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GUIA: A Case Study in Responsible AI and Experiential Learning for Cultural Heritage

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Abstract

This study investigates how experiential, project-based learning in Information Systems (IS) education can integrate technical rigor with ethical responsibility, preparing students for real-world challenges of AI development. Conducted as a semester-long pilot at the University of the Philippines Cebu, the project engaged students in collaborative design, stakeholder consultation, and responsible AI practices framed through the Ethical AI-Integrated Design Framework (EAIDF). The tangible output was GUIA, an AI-powered museum guide that enhances cultural heritage experiences through artwork recognition while raising questions of privacy, accessibility, and cultural sensitivity. To evaluate learning outcomes, a retrospective pretest–posttest survey complemented by qualitative reflections revealed growth in students' technical competencies, ethical awareness, and confidence in applying AI to socially relevant domains. Despite limitations of small sample size (n = 4), the project highlighted the value of embedding ethical reflection directly into design practice rather than isolating it in theory. The central contribution of this study lies in demonstrating how EAIDF-guided experiential learning cultivates holistic competencies—technical, ethical, and contextual—while producing authentic, community-relevant innovations. Recommendations emphasize scaling the approach to larger cohorts, sustaining cross-sector partnerships in cultural heritage, and embedding fairness, accountability, transparency, human-centered values, and sustainability into IS curricula. This work positions small-scale, context-rich pilots as stepping stones toward a more responsible and socially grounded digital transformation.

Keywords: Experiential Learning, Artificial Intelligence, Information Systems Education, Digital Innovation, Emerging Technologies, Cultural Heritage

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1. INTRODUCTION

The rapid advancement of Artificial Intelligence (AI) and computer vision is reshaping how cultural institutions engage with audiences. Museums are increasingly using digital tools to enhance visitor experiences, broaden access, and modernize cultural storytelling. In the Philippines—where heritage is rooted in both colonial history and local traditions—such technologies enable more inclusive and context-aware engagement. Studies by Qian et al. (2023) and Cai (2025) highlight the potential of AI and mobile platforms to transform museums into interactive, learner-centered environments.

At the same time, Information Systems (IS) and Software Engineering education face the challenge of bridging classroom instruction with real-world application. Project-Based Learning (PBL) approaches are widely recognized for strengthening technical skills, collaborative problem-solving, and ethical reasoning (Saad, 2022; Hu et al., 2023; Warr & West, 2020). Tuomi (2018) further argues that AI in education should go beyond automation and empower students to critically shape digital innovation. This study builds on these insights, presenting a pilot course design that integrated PBL, responsible AI, and community-based engagement into a semester-long Software Engineering class.

To structure this integration, we introduce the Ethical AI-Integrated Design Framework (EAIDF), a novel model that extends principles of design thinking, value-sensitive design, and responsible AI guidelines into a unified process. The EAIDF begins with identifying problems and opportunities in non-technical domains, followed by conceptualizing technology-driven solutions, embedding ethical AI principles and practices at every stage, and iterating through development, testing, and reflection. Unlike traditional design approaches, EAIDF positions ethical AI not as an add-on but as a central design dimension, ensuring that technical solutions are aligned with societal values, fairness, and accountability.

As part of this design, students worked on an interdisciplinary project in partnership with Jose T. Joya Gallery at UP Cebu, tourism authorities, and airport managers. The course guided them through the full software lifecycle—including problem identification, stakeholder consultation, iterative development, and ethical reflection—while embedding principles of responsible AI aligned with frameworks like UNESCO's AI Ethics Guidelines (UNESCO, 2021; Zheng et al., 2024). This approach fostered not only technical proficiency but also cultural sensitivity, teamwork, and ethical awareness.

A concrete outcome of this pedagogical model was GUIA, an AI-powered museum guide that enhances visitor experiences through artwork recognition. While GUIA showcases what students accomplished, it is not the focal point of this paper. Rather, its success underscores the effectiveness of the EAIDF-guided course structure, mentoring strategies, experiential learning design, and the opportunity for students to engage directly with real stakeholders in the cultural sector. In future iterations, different challenges and products may emerge, but the central contribution remains the pedagogy that integrates technical rigor, ethical reflection, and stakeholder collaboration.

Through this case, we contribute to broader discussions on how course design, experiential learning, and ethical AI integration—operationalized through the EAIDF—can prepare students to lead inclusive and meaningful digital transformation in society.

2. BACKGROUND

This section outlines the contextual and theoretical foundations of the pilot course design that led to the development of GUIA. Three interrelated domains frame this work: (1) experiential learning and competency development in IS education, which provides the educational research foundation; (2) digital transformation in cultural heritage and tourism, which serves as the case context; and (3) responsible AI and ethical development, which represents a critical design and production component. Together, these dimensions are synthesized in the proposed Ethical AI-Integrated Design Framework (EAIDF), which guides the structure of the course and the students' design process.

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Experiential Learning and Competency Development in IS Education

Bridging the gap between classroom theory and real-world application is a persistent challenge in Information Systems (IS) and Software Engineering education. Project-Based Learning (PBL) offers a powerful pedagogical response, emphasizing active, collaborative problem-solving that equips students with both technical and transferable skills.

Research confirms the efficacy of PBL in IS/CS contexts: Hu et al. (2023) demonstrated that PBL enhances academic performance and technical skill acquisition in AI courses; Saad (2022) found improvements in both technical and soft skills in software engineering projects; and Warr & West (2020) highlighted the capacity of interdisciplinary PBL to foster innovation and cross-domain thinking. Meruyert et al. (2025) further showed that real-world computer vision projects increased student motivation and performance by up to 60%.

Within this study, PBL and experiential learning form the pedagogical foundation of the course design. The EAIDF operationalizes PBL by providing a structured pathway: starting from problem/opportunity identification, progressing through solution conceptualization, and embedding ethical AI considerations throughout the development lifecycle. In this way, the project was not primarily about building an application but about creating a scaffolded environment where students could navigate technical, ethical, and contextual challenges. GUIA thus serves as a case outcome demonstrating the effectiveness of this design framework.

Digital Transformation in Cultural Heritage and Tourism

The contextual domain for this pilot course was cultural heritage. Museums and cultural institutions globally are adopting AI, computer vision, and mobile technologies to modernize visitor engagement, improve accessibility, and preserve narratives. Initiatives such as Google Arts & Culture and Europeana illustrate how immersive technologies expand cultural participation.

In Asia, Qian et al. (2023) showed that mobile augmented reality improved museum visitor satisfaction and learning outcomes, while Cai (2025) emphasized AI's role in personalization and enriched visitor interaction. In the Philippines—where heritage is deeply rooted in both colonial and local traditions—these technologies enable more inclusive and context-aware cultural storytelling.

Against this backdrop, the chosen project context gave students authentic stakeholder engagement: working with museum curators and tourism officials to co-define goals and align technical design with cultural needs. Within the EAIDF, this corresponds to the problem/opportunity identification and stakeholder engagement phases, ensuring that technological solutions are anchored in real-world relevance. GUIA, the AI-powered museum guide application, emerged as a tangible expression of this contextual engagement, but the broader lesson lies in how EAIDF leveraged this domain to drive both learning and innovation.

Responsible AI and Ethical Development

The third dimension is the production component: embedding responsible AI into the project. Global frameworks such as UNESCO's AI Ethics Guidelines and the EU AI Act stress the importance of fairness, transparency, and accountability. Yet, as Eitel-Porter (2021) notes, translating principles into practice remains difficult without governance mechanisms.

By situating responsible AI within the course, the project gave students practical experience grappling with fairness, cultural sensitivity, and privacy. Requirements-gathering explicitly included ethical dimensions; students assessed potential model biases, considered inclusivity in interface design, and avoided storing personal data to protect privacy. This integration reinforced that ethics cannot be an afterthought but must be part of the development lifecycle. Zheng et al. (2024) similarly argue that engaging students in co-design processes strengthens reflective thinking and ethical awareness—outcomes intentionally targeted in this course.

The EAIDF embeds these responsible AI principles directly into the design cycle, positioning ethical reflection and accountability as iterative checkpoints rather than add-ons. This ensures that students' technical outputs are not only functional but also socially responsible, culturally sensitive, and aligned with global standards for ethical AI.

Ethical AI-Integrated Design Framework (EAIDF)

Building on the three domains outlined above, this study introduces the Ethical AI-Integrated Design Framework (EAIDF) as both a pedagogical and practical contribution. The framework emerged from the recognition that existing

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models of design thinking, project-based learning, and responsible AI often remain fragmented: one emphasizes creativity and problem-solving, another focuses on experiential pedagogy, while the last highlights ethical concerns in AI development. What is often missing is a coherent structure that integrates these dimensions from the very start of the design process.

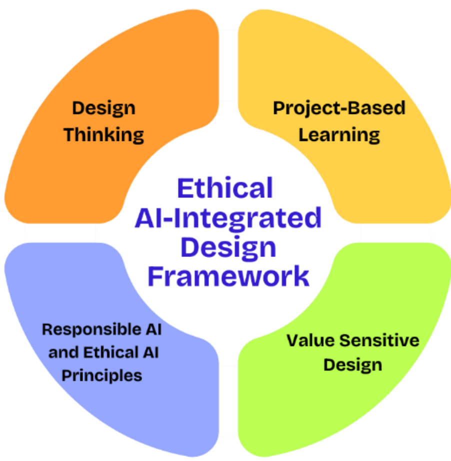

Figure 1. Ethical AI-Integrated Design Framework

EAIDF is conceptually informed by four bodies of scholarship (Figure 1). First, Design Thinking (Stanford d.school, 2010) provides the foundation for iterative, human-centered innovation, encouraging divergent and convergent thinking in problem framing and solution exploration. Second, Project-Based Learning (PBL) in Computing and Information Systems (Thomas, 2000; Helle, Tynjälä, & Olkinuora, 2006) underscores the importance of experiential pedagogy, where learners engage with authentic problems, build prototypes, and reflect on their process. Third, Responsible AI and Ethical AI Principles (OECD, 2019; IEEE, 2019; EU AI Act, 2023) guide the incorporation of fairness, accountability, transparency, and inclusivity into the design of AI systems. Finally, Value Sensitive Design (Friedman, Kahn, & Borning, 2002) highlights how human values must be explicitly embedded within technical development processes.

EAIDF begins with problem and opportunity identification, encouraging learners and practitioners to look beyond the technology sector and explore challenges across industries and social contexts. This ensures that technology solutions are not solutions in search of a problem but responses to authentic, stakeholder-driven needs. Once a problem is framed, the framework moves into solution conceptualization, where participants imagine potential applications, software, or systems while explicitly embedding ethical checkpoints related to fairness, inclusivity, transparency, and accountability.

Unlike traditional design thinking, EAIDF explicitly requires the consideration of AI integration at the ideation stage, asking: How can AI responsibly enhance this solution? What risks might emerge if AI is misapplied? These questions ensure that ethical deliberations accompany, rather than follow, technical innovation. To guide this, the framework draws inspiration from global standards such as UNESCO's Recommendation on the Ethics of Artificial Intelligence (2021), OECD's AI Principles (2019), and the EU AI Act (2023), while contextualizing them within local cultural and institutional realities.

The EAIDF thus functions as both a learning scaffold and a design methodology. In education, it helps students systematically progress from real-world problem analysis to ethically aligned solution development, enhancing both technical and reflective competencies. In practice, it provides organizations with a roadmap to ensure that AI-driven innovations are human-centered, socially responsible, and context-sensitive.

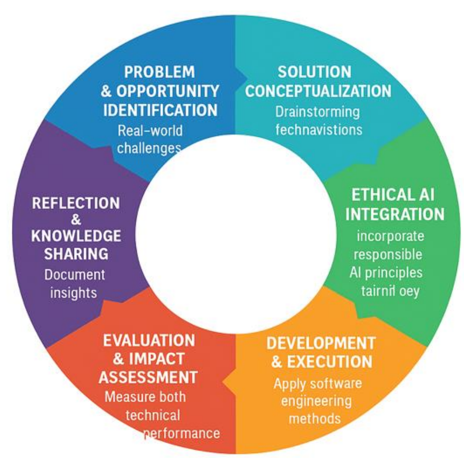

Figure 2. EAIDF Cycle

The figure above illustrates the EAIDF as a cyclical process, showing how ethical reflection is integrated into each stage rather than treated as an afterthought.

In sum, the EAIDF emerges as the conceptual bridge between the three domains—experiential learning, cultural heritage digital transformation,

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and responsible AI—and serves as the guiding framework for both the course design and the development of GUIA, the AI-powered museum guide prototype.

3. METHODOLOGY

This study adopts a pilot, exploratory case study design (Yin, 2018) to evaluate the pedagogical effectiveness of embedding experiential and project-based learning into a Software Engineering course. Findings from this small-scale pilot are intended to provide preliminary insights and inform future large-scale studies, rather than claim generalizable results. The study was guided throughout by the Ethical AI-Integrated Design Framework (EAIDF), which emphasizes aligning technical development, ethical responsibility, cultural sensitivity, and collaborative practice.

Participants and Context

The project was conducted during a semester-long Software Engineering course at the University of the Philippines Cebu. The class enrolled more students overall; however, this paper specifically highlights the work of one team of four undergraduate Computer Science students who collaborated with the Jose T. Joya Gallery, a university-run cultural space.

This team was selected as a pilot case because their project, GUIA, encapsulated the intended educational design: engaging in the full software development lifecycle, addressing ethical challenges, and co-designing with cultural stakeholders. The EAIDF provided a guiding structure, ensuring that the team's engagement was not only technically rigorous but also ethically responsible, culturally responsive, and collaboratively grounded.

Data Collection

Data collection employed a retrospective pretest–posttest design (Howard & Dailey, 1979), also known as the then-test, alongside qualitative reflection prompts. This design was chosen because, at the true start of the course, students had limited exposure to AI integration and responsible AI frameworks, making an accurate self-assessment unlikely. By asking students to reflect after the project on both their current skills and their pre-project abilities, the retrospective approach minimizes response-shift bias—a threat to validity in traditional pre-post surveys where participants' frames of reference evolve after instruction.

Quantitative Section. The quantitative instrument, developed by the researchers, contained 27 items across four domains: (1) AI Technical Competencies (e.g., preprocessing, model training, deployment), (2) Digital Transformation in Cultural Heritage, (3) Responsible AI Principles, and (4) Overall Perceived Learning and Confidence (see Appendix B).

Students rated their competencies twice in a single sitting at the end of the semester: first as they believed they had been before the project (retrospective pre), and second as they were after the project (post). Items were rated on a 5-point Likert scale.

The survey's constructs were informed by Kolb's Experiential Learning Theory (1984) and literature on project-based learning in IS education (Hu et al., 2023; Saad, 2022), and the dimensions of the EAIDF. By embedding EAIDF into the instrument design, the survey captured not only technical growth but also ethical reflection, cultural engagement, and collaborative awareness—domains central to the course objectives.

Qualitative Section. The second component consisted of ten open-ended questions, personally designed by the researchers to elicit rich narratives of student learning (see Appendix B). While the items were not adapted from validated instruments, their design was conceptually informed by Kolb's experiential learning cycle (Kolb, 1984), UNESCO's Recommendation on the Ethics of Artificial Intelligence (2021), and contemporary discussions on AI in project-based learning (Zheng et al., 2024).

Questions invited students to reflect on their conceptual understanding, challenges faced, ethical dilemmas considered, and cultural insights gained throughout the GUIA project. This approach ensured that the qualitative data complemented the retrospective pretest–posttest self-assessment by capturing deeper, process-oriented accounts of experiential learning and the integration of responsible AI practices in an authentic, community-based context.

Importantly, these questions were intentionally aligned with the EAIDF's interrelated dimensions. Five (5) questions (Q1–Q5) probed students' technical competency development and the role of experiential design in strengthening readiness for real-world AI practice. Two (2) questions (Q6 and Q7) explored digital transformation in

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cultural heritage and tourism, examining how students envisioned AI's potential for accessibility, preservation, and community engagement. Three (3) questions (Q8–Q10) addressed responsible AI and ethical development, focusing on how students confronted dilemmas, privacy concerns, and societal impacts of their work. This categorization ensured that the qualitative data complemented the retrospective pretest–posttest self-assessment by capturing deeper, process-oriented accounts of experiential learning while directly linking technical, ethical, and cultural outcomes in an authentic, community-based context.

Procedural Safeguards. To ensure ethical rigor and transparency in the research design, several procedural safeguards were implemented. Participation in the survey and reflections was entirely voluntary, and students were informed that non-participation would not affect their grades or course standing. To further separate academic performance from research involvement, survey responses were collected independently of the grading process to avoid any undue influence or pressure.
Prior to data collection, students were thoroughly briefed on the objectives of the study and asked to provide written consent for their responses to be used for research purposes. Confidentiality was strictly maintained, with responses anonymized and no identifying information included in either the analysis or reporting. The study also followed the University of the Philippines Cebu's policies on classroom-based research.

Although formal Institutional Review Board (IRB) approval was not mandated for classroom-embedded studies at the time, the project adhered to EAIDF principles of fairness, transparency, and accountability in data handling. By extending EAIDF into procedural ethics, the study reinforced its commitment to protecting students' autonomy and ensuring responsible use of their reflections.

Data Analysis

Quantitative Analysis. Given the very small sample size (n = 4), quantitative analysis was strictly descriptive. Mean scores for each domain were computed for retrospective-pre and post ratings, with differences (post – pre) used to identify perceived growth trends. No inferential statistics were performed.

While exploratory, the analysis provided signals about how students perceived growth across the EAIDF-informed dimensions: technical competence, cultural awareness, and responsible AI.

Qualitative Analysis. Qualitative data were analyzed thematically following Braun and Clarke's (2006) six-phase method. An inductive-deductive coding strategy was employed: Initial codes were based on the questionnaire's structure (technical, ethical, cultural, collaborative); and additional codes emerged iteratively. Themes were synthesized into three EAIDF-informed dimensions: (1) technical development, (2) ethical and social engagement, and (3) interdisciplinary collaboration. This framing ensured that both the quantitative and qualitative strands of analysis were unified under a shared ethical-technical-cultural lens, reflecting the integrative ethos of the study.

Framework Alignment

To make the integration of EAIDF more explicit, the Appendix A maps each step of the methodology to its corresponding EAIDF phase. This structured alignment highlights how the framework informed not only the technical but also the ethical dimensions of the project.
Through this alignment, the methodology demonstrates that the EAIDF is not an add-on but an integral guide for the project's design, development, and evaluation. The framework provided the ethical scaffolding necessary to ensure the project's relevance, inclusivity, and trustworthiness.

4. RESULTS AND DISCUSSION

This section presents findings from the pilot study, integrating descriptive statistics from the retrospective pretest–posttest survey with thematic insights from student reflections. In line with the Ethical AI-Integrated Design Framework (EAIDF), the results are organized under three domains corresponding to the project's objectives: (1) Experiential Learning and Competency Development, (2) Digital Transformation in Cultural Heritage and Tourism, and (3) Responsible AI and Ethical Development. Each domain illustrates how EAIDF guided both the technical and ethical dimensions of learning.

Experiential Learning and Competency Development

Descriptive Findings. Students reported substantial growth across all domains of technical competency (see Appendix C). For example, average self-ratings for integrating AI models into a web application increased from 1.5 (very low) to 4.5 (high proficiency), while deploying AI

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models into a production environment rose from 1.25 to 4.25. Gains were also evident in data preprocessing and cleaning (2.0 → 3.75) and model evaluation (1.75 → 4.0).

These descriptive results, though limited to four participants, highlight how engagement in the full software development lifecycle—from dataset creation to deployment—enabled students to move beyond abstract theory into applied, practice-based competencies.

Qualitative Themes. The qualitative reflections provide more nuanced evidence of experiential learning. Students consistently highlighted how the project transformed abstract knowledge into concrete application. One noted that GUIA helped them "visualize and actually code the concepts I only saw as words." Another explained that they finally grasped how "image classification, hyperparameter tuning, and model evaluation" interact in practice.

Data preparation emerged as a recurring theme. Several students admitted that they had not fully recognized its importance before the project. One noted that they would now allocate more time to preprocessing to ensure data quality. Another explained how the team had to retake images repeatedly in order to improve model accuracy. These reflections illustrate that students developed an appreciation for the "messy realities" of working with imperfect datasets—an element often absent from controlled classroom exercises.

The project also fostered the development of transferable skills. Some students reported increased confidence in creating models and integrating them into web applications, skills they viewed as directly relevant to their thesis research. Others highlighted improvements in organizing and preparing data for model training, which they considered helpful in streamlining later academic work.

Moreover, this domain aligns with Phase 1 (Contextual Problem Recognition) and Phase 5 (Iterative Development & Ethical Testing) of the EAIDF, demonstrating how students' technical development was grounded in contextual problem-solving and iterative, ethically guided practice.

Overall, the pilot demonstrated that project-based experiential learning can equip students with practical, industry-relevant skills not easily gained through lectures alone. The experience not only strengthened technical proficiency but also enhanced adaptability, confidence, and problem-solving abilities in real-world contexts.

Digital Transformation in Cultural Heritage and Tourism

Descriptive Findings. Students' understanding of digital transformation in cultural heritage also improved, with average ratings rising from 2.25 to 4.25 on items related to how digital tools can modernize visitor experiences (see Appendix D). All students strongly agreed that they gained a deeper understanding of the role of technology in preserving and promoting cultural heritage.

Qualitative Themes. Students reflected on the broader impact of applying AI in a cultural context. They emphasized how digital innovation can enhance the relevance of traditional heritage and expand accessibility. One participant explained that such technologies can "make blind people experience visual art through a smart audio description," underscoring the potential of AI to foster inclusivity in cultural spaces. Another highlighted the novelty of the project, remarking that they were surprised to see AI applied in unexpected domains such as cultural tourism.

Practical constraints in real museum settings also shaped the learning process. Participants described how variations in lighting conditions and the multiple viewing angles of artworks required them to adjust their data collection strategies. These challenges demonstrated the necessity of context-sensitive design, where system performance depends not only on algorithmic optimization but also on environmental factors and user interaction.

Additionally, this domain connects with Phase 2 (Responsible Solution Ideation) and Phase 4 (Co-Design & Ethical Requirements Gathering) of the EAIDF, as students engaged directly with cultural stakeholders and contextual realities, ensuring that solutions were not only technically feasible but also socially meaningful and inclusive.

Collectively, these reflections suggest that experiential projects situated in cultural heritage contexts provide fertile ground for interdisciplinary learning. Students not only strengthened their technical competence but also developed an appreciation of the societal and cultural implications of technology use. This alignment of technical and contextual awareness highlights the value of integrating real-world cultural settings into AI education.

Responsible AI and Ethical Development

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Descriptive Findings. Students' ratings of their ethical awareness also showed positive change (see Appendix E). On average, self-ratings for awareness of ethical risks in AI increased from 2.25 to 4.25, while their ability to apply ethical reasoning to AI development rose from 2.0 to 4.5. All four participants strongly agreed that the project increased their awareness of ethical considerations in AI.

Qualitative Themes. Qualitative responses revealed that students internalized ethical principles more deeply when applied in practice. One participant noted that the project allowed them to "actualize those ethical practices I only studied to pass my classes," underscoring a shift from theoretical compliance to genuine understanding of user vulnerability when safeguards are neglected.

Privacy emerged as a particularly salient concern. Several students stressed the need to double-check how personal information was handled to ensure that the application remained both safe and useful. For instance, one explained their decision not to store images when accessing users' cameras, recognizing the potential risks and emphasizing that they sought consent from the museum before any data collection.

Students also connected responsible AI with human-centered design. They emphasized the importance of prioritizing people's needs, with one urging future developers to "always put people at the center of what you do." Others reflected on the need for sensitivity to communities, noting that this can best be achieved through direct communication and engagement.

This domain corresponds to Phase 3 (Ethical AI Integration) and Phase 6 (Societal Validation & Reflective Practice) of the EAIDF, illustrating how students internalized fairness, transparency, privacy, and cultural respect as integral parts of their development process.

Taken together, these reflections demonstrate that ethical competence was not merely discussed in abstract terms but enacted in practice. By grappling with real dilemmas around privacy, data ownership, and cultural respect, students developed an applied ethical awareness essential for responsible AI development.

Synthesis
Across all three domains, findings suggest that embedding AI projects within EAIDF's ethical and contextual scaffolding enables students to simultaneously develop technical competence, cultural sensitivity, and ethical responsibility (see Appendix F. While descriptive and exploratory, these results affirm the potential of EAIDF-guided experiential learning to prepare students not only as skilled developers but also as responsible, reflective practitioners attuned to societal impact.

5. CONCLUSION

The GUIA project illustrates the potential of experiential, project-based learning when guided by the Ethical AI-Integrated Design Framework (EAIDF). As a small-scale pilot, it provided preliminary evidence that engaging students in the full software development lifecycle—within a real cultural heritage context—can foster growth in technical competencies, ethical awareness, and cross-disciplinary application of AI.

Findings showed that students advanced from theoretical understanding to applied practice, strengthening their abilities in model development, deployment, and data preparation. At the same time, EAIDF's scaffolding ensured that technical progress was accompanied by responsible AI integration: students confronted privacy dilemmas, usability trade-offs, and cultural sensitivities, leading to applied ethical reasoning rather than abstract compliance.

From a pedagogical standpoint, this work demonstrates that EAIDF can function as a bridge between classroom instruction and societal impact. It positions ethical reflection as inseparable from software design, showing that real-world projects in domains such as cultural heritage and tourism provide fertile ground for experiential learning that is both technically rigorous and socially meaningful.

Importantly, the project highlights the value of EAIDF as more than a descriptive framework—it can be an actionable pedagogical model that shapes how IS education integrates technical, ethical, and contextual learning outcomes. While the pilot's small sample limits generalizability, its qualitative depth points to meaningful student transformation, particularly in understanding how AI innovation can be inclusive, responsible, and culturally situated.

Future work should expand this pilot by testing EAIDF-guided approaches with larger cohorts, across varied institutional contexts, and in different application domains. Such iterations will help refine the framework's utility in preparing students not only as skilled developers but as

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responsible innovators capable of leading inclusive digital transformation in society.

Overall, GUIA demonstrates that embedding AI education within EAIDF's phases of problem recognition, ethical integration, co-design, iterative development, and reflective practice can cultivate graduates who are as ethically grounded as they are technically proficient. This dual emphasis is essential for shaping a generation of practitioners prepared to advance both innovation and responsibility in the digital age.

6. RECOMMENDATION

Based on the findings of this pilot study and aligning with the Ethical AI Integration and Development Framework (EAIDF), the following recommendations are proposed to strengthen experiential learning, support digital transformation in cultural heritage, and embed responsible AI practices across Information Systems (IS) education.

Experiential Learning in IS Education

Future projects should continue to cover the entire AI development pipeline—from data collection and preprocessing to deployment and maintenance—since this holistic approach was effective in preparing students for real-world challenges. Curriculum design should allocate structured time to explore data quality, bias detection, and documentation, ensuring students understand how dataset decisions influence model outcomes.

Additionally, interdisciplinary collaboration must be emphasized. Projects that bridge technology with the humanities, arts, and social sciences foster environments where students can practice integrating technical, ethical, and contextual thinking. Such approaches build student resilience in navigating complex problem spaces while enhancing their cultural sensitivity.

Digital Transformation in Cultural Heritage and Tourism

Advocacy for AI adoption in cultural heritage must extend beyond efficiency to highlight its role in enhancing visitor experience, broadening accessibility, and engaging new audiences. To address resource constraints, institutions and student teams should prioritize the use of open-source tools, lightweight models, and partnerships for technical resources such as cloud credits.

Moreover, sustainable solutions require cross-sector collaborations between academia, cultural organizations, and industry. These partnerships can co-create AI systems that are not only technically feasible but also socially relevant, helping cultural institutions carry projects forward after the student engagement ends.

Responsible AI and Ethical Development

Ethical reflection should be embedded directly into project workflows rather than isolated in separate theoretical modules. Real-world dilemmas—such as privacy concerns, cultural representation, or accessibility trade-offs—should be framed as case studies to cultivate students' ability to weigh ethical implications in context.

Stakeholder engagement should be institutionalized through participatory design workshops, feedback sessions, and consent processes, ensuring transparency and trust with communities affected by AI systems. Alongside this, students should adopt ethical documentation practices such as development diaries or audit trails to record decision-making and stakeholder input.

Finally, greater emphasis should be placed on human-centered design: privacy-by-design practices, culturally respectful content curation, and accessibility-first approaches that broaden inclusion in digital heritage.

Towards an Integrated Vision

Collectively, these recommendations point toward a vision of IS education where experiential projects are carefully designed to integrate technical rigor, domain-specific impact, and ethical reflection in alignment with EAIDF. By scaling this pilot approach and testing it across varied contexts, educators can cultivate students not only as technically competent developers but also as responsible innovators—capable of advancing cultural heritage while upholding fairness, accountability, transparency, human-centered values, and sustainability in AI.

7. REFERENCES

Cai, Z. (2025). AI empowering museums: Current applications, challenges, and future trends. In I. A. Khan, S. Singh, R. B. B. M. Hussain, & A. B. Asmawi (Eds.), *Proceedings of the 2025 4th International Conference on Humanities, Wisdom Education and Service Management (HWESM 2025)* (pp. 301–311). Atlantis Press. https://doi.org/10.2991/978-2-38476-422-8_37

Eitel-Porter, R. (2021). Beyond the promise: Implementing ethical AI. *AI and Ethics*, *1*(1), 73–80. https://doi.org/10.1007/s43681-020-00011-6

ISSN: 2473-4901
v11 n6395

European Union. (2023). *Artificial Intelligence Act.* Official Journal of the European Union (L 155/1)

Helle, L., Tynjälä, P., & Olkinuora, E. (2006). *Project‐based learning in post‐secondary education – theory, practice and rubber sling shots.* Higher Education, 51(2), 287–314. https://doi.org/10.1007/s10734-004-6386-5

Howard, G. S., & Dailey, P. R. (1979). *Response-shift bias: A source of contamination of self-report measures*. Journal of Applied Psychology, 64(2), 144–150. https://doi.org/10.1037/0021-9010.64.2.144

Hu, Z., Guo, Z., Jiang, S., Zhao, X., & Li, X. (2023). Research on project-based teaching methods in the introduction to artificial intelligence. *Curriculum and Teaching Methodology*, *6*(20), 38–43. https://doi.org/10.23977/curtm.2023.062006

IEEE. (2019). *Ethically Aligned Design: A Vision for Prioritizing Human Well-being with Autonomous and Intelligent Systems* (1st ed.). The IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems.

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, NJ: Prentice Hall.

Meruyert, S., Aigul, S., Nassipzhan, D., Samashova, G., & Kultan, J. (2025). Project-based learning for machine learning in computer vision courses: Case study of Kazakhstan and Slovakia. *International Journal of Innovative Research and Scientific Studies*, *8*(2), 1183–1196. https://doi.org/10.53894/ijirss.v8i2.5422

OECD. (2019). *OECD Principles on Artificial Intelligence*. Paris: OECD. Retrieved from https://oecd.ai/en/ai-principles

Qian, J., Cheng, J., Zeng, Y., & Tjondronegoro, D. W. (2021). Design and implementation of museum educational content based on mobile augmented reality. *Computer Systems Science and Engineering*, *36*(1), 157–173. https://doi.org/10.32604/csse.2021.014258

Saad, A. (2022). The effectiveness of project-based learning with computational thinking techniques in a software engineering project course. *Journal of Contemporary Issues and Thought*, *12*(1), 65–79. https://doi.org/10.37134/jcit.vol12.1.6.2022

Stanford d.school. (2010). *An Introduction to Design Thinking: Process Guide*. Hasso Plattner Institute of Design, Stanford University.

Thomas, J. W. (2000). *A review of research on project-based learning*. San Rafael, CA: Autodesk Foundation.

UNESCO. (2021, November 23). *Recommendation on the Ethics of Artificial Intelligence*. Paris: UNESCO. Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000381133

Warr, M., & West, R. E. (2020). Bridging academic disciplines with interdisciplinary project-based learning: Challenges and opportunities. *Interdisciplinary Journal of Problem-Based Learning*, *14*(1), Article 2. https://doi.org/10.14434/ijpbl.v14i1.28590

Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). SAGE Publications.

Zheng, C., Yuan, K., Guo, B., Mogavi, R. H., Peng, Z., Ma, S., & Ma, X. (2024). *Charting the future of AI in project-based learning: A co-design exploration with students*. arXiv. https://doi.org/10.48550/arXiv.2401.14915

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APPENDIX A
EAIDF Framework Alignment

Methodology Step	EAIDF Phase	Alignment Description
Problem and Opportunity Identification	Phase 1: Contextual Problem & Opportunity Recognition	Identifies challenges in non-technical domains and frames them as opportunities for tech-driven, socially meaningful solutions.
Conceptual Solution Design	Phase 2: Responsible Solution Ideation	Ensures that initial designs prioritize inclusivity, accessibility, and sustainability while engaging with stakeholders.
Ethical AI Consideration	Phase 3: Ethical AI Integration	Evaluates fairness, transparency, accountability, and privacy implications of AI features before implementation.
Requirements Generation & Modeling	Phase 4: Co-Design & Ethical Requirements Gathering	Incorporates both technical and ethical requirements, ensuring a dual focus on functionality and responsible innovation.
Development & Testing	Phase 5: Iterative Development & Ethical Testing	Combines agile iterations with ethical checkpoints, embedding bias testing, privacy validation, and accessibility reviews.
Validation & Reflection	Phase 6: Societal Validation & Reflective Practice	Examines technical performance, user empowerment, and broader social value, while encouraging ethical reflection and iteration.

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APPENDIX B
Post-Project Questionnaire

A. Quantitative Self-Assessment

Skill/Area	**Before GUIA**					**After GUIA**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
Data Handling & Preprocessing for AI										
1. Ability to collect and organize data for AI models.										
2. Ability to preprocess and clean data for AI models.										
3. Ability to perform feature engineering for AI models.										
AI Model Development & Training										
1. Ability to select appropriate AI algorithms/models.										
2. Ability to train machine learning/deep learning models.										
3. Ability to evaluate AI model performance (e.g., accuracy, precision, recall).										
4. Ability to optimize AI models (e.g., hyperparameter tuning, transfer learning)										
AI Application & Deployment										
1. Ability to integrate AI models into a web application.										
2. Ability to debug AI-related issues in a functional system.										
3. Ability to deploy AI models to a production environment.										
Specific AI Areas										
1. Proficiency in developing image classification models.										
2. Proficiency in developing object detection models (for artwork recognition).										
Digital Transformation in Cultural Heritage										
Understanding of how digital tools can enhance cultural heritage experiences										
Ability to design user experiences for tourism or cultural sectors										

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Familiarity with the challenges of digital transformation in cultural institutions										
Responsible AI Development										
Awareness of ethical risks in AI (e.g., bias, misuse, privacy)										
Ability to make ethically informed decisions in AI system design										
Familiarity with the University of the Philippines' principles for responsible AI										

B. Open-Ended Qualitative Reflection

Question
1. Can you describe your journey with Artificial Intelligence knowledge before and during the GUIA project? What were your initial expectations, and how did they evolve?
2. How did the hands-on nature of building GUIA change your understanding of theoretical AI concepts? Can you give an example of a concept that clicked for you because of this project?
3. When you were developing the artwork recognition system, what was your process for making sure it actually worked in a practical museum setting? What kind of adjustments or optimizations did you have to make?
4. What new practical AI skills do you feel most confident in now, specifically because of your involvement in the GUIA project? Can you provide an example of when you applied this skill?
5. In what ways did the GUIA project prepare you for the 'real world' of AI development, compared to what you might learn from textbooks or traditional assignments?
6. What insights did you gain about the role of digital innovation in preserving or promoting cultural heritage?
7. How did the GUIA project influence your views on the ethical responsibilities of AI developers?
8. Can you describe a moment in the project where you or your team had to consider the impact of AI on people or culture?
9. Reflecting on GUIA, how did the project prepare you to navigate both technical and ethical challenges in future careers?
10. What advice would you give future students working on AI projects that impact communities or heritage?

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APPENDIX C
Mean Likert Scale Ratings for AI Competencies (Before vs. After GUIA)

Skill/Area	Mean Before GUIA	Mean After GUIA	Improvement (Points)
Ability to collect and organize data for AI models	2.00	4.25	2.25
Ability to preprocess and clean data for AI models	2.00	4.25	2.25
Ability to perform feature engineering for AI models	1.50	3.75	2.25
Ability to select appropriate AI algorithms/models	1.75	3.75	2.00
Ability to train machine learning/deep learning models	1.75	4.25	2.50
Ability to evaluate AI model performance	2.00	4.25	2.25
Ability to optimize AI models	1.75	4.00	2.25
Ability to integrate AI models into a web application	1.25	4.25	3.00
Ability to debug AI-related issues in a functional system	1.50	4.25	2.75
Ability to deploy AI models to a production environment	1.50	4.50	3.00
Proficiency in developing image classification models	1.25	4.00	2.75
Proficiency in developing object detection models	1.00	4.00	3.00
Understanding of how digital tools can enhance cultural heritage experiences	1.75	4.50	2.75
Ability to design user experiences for tourism or cultural sectors	1.75	4.25	2.50
Familiarity with the challenges of digital transformation in cultural institutions	1.25	3.75	2.50
Awareness of ethical risks in AI	2.75	4.25	1.50
Ability to make ethically informed decisions in AI system design	2.75	4.00	1.25

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Familiarity with UP's principles for responsible AI	3.25	4.25	1.00

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APPENDIX D
Mean Likert Scale Ratings for Ethical AI Awareness and Decision-Making
(Before vs. After GUIA)

Skill/Area	Mean BEFORE GUIA	Mean AFTER GUIA	Improvement (Points)
Awareness of ethical risks in AI (e.g., bias, misuse, privacy)	2.75	4.25	1.50
Ability to make ethically informed decisions in AI system design	2.75	4.00	1.25
Familiarity with the University of the Philippines' principles for responsible AI	3.25	4.25	1.00

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APPENDIX E
Mean Likert Scale Ratings for Digital Transformation Understanding (Before vs. After GUIA)

Skill/Area	Mean BEFORE GUIA	Mean AFTER GUIA	Improvement (Points)
Understanding of how digital tools can enhance cultural heritage experiences	1.75	4.50	2.75
Ability to design user experiences for tourism or cultural sectors	1.75	4.25	2.50
Familiarity with the challenges of digital transformation in cultural institutions	1.25	3.75	2.50

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APPENDIX F
Mean Likert Scale Ratings for Overall Project Effectiveness

Project Effectiveness Statement	**Mean Rating**
The GUIA project was highly effective in cultivating my practical AI competencies.	4.75
The GUIA project increased my awareness of ethical considerations and responsible practices in AI development and deployment.	4.75
The GUIA project enhanced my ability to integrate AI solutions into business or social contexts effectively.	4.75
My confidence in applying theoretical AI concepts to solve real-world problems significantly increased due to the GUIA project.	5.00
I developed a deeper understanding of how digital technology can modernize cultural tourism.	5.00
I was able to apply ethical reasoning when designing or deploying AI features in GUIA.	4.75
I felt more confident working on AI systems that are meant for public or social use.	4.75
I understood how technology could impact cultural sensitivity and representation.	5.00