, Z., Bo, X., Ma, C., Li, R., Chen, X., Dai, Q., Zhu, J., Dong, Z., & Wen, J.-R. (2024). A survey on the memory mechanism of large language model based agents. *arXiv*.
<https://arxiv.org/abs/2404.13501>

Profiling AI-TPACK Readiness for Agentic AI Integration: Evidence from Ghanaian Preservice Teachers

Francis Arthur, Ph.D.

Department of Business and Social Sciences Education
Faculty of Humanities and Social Sciences Education
University of Cape Coast, Cape Coast, Ghana

E-mail: a.francis1608@gmail.com
<https://orcid.org/0000-0001-7792-6563>

Francis Obeng Gyedu

Department of Business and Social Sciences Education
Faculty of Humanities and Social Sciences Education
University of Cape Coast, Cape Coast, Ghana

E-mail: francis.gyedu@stu.ucc.edu.gh
<https://orcid.org/0009-0009-4248-2064>

Eric Boateng

Department of Business and Social Sciences Education
Faculty of Humanities and Social Sciences Education
University of Cape Coast, Cape Coast, Ghana

Email: eboateng017@stu.ucc.edu.gh
<https://orcid.org/0009-0009-1246-632X>

Emmanuel Quayson

Department of Business and Social Sciences Education
Faculty of Humanities and Social Sciences Education
University of Cape Coast, Cape Coast, Ghana

Email: equayson005@stu.ucc.edu.gh
<https://orcid.org/0000-0003-0400-401X>

Silas Afutu Quaye

Institute of Educational Planning and Administration
University of Cape Coast, Cape Coast, Ghana

E-mail: afutuquaye13@gmail.com
<https://orcid.org/0009-0000-8203-9803>

Introduction

The increasing integration of Artificial Intelligence (AI) into education is creating new expectations for teachers to develop technological, pedagogical, content-related, and ethical competencies. These expectations become particularly important with the emergence of Agentic AI systems, which can perform increasingly autonomous and adaptive functions within educational environments. Consequently, preparing future teachers for AI-supported teaching requires attention not only to general AI competence but also to their ability to integrate AI with pedagogical and disciplinary knowledge. The extension of the Technological Pedagogical

Content Knowledge (TPACK) framework to AI provides a useful basis for examining these multidimensional competencies.

Recent research has demonstrated that preservice teachers' AI competencies are multidimensional and that substantial variation may exist across individuals. Acquah et al. (2026) identified distinct patterns of AI competence among preservice teachers using network and latent profile analyses, highlighting the value of person-centred approaches for understanding AI readiness. Similarly, Sadaf et al. (2025) reported relationships between preservice teachers' perceived AI competencies, affective dispositions, and readiness to use AI. Research has also linked AI-related competencies with behavioural intentions towards AI-supported lesson planning (Acquah et al., 2024). These findings suggest that aggregate competence scores may not fully capture the diversity of readiness among future teachers.

The TPACK framework provides an important foundation for examining how teachers combine technological, pedagogical, and content knowledge. Recent AI-TPACK research has extended this perspective by examining teachers' ability to integrate AI within instructional contexts. For example, Ergun and Arslan (2026) examined AI-TPACK competencies among preservice science teachers, while Zhu et al. (2026) applied an extended TAM-TPACK framework to examine teachers' acceptance of AI-generated content for assisted tutoring. In addition to technical and pedagogical competence, ethical readiness is increasingly relevant because responsible AI integration requires teachers to recognise ethical considerations surrounding AI use. Acquah et al. (2026) similarly demonstrated the relevance of ethical awareness as an important dimension of university students' AI-related orientations.

Against this background, this study profiled AI-TPACK readiness for Agentic AI integration among Ghanaian preservice teachers. Specifically, the study examined five competence domains: AI Technological Knowledge (AITK), AI Pedagogical Knowledge (AIPK), AI Content Knowledge (AICK), integrative AI-TPACK, and AI Ethical Technology Readiness (AIET). By combining variable-centred and person-centred approaches, the study sought to examine both the overall structure of AI-TPACK readiness and the heterogeneity of readiness profiles among future teachers.

Method

A descriptive cross-sectional survey design was employed with 509 Level 400 preservice teachers in Ghana. Confirmatory factor analysis (CFA) was used to examine the measurement structure of AI-TPACK readiness across five domains: AITK, AIPK, AICK, AI-TPACK, and AIET. Reliability and convergent validity were assessed to establish the adequacy of the measurement model.

Correlation analysis was subsequently used to examine the relationships among the competence domains. Finally, latent profile analysis (LPA) was employed to identify distinct subgroups of preservice teachers based on their patterns of AI-TPACK readiness. Gender invariance testing was also conducted to examine whether the measurement structure operated comparably across male and female preservice teachers.

Findings

The confirmatory factor analysis supported a five-factor structure comprising AI Technological Knowledge, AI Pedagogical Knowledge, AI Content Knowledge, integrative AI-TPACK, and AI Ethical Technology Readiness. The measures demonstrated satisfactory reliability and convergent validity, supporting their use in examining different dimensions of preservice teachers' AI-TPACK readiness.

The correlation analysis showed strong positive interrelationships among the five competence domains. This pattern suggests that the different dimensions of AI-TPACK readiness were closely connected. Preservice teachers with stronger competence in one area of AI-related knowledge also tended to report stronger competence in other areas. This finding is consistent with the multidimensional conceptualisation of AI competence reported by Acquah et al. (2026) and with research linking perceived AI competencies with readiness to use AI (Sadaf et al., 2025).

The latent profile analysis further revealed distinct readiness profiles among the 509 preservice teachers. Despite generally high levels of AI-TPACK competence, the profiles demonstrated meaningful heterogeneity in the configuration of technological, pedagogical, content, integrative, and ethical competencies. Most participants demonstrated relatively strong patterns of integrative and ethical AI competence, whereas smaller subgroups displayed moderate or emerging readiness patterns.

The presence of distinct profiles indicates that the overall level of AI competence observed in the sample did not fully represent the diversity of individual readiness patterns. This finding is particularly consistent with Acquah et al. (2026), whose network and latent profile analysis demonstrated heterogeneity in preservice teachers' AI competence. The present findings therefore reinforce the value of person-centred analytical approaches for understanding AI readiness rather than relying exclusively on sample-level mean scores.

Gender invariance testing indicated no significant differences in AI-TPACK readiness across male and female preservice teachers. This suggests that the measurement of AI-TPACK readiness was sufficiently comparable across the two gender groups and that the identified readiness patterns were not substantially differentiated by gender within this sample.

The findings also extend previous AI-TPACK research. Ergun and Arslan (2026) demonstrated the relevance of AI-TPACK competencies among preservice science teachers, while Zhu et al. (2026) highlighted the role of AI and TPACK-related considerations in teachers' acceptance of AI-generated content. The present study extends this emerging literature by examining AI readiness through a multidimensional framework and identifying heterogeneous readiness profiles.

Implications

The findings have implications for teacher education programmes preparing future teachers for AI-supported classrooms. First, AI preparation should extend beyond general knowledge of AI

technologies to include pedagogical integration, disciplinary application, and ethical readiness. The five-domain structure identified in this study suggests that effective preparation may require attention to the different dimensions of AI-TPACK rather than treating AI competence as a single undifferentiated construct.

Second, the presence of distinct readiness profiles highlights the potential value of differentiated professional preparation. A uniform AI training programme may not address the needs of preservice teachers who enter teacher education with different combinations of technological, pedagogical, content, and ethical competencies. Teacher education institutions could therefore use diagnostic assessments to identify areas of relative strength and development and provide targeted learning opportunities accordingly.

Third, ethical competence should remain an integral component of AI teacher education. As Agentic AI systems become increasingly capable of autonomous and adaptive functions, future teachers may encounter issues involving transparency, accountability, privacy, bias, human oversight, and responsible decision-making. The inclusion of AI Ethical Technology Readiness in the present framework is therefore consistent with growing recognition that AI competence should encompass responsible and ethically informed use (Acquah et al., 2026).

The findings also support the integration of AI into authentic pedagogical activities. Preservice teachers could be provided with opportunities to design AI-supported lesson plans, critically evaluate AI-generated teaching materials, develop AI-assisted assessment activities, and reflect on the pedagogical and ethical implications of autonomous AI systems. Such activities could help connect technological knowledge with pedagogical and content knowledge, consistent with the broader TPACK perspective and recent AI-TPACK research (Ergun & Arslan, 2026; Zhu et al., 2026).

Finally, the absence of significant gender differences in AI-TPACK readiness suggests that AI teacher education can be considered within a common preparation framework for male and female preservice teachers in this sample. However, the existence of distinct readiness profiles indicates that individual-level differences may be more informative than gender alone when designing differentiated AI preparation.

Conclusion

This study examined AI-TPACK readiness for Agentic AI integration among 509 Ghanaian preservice teachers using a combination of confirmatory factor analysis, correlation analysis, and latent profile analysis. The findings supported five interconnected competence domains: AI Technological Knowledge, AI Pedagogical Knowledge, AI Content Knowledge, integrative AI-TPACK, and AI Ethical Technology Readiness. Although overall competence was relatively high, the latent profile analysis revealed meaningful heterogeneity in readiness patterns. Gender invariance testing did not indicate significant differences in AI-TPACK readiness between male and female preservice teachers.

Overall, the findings highlight the importance of viewing preservice teachers' readiness for Agentic AI integration as multidimensional and heterogeneous. Rather than relying solely on

aggregate competence levels, teacher education programmes may benefit from identifying different readiness configurations and providing differentiated, pedagogically relevant, and ethically grounded AI preparation. Given the cross-sectional design, the findings describe patterns and associations within the sample and should not be interpreted as evidence of causal relationships. Future research could examine how AI-TPACK readiness develops over time and how different readiness profiles relate to actual classroom integration of Agentic AI.

References

- Acquah, B. Y. S., Arthur, F., Gyedu, F. O., Quayson, E., Boateng, E., Quaye, S. A., & Nortey, S. A. (2026). Preservice teachers' artificial intelligence competence: A network and latent profile analyses. *European Journal of Education*, 61(3), e70735. <https://doi.org/10.1111/ejed.70735>
- Acquah, B. Y. S., Arthur, F., Salifu, I., Quayson, E., & Nortey, S. A. (2024). Preservice teachers' behavioural intention to use artificial intelligence in lesson planning: A dual-staged PLS-SEM-ANN approach. *Computers and Education: Artificial Intelligence*, 100307.
- Acquah, B. Y. S., Salifu, I., Arthur, F., Inkoom, M., Suradji, S. D., Inkoom, C., et al. (2026). Artificial intelligence ethical awareness of university students in Ghana: A network and latent profile analyses. *Computers and Education: Artificial Intelligence*, 100652.
- Ergun, M., & Arslan, M. A. (2026). Exploring preservice science teachers' AI-TPACK competencies and perceptions of artificial intelligence in education. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 41(2), 404–425.
- Sadaf, A., Maxwell, D., Küplüce, C., & Holz, H. (2025). Relationship between pre-service teachers' perceived competencies, affective dispositions, and readiness to use artificial intelligence: A study informed by the intelligent-TPACK. *Computers and Education Open*, 100305.
- Zhu, Z., Gan, Q., & Duan, P. (2026). Art and design teachers' acceptance of AI-generated content for assisted tutoring: An extended TAM-TPACK framework. *Humanities and Social Sciences Communications*, 13(1), 362.

Preservice Teachers' AI Ethical Reflection (AIER): A Multi-Analytical Approach Using Network, Latent Profile, and Multivariate Analyses

Francis Arthur, Ph.D.
Sheriff Dangimah Suradji
Mark Inkoom

University of Cape Coast (Cape Coast, Ghana)

francis.arthur007@stu.ucc.edu.gh; sheriffdangimahsuradji@gmail.com;
markinkoom111@gmail.com

The growing integration of artificial intelligence (AI) into education creates new opportunities for teaching and learning; however, it also raises ethical concerns about fairness, privacy, transparency, accountability, and responsible use (Borenstein & Howard, 2021; Nguyen et al., 2023). These concerns make preservice teachers' ethical preparedness increasingly important, especially because teachers shape how AI is understood and applied in educational settings (Dieterle et al., 2024; Arthur et al., 2026). Recent research has also highlighted preservice teachers' diverse perspectives on the benefits, challenges, and educational integration of generative AI (Bae et al., 2024).

This study examined preservice teachers' AI Ethical Reflection (AIER), defined as the ability to identify, evaluate, and respond to the ethical implications of AI use in education. Drawing on Rest's Four Component Model and Moral Development Theory (Rest, 1986), AIER was conceptualised across three dimensions: AI Ethical Awareness (AEA), AI Critical Evaluation (ACE), and AI for Social Good (ASG). The conceptualisation is consistent with growing calls for systematic attention to ethical reasoning and responsible AI use within teacher education (Holmes & Porayska-Pomsta, 2022). While existing research has examined AI literacy, attitudes, preparedness, and adoption, less attention has been given to the interconnected structure and heterogeneous profiles of ethical reflection among future teachers.

A descriptive cross-sectional study was conducted with a simple random sample of 509 Preservice Teachers from a Ghanaian University. Data were collected using the validated AI Ethical Reflection Scale comprising AEA, ACE, and ASG (Wang et al., 2025) and analysed using Confirmatory Factor Analysis (CFA), Network Analysis, Latent Profile Analysis (LPA), and one-way Multivariate Analysis of Variance (MANOVA). The network analysis revealed a densely interconnected ethical reflection system, with 56 of 66 possible edges present and a sparsity of .152. AI Critical Evaluation and AI for Social Good emerged as important integrative components of the network, with ACE4, ASG1, and ACE3 showing particularly strong centrality and bridging roles. The descriptive results further showed generally high levels of AIER.

The LPA results identified eight distinct profiles of preservice teachers' AI ethical reflection, demonstrating substantial heterogeneity in how the three dimensions were combined. The largest groups were Integrative Ethical Reflectors, characterised by very high reflection across all dimensions, and Analytical Moral Evaluators, characterised by high ethical awareness and

critical evaluation with comparatively lower social-good orientation. Other profiles included Principled Ethical Practitioners, Socially Responsible Innovators, Cognitively-Oriented Reflectors, Contextual Moral Idealists, Balanced Ethical Reflectors, and a small Ethically Unreflective Group. The eight-class solution demonstrated high classification quality, with entropy of .96 and a significant BLRT ($p = .0099$). These findings indicate that although preservice teachers generally demonstrate high ethical reflection, their patterns of ethical engagement are not uniform.

The MANOVA results showed no statistically significant gender differences in AI Ethical Reflection, Pillai's Trace = .006, $F(3, 505) = 1.006$, $p = .390$, partial $\eta^2 = .006$. The findings demonstrate that AIER is a multidimensional, interconnected, and heterogeneous construct among preservice teachers. The study highlights the importance of differentiated and context-sensitive AI ethics education that strengthens ethical awareness, critical evaluation, and commitment to social good. By identifying both the structure and distinct profiles of ethical reflection, the study provides a basis for teacher education institutions to design targeted ethics instruction that prepares future teachers to integrate AI in ways that are fair, responsible, inclusive, and socially beneficial.

References

- Arthur, F., Boateng, E., Opoku, E., Gyedu, F. O., Asare-Bediako, S., Quayson, E., ... & Nortey, S. A. (2026). Exploring artificial intelligence anxiety among basic school teachers in Ghana. *SAGE Open*, 16(1), 21582440251410713.
- Bae, H., Jaesung, H., Park, J., Woong Choi, G., & Moon, J. (2024). Pre-service teachers' dual perspectives on generative AI: Benefits, challenges, and integration into their teaching and learning. *Online Learning*, 28(3), 131–156. <https://doi.org/10.24059/olj.v28i3.4543>
- Borenstein, J., & Howard, A. (2021). Emerging challenges in AI and the need for AI ethics education. *AI and Ethics*, 1(1), 61–65. <https://doi.org/10.1007/s43681-020-00002-7>
- Dieterle, E., Dede, C., & Walker, M. (2024). The cyclical ethical effects of using artificial intelligence in education. *AI and Society*, 39(2), 633–643.
- Holmes, W., & Porayska-Pomsta, K. (Eds.). (2022). *The ethics of artificial intelligence in education: Practices, challenges, and debates*. Routledge. <https://doi.org/10.4324/9780429329067>
- Nguyen, A., Ngo, H. N., Hong, Y., Dang, B., & Nguyen, B. P. T. (2023). Ethical principles for artificial intelligence in education. *Education and Information Technologies*, 28(4), 4221–4241. <https://doi.org/10.1007/s10639-022-11316-w>
- Rest, J. R. (1986). *Moral development: Advances in research and theory*. Praeger.
- Wang, Z., Chai, C. S., Li, J., & Lee, V. W. Y. (2025). Assessment of AI ethical reflection: The development and validation of the AI ethical reflection scale (AIERS) for university students. *International Journal of Educational Technology in Higher Education*, 22(1), 19. <https://doi.org/10.1186/s41239-025-00519-z>



2020 East Maple Street | North Canton, Ohio 44720 | www.walsh.edu