Leading in the AI Era: An Interactive Experiential Hands-On Learning Approach for Professionals and Leaders

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Abstract

The pervasive and rapid advancement of Artificial Intelligence (AI) necessitates a fundamental AI understanding for all individuals. AI's dynamic nature often makes it challenging even for technical people to stay continuously updated on AI, making it especially essential for professionals in leading positions, regardless of their technical background. Understanding AI equips leaders to make knowledgeable decisions about AI's responsible adoption in their workplace, address its ethical implications, and enable better communication about AI initiatives within the organization. It also demystifies the technology, and ensures leaders can responsibly navigate AI-driven changes.

Most AI-related courses mainly focus on teaching programming languages and handling big data. A closer look at AI adult education reveals gaps and limitations in content suitable for professional adults – e.g in leadership, decision-making, ethics, governance and cultural aspects of organizational change. Furthermore, AI education pedagogy for adult learners,is still understudied. Literature suggests that adults are self-directed, experience-based learners. Therefore, their learning should involve self-planning, experiential learning, collaborative environments, and real-world applications. Notably, current AI education platforms lack sufficient focus on these areas. While efforts are being taken to address these issues, more adult education programs need to be specifically designed for the training needs of leadership in AI.

This research investigates the efficacy and outcomes of an AI education workshop, uniquely designed for large scale organization leaders, employing hands-on projects, collaborative learning, and problem-solving scenarios grounded in real-world applications, that considers technical, ethical, policy and organizational culture dimensions. The workshop incorporates experiential learning methods, case studies, problem-based learning, and group projects. This research also analyzes how adult learners interactively learn, reflect, and apply their AI knowledge to examples drawn from their workplace, while improving their understanding and readiness to implement AI technologies effectively.

Our three-day workshop centered around enriching and engaging learning about AI technologies, ethics, and leadership, featuring topics like supervised learning and bias, AI strategy, and

generative AI. Apart from discussions, the workshops incorporated hands-on learning with digital tools, robots, problem-solving scenarios, and a capstone project. Participants were 44 leaders from a large government organization. Their learning was measured through pre- and post-questionnaires on AI leadership, knowledge checks on workshop content, and group interviews post-event.

Results indicated a substantial increase in the participants' AI knowledge, emphasizing the workshop's efficacy in enhancing AI literacy, expanding human-AI collaboration, and ethical understanding. The satisfaction survey showed the workshop was enjoyable and substantially improved learners' understanding of AI and its applications. Learners praised the emphasis on people and ethics in AI and how it inspired them to drive change. They, however, wanted more preparation time and support for understanding content. The capstone project offered an effective hands-on experience that fostered learning and teamwork. Some technical problems were reported, negatively impacting engagement levels. Current research findings are guiding future workshop iterations.

Keywords: AI Literacy for Leaders, Experiential Learning, Leadership Training, AI Ethics and Policy

Introduction

"Artificial Intelligence (AI) is a rapidly growing field expected to change the way organizations and businesses operate, as well as how grand challenges of the future will get tackled" [1]. The pervasive and rapid advancement of AI necessitates a fundamental understanding of AI for all individuals. Within this context special efforts need to be placed by organization leaders to better understand how to efficiently and effectively educate their personnel, as well as on what content and skills. This space however is still greatly understudied. Introducing AI to leaders could be a great starting point to guide this effort. AI's dynamic nature often makes it challenging even for technical people to stay continuously updated on AI, making it especially essential for professionals in leading positions, regardless of their technical background. Understanding AI allows leaders to make knowledgeable decisions about AI's responsible adoption in their workplace, address its ethical implications, and enable better communication about AI initiatives within the organization. It also demystifies the technology and ensures leaders can responsibly navigate AI-driven changes.

Given all aforementioned developments and gaps, and to advance understanding about adult AI training, in 2021 the United States Air Force (USAF) and the Department of Defense (DoD) entered into a collaboration with multiple units within the [Anonymous] University. The goal was the development of a new academic program focusing on AI training, placing emphasis on leader training in AI, and conduct a research study evaluating AI learning for USAF employees [1, 2]. Findings of this study are expected to also support understanding and future planning regarding AI training for the general public.

To develop this program the development team, consisting of AI, learning, and educational research experts, considered various pedagogies, learning modalities, content relevant to the USAF interests, as well as conducted a series of relevant pilot studies [1, 2]. The overall program consisted of a series of online and in person synchronous and asynchronous components. This

particular paper discusses an intensive 3 day workshop that took place in the summer of 2023 at the [Anonymous] campus. According to current literature most AI-related courses mainly focus on teaching programming languages and handling big data. A closer look at adult AI education reveals gaps and limitations in content suitable for professional adults in leadership roles. – e.g in leadership, decision making, ethics, governance and cultural aspects of organizational change. Although not much literature still exists regarding training business leaders on AI, literature regarding adult education from other STEM fields suggests that learners respond well to authentic hands-on challenge-based learning, meaning that they could be more inclined to learn when they are actively participating in a meaningful, collaborative activity relevant to their daily life/work challenges [3, 4]. Furthermore, research on adult education also emphasizes the importance of self-directed learning [5, 6]. Findings from literature review come also in great alignment with the group's prior pilot study [Anonymous] with a group of leaders participating in the first cohort of this program and the prior iteration of this workshop, as they had expressed great importance on having examples, challenges or case studies relevant to current USAF work presented to them.

Overview of Curriculum Designs

Based on the aforementioned findings from educational literature as well as on our prior pilot study, we designed and conducted a workshop titled "Learning Machines: Computation, Ethics, and Policy", where we designed a curriculum to provide an introduction to autonomous robots and machine learning, with a special focus on their integration in human-robot teams. It is structured as an immersive 3-day workshop, fostering understanding through hands-on activities, group discussions, and case studies. The course targeted professional adults, specifically USAF leaders and decision makers, who are keen to utilize AI in their workplace. We focus not only on the technical, but also the ethical, and policy aspects of AI presented through the context of autonomous robots and human-robot teaming.

Design Principles

At the core of our Learning Machines curriculum are three fundamental design principles: 1) Engaging learners in experiential learning methods, 2) Addressing applicable workplace ethics and policy topics in the learning content, and 3) Ensuring accessible experiences for learners from all educational and technical backgrounds. These principles guided the construction and development of our sessions' learning objectives, hands-on activities, and instructional tools.

The curriculum design emphasizes **hands-on, team based, experiential learning**, which encourages learners to apply theoretical knowledge in practical contexts, engaging in active learning instead of traditional teacher-centric teaching, expected to lead to improved comprehension, creativity, and problem-solving abilities. Alongside technical concepts, the curriculum includes teachings on **ethical implications** and **policies** of AI, educating learners on societal effects, related responsibilities, and implementation. The curriculum also focuses on making complex AI concepts **comprehensible to all learners**, regardless of their technical expertise. Thus, the curriculum explains the logic behind AI and uses interactive visuals and

Table 1: Curriculum Overview of our Learning Machines: Computation, Ethics, and Policy Workshop

Day & Theme	Session Title	Activities	Key Skills/Topics
1 Machine Perception	Seeing Machines	Interactive lecture, hands-on drone activity	Computer vision, feature engineering
	Supervised Learning	Interactive exercises, hands-on drone activity	model development
	Conversational AI	Programming social robot, dialogue flow training	NLP, intent recognition
	Bias and Ethical Implications	Case studies, small group discussions	Bias in ML, ethical principles
2 Machine Behavior	Reinforcement Learning	Interactive robot activity, Q-learning introduction	Robot behavior, path following
	Deep Reinforcement Learning	Hands-on drone training, moving object tracking	Deep RL, dynamic autonomous navigation
	Generative AI	Story creation, Deep Fake videos	Creative applications of AI, visual elements
	Ethics & Policy	Group discussion, real-world examples	Responsible AI use, ethical principles
3 Human-Robot Teaming	Capstone Project: Escape Room	Drone team design, pilot exercises, puzzle solving	Human-robot collaboration, strategy development
	Social Dimensions of HRI	Group discussion, robot demonstration	Emotional aspects of HRI, ethical design
	AI Procurement	Presentations, discussion, policy proposal	Applying AI within organizations, policy development
	Organizational Change & Culture	Reflective discussion, organizational impact	Adapting to new technology, cultural considerations

relatable examples to ease understanding.

That is, participants engaged in a variety of hands-on tasks such as programming autonomous drones for automated navigation challenges, deploying conversational AI with a social robot, training a reinforcement learning model for robot decision-making, and constructing AI-driven policy proposals. In more detail, one of the workshop's key activities allowed the participants to utilize 'CuteBot' robots to explore basic principles of reinforcement learning through a maze navigation task, where the bot's adjustments were coded collaboratively by the team through human-in-the-loop concept to efficiently navigate the maze. Another engaging activity involved using drones equipped with computer vision capabilities to execute a search and rescue missions, reflecting real-world applications. Each project aimed to embody ethical considerations in practical settings, merging technical skill development with critical ethical reflection in topics such as accuracy, fairness and safety. Furthermore, specific sessions were dedicated to the critical emphasis on ethics in AI through engaging participants in deep discussions and case studies that explored the moral implications of AI technologies, decision-making, and policy frameworks. These hands-on activities and discussion, facilitated through accessible, yet sophisticated technologies, were structured not only to enhance AI understanding but also to foster ethical and responsible adoption of AI.

Curriculum Descriptions and Implementation

We applied the aforementioned curriculum design principles to our workshop. Employing the experiential learning lens, the 3-days course structure incorporated a dynamic blend of lectures, hands-on activities, case studies, and lively learning-by-making sessions (see Table 1 for detailed overview). Dedicated sessions as well as embedded ethics and policy components were incorporated in the curriculum. For accessible learning, custom designed digital tools were

extensively used for practical applications, with no prior coding experience required from the participants.

The course materials for Learning Machines were offered in-person, for two different cohorts, as a standalone workshop (see Figure 1). The first cohort attended the 3-day workshop in November and the second cohort attended the same 3-day workshop in December of 2023. Within each cohort approximately 1/4 of the learners were also participants in a 3-month long online AI training program offered through the [Anonymous]-USAF collaboration, while most of the other learners in each cohort were only attending the workshops.

The first day of the workshop on ”Machine perception: Learning to see and understand” covered several key areas including an introduction to the course objectives and content, machine visual perception, and its responsible implementation. Machine vision was explored through concepts such as feature engineering and supervised learning and via exercises involving a small drone that automatically navigated the environment. The drone transmits its own WiFi, where a computer connects to it to control it. Participants also developed conversational AI models using word embeddings and Natural Language Processing for a social robot named, Jibo [7]. The day ended with a session on the ethical considerations and potential biases in machine learning practices. Participants engaged with tools, theories, and ethics in the machine learning field, preparing them for advanced discussions in the following days.

Day 2 of the workshop focused on “Machine behavior: learning to act and create” with AI. Participants dived into reinforcement learning concepts through a hands-on session with a small robot (i.e. CuteBot [8]), learning path following using Q-learning. A session on deep reinforcement learning had the participants teach an autonomous drone to follow a moving object. Participants also explored the more creative side of AI using generative AI to create stories and visual elements, including Deep Fake videos. The day wrapped up with a group discussion on the ethical and policy dimensions of AI, using real-world examples and Department of Defense’s ethical AI principles. This day aimed to equip learners with both the technical skills for using AI and autonomous agents, and awareness of their ethical and policy implications.

The last day of the workshop was centered around “Human-robot Teaming and Organizational Change” with a focus on autonomous drones. Participants started with a capstone project to compete in designing a working strategy for autonomous drones based on their gained knowledge from the previous two days. That was followed by group discussion sessions on the social and ethical dimensions of Human-Robot Interactions (HRI). The following session had participants delve into procurement within the context of artificial intelligence and strategize on how to establish procurement policies in their organizations. Reflection on organizational change and culture was facilitated in the final session, which allowed participants to envisage the integration of AI and autonomous technology into their workplaces. The day concluded with an award ceremony and a feedback session.

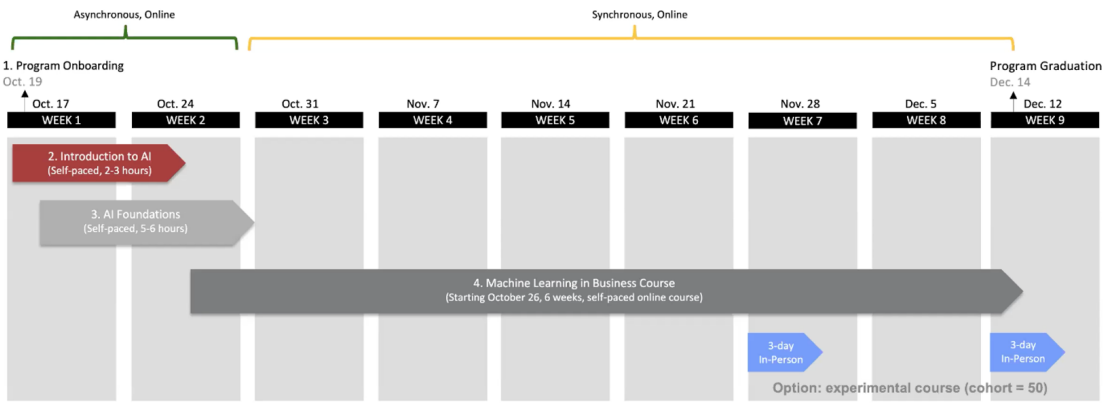

Figure 1: AI online training program and 3-day in person workshops [2]

Research Methodology

Participant Demographics

To implement this research study the research protocol was approved by the Institutional Review Board at [anonymous], alongside the Human Research Review Board (HRBO) at the AirForce, and commander approvals were collected for all research subjects. Invited participants were all learners attending the 3-day workshops and all 44 individuals who participated in the workshop from the two cohorts accepted participation in the study. These participants were all affiliated with the United States Air Force (USAF), a vast organization employing over 650,000 individuals from a multitude of different backgrounds and occupational leading roles. Each of the 44 individuals provided their consent to be part of the research. The cohorts were predominantly male, with 36 men, 5 women, and 3 participants choosing not to reveal their gender. Educational level was high across the board, with every participant holding at least an undergraduate degree. In fact, a sizeable portion of them (about 64%) had earned Master or above degrees. A minority (roughly 14%, equivalent to 6 participants) had academic qualifications in computer science. Nevertheless, given that all participants have been active professionals for several years post-college, it was not common for them to be directly involved in hands-on technical work such as software development. Participants in this study were asked about their prior enrollment with the AI learning journey (see Figure 1). Out of 44 participants, eleven (25%) indicated that they had taken part in such courses, which was not a prerequisite of this workshop.

Data Collection

A comprehensive data collection strategy was formulated to evaluate the effectiveness of our workshop to assess educational objectives. Each data collection activity, carefully developed, was aligned to the workshop's three core design principles to ensure that participants gained the intended value. Before the workshop, a pre-workshop questionnaire was distributed to capture participants' attitudes towards AI, their motivations for attending, and gauge their understanding of AI concepts. This pre-questionnaire helped tailor the workshop as per the differing backgrounds and expectations of the participants. It also accumulated data on previous

experiences with different pedagogical methods and AI courses.

After the workshop, a post-workshop questionnaire was disseminated to measure any changes in attitudes towards AI, motivation levels, and knowledge gains. The comparison between the responses from pre-and post-questionnaires helped evaluate the workshop's effectiveness and understand its impact on participants' preparedness to incorporate AI in their workplace. This post-questionnaire also assessed participant satisfaction with the content, delivery, activities, structure, and the performance of facilitators of the workshop.

Method of Data Analysis

To ensure a full analysis of the data collected from our workshop activities, we employed a mixed-method approach, combining both quantitative and qualitative analytical techniques. We initially conducted a descriptive and inferential statistical analysis of the pre- and post-workshop questionnaires to determine whether the observed changes are statistically significant. This was done using paired t-test or Wilcoxon signed-rank test, depending on the distribution of the data. If the distribution of scores fails tests for normality, non-parametric methods were used. Additionally, the level of participants' pedagogical experiences and workshop satisfaction was quantified and analyzed. The percentages of participants in each category were calculated for individual items to assess overall satisfaction and areas needing improvement. For open response questions, the data was analyzed qualitatively for general themes and feedback.

Results

Pedagogical Exposure

The pre-survey, aiming to assess participants' familiarity with different pedagogical methods, revealed varied levels of exposure. For hands-on activities, which emphasize experiential and active learning, 57% (25 out of 44) had engaged in group activities, 23% (10 out of 44) had experienced individual activities, but 20% (9 out of 44) were not familiar with this learning style. Team-based learning, which highlights collaborative learning experiences, was more popular, with 93% having had some experience (22 participants had experienced any group size team-learning, while 19 had experienced small group team-based learning), and only 7% (3 out of 44) unfamiliar with this approach.

Regarding engagement with educational technology, which can influence how they interact with and benefit from our workshop, 98% (43 out of 44) of the participants had used online videos as part of their learning in the past, and 84% (37 out of 44) used online learning platforms, like EdX and Coursera, highlighting a significant exposure to structured online courses. Mid-level familiarity was reported between coding platforms like Scratch, computer simulators and educational video games, used by 43%, 66% and 73% respectively, reflecting an engagement with immersive and gamified learning experiences. Over half of participants had also used educational toys and robots, such as Lego Mindstorms [9], hinting at an existing interest in robotics and fields related to AI.

These findings provided valuable insights into the participants' initial understanding and comfort

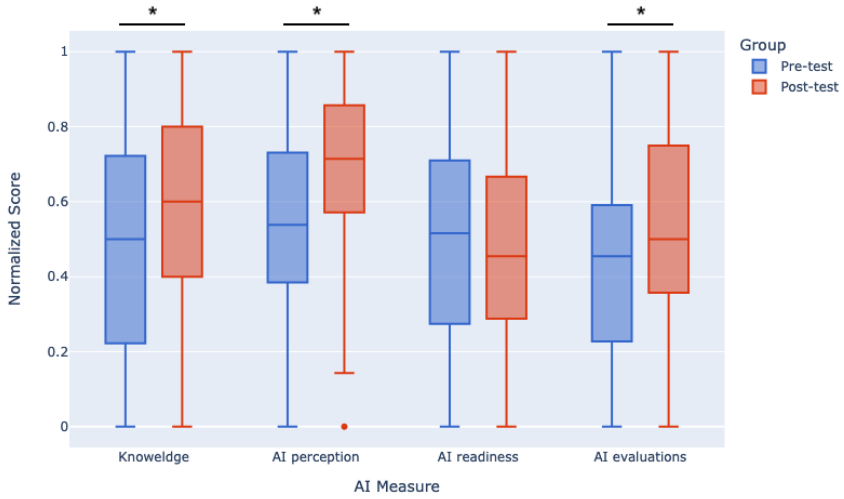

Figure 2: Results from AI Measures based on Pre- and Post-Questionnaire Shows Significant Increase in AI Knowledge, AI Perception, and AI Evaluation.

level with different learning approaches that were used during the workshop. The higher familiarity with hands-on activities, team-based learning and educational technologies suggested that the participants might be more receptive to our workshop elements that incorporate these pedagogies and tools. These insights align with adult learning theories, which emphasize the importance of experience-based learning and practical applications in adult education [3].

AI Knowledge and Attitude

To evaluate the impact of the workshop on AI knowledge, participants' understanding was assessed through the use of 8 knowledge check questions both before and after the workshop. The results from the paired sample t-test revealed a statistically significant improvement in AI knowledge, with $p < .00001$ (p-value=0.000004) at 86 degrees of freedom (see Figure 2). Even though the majority of the participants reported not having enrolled in AI courses prior to the workshop, the results showed a significant post-workshop shift in AI knowledge. This indicates that the workshop had a profound effect on participants' AI knowledge, aligning with the expected outcomes based on the educational goals of the workshop, supporting the hypothesis that tailored, experiential learning programs can effectively enhance AI literacy.

To assess the general attitude toward AI, we asked participants about their self-driven efforts in advancing their AI knowledge, where 30 out of 44 indicated previous efforts to do so, with watching videos and reading papers as the primary methods. Furthermore, we assess AI attitude, in terms of AI perception, AI readiness, and AI evaluations (see Figure 2). After the workshop, a statistically significant positive shift in their AI perception (awareness and opinion of AI solutions) was seen, measured by the Wilcoxon signed-rank test (p-value=0.006). This indicates that the workshop had a pivotal influence on their awareness and opinions related to AI applications in their workplace. However, this shift did not translate into AI readiness, which

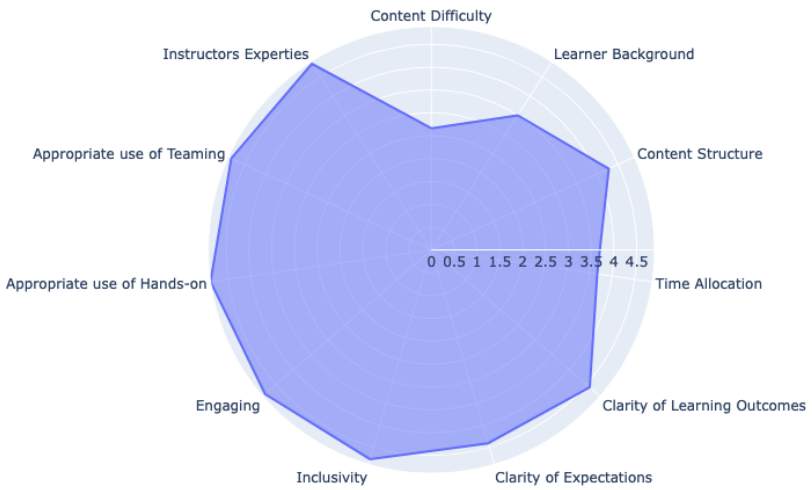

Figure 3: Workshop Satisfaction Survey Showing High level of Satisfaction in Several areas.

involved willingness to implement AI capabilities at work, pointing to the need for more extended engagement and tailored teaching for AI techniques in order to boost readiness levels.

Lastly, the study participants showed significant improvement in their ability to critically evaluate the contribution of AI applications to organizational objectives (p-value=0.0000019),in terms of operational performance, bias, privacy, and in recognizing existing AI applications in their workplaces, as well as identifying potential new AI opportunities. This implies that the integration of real-world scenarios, ethical considerations, and hands-on activities in the workshop were effective in helping leaders think critically about the impact of AI in their organizations.

Workshop Satisfaction

The satisfaction survey from 44 workshop participants was conducted in several ways, not only through post-workshop questions, but also asking about the participants' goals prior to the workshop and their achievements thereafter (see Figure 3).

The post-workshop results revealed that most participants didn't find the workshop content too challenging, with 23 people expressing neutrality or agreement with its level of difficulty, suggesting that the material was accessible. Additionally, almost half (21 of 44) considered their academic backgrounds a good fit for the subject, reflecting an appropriate match between participants' prior knowledge and the workshop's designed complexity, even though they have diverse backgrounds. The content structure was well received by the majority (37 of 44) of attendees. However, there's a split opinion on the appropriateness of time allocation with 32 out of 44 felt it was just enough or barely enough, pointing to an area for potential improvement in future iterations of the workshop. The use of hands-on learning and teamwork proved effective, as indicated by the strong agreement among participants, aligning with adult learning theories for experiential and collaborative learning [3].

The Pedagogy Satisfaction Questionnaire revealed that the majority of participants in the workshop found hands-on activities to be effective for learning and fun, and instrumental in reinforcing learned concepts, citing the ability to directly engage with AI technologies (such as robotics) as particularly valuable. Some technical issues were reported but the instructional objectives remained clear due to the support of the teaching team. That is, the process of connecting the drone to the computer introduced WiFi interference, which raised technical difficulties and delayed some teams. Nonetheless, participants reported deeper engagement with AI material through group discussions and project-based activities, which they appreciated for the ability to develop and refine their ideas through diverse perspectives. The active application of AI principles in a team environment was recognized as conducive to both understanding the content and fostering teamwork. Some suggested the need for more time to fully benefit from these activities. These results confirm that adult learners can greatly benefit from experiential learning, collaboration, and practical application in the field of AI education, mirroring previously published studies as reviewed in [3].

The study measured the alignment between pre-workshop goals and post-workshop achievements, where participants expressed a strong interest in AI, its applications, implications and ethical considerations pre-workshop. After the workshop, most participants reported achieving their goals, with improved understanding and increased confidence in AI. Hands-on activities and discussions, as well as guest lectures, were repeatedly mentioned as effective in aiding understanding. Moreover, results show increase in comfort and reduced apprehension towards AI technologies among some participants, “Yes, much better understanding and less fear regarding AI.” Some participants, however, expressed the need for more technical depth, ”I think the course was good I just feel like I want more experience with the topics and hard to do in 3 days”, suggesting the need for more advanced follow-up workshops.

The feedback from workshop participants was generally positive but mixed, with some feeling confident in their mastery of the material and others desiring more technical depth. Many participants express the need for a deeper understanding of AI’s technical aspects, indicating that the introduction stimulated their interest and was appropriate for their professional roles. Participants also suggested technical improvements, longer durations, and more practical hands-on time, implying the need to further refine the workshop’s design. Overall, the data suggests that continuing to refine the workshop’s material and address logistical and technical issues could help bridge the AI education gap among professionals in leadership positions.

Discussion

This workshop was designed to address gaps in AI education for adult learners, particularly in the domains of leadership, ethics, and organizational change. The results of this study are both informative and encouraging, suggesting that tailored workshops can significantly improve AI knowledge and reshape attitudes toward AI among professional leaders.

The significant increase in AI knowledge, as measured by pre- and post-test scores, confirms the effectiveness of our educational approach. The workshop’s emphasis on fundamental AI technical understanding, coupled with a broader view of AI’s impact on ethics, policy, and organizational culture, facilitated a holistic increase in AI literacy. However, the improvement in AI readiness

was not statistically significant, suggesting that while workshops can enhance AI literacy, they might not suffice to prepare leaders for the application in their unique contexts. It implies that a more prolonged or specialized follow-up training may be necessary to achieve readiness, especially concerning AI capacity building and implementation. Substantial growth in the ability to critically evaluate AI applications was observed among participants. This was manifested in recognizing operational impacts and potential opportunities, indicating that the workshop succeeded in empowering leaders with informed decision-making.

Participants' feedback highlighted the success of collaborative and project-based activities in fostering engagement. Participants appreciated the experiential learning environment, which made AI concepts relatable and understandable. However, the presence of technical issues underscores the need for robust technology infrastructure in delivering effective AI education, revealing that logistical and technical hurdles can undermine engagement. The high level of workshop satisfaction and alignment of learning goals with workshop outcomes indicate that the experiential approach was well-received. Participants found the workshop enjoyable and worthwhile but also pointed out areas for improvement, such as more in-depth technical content.

The study provides a blueprint for developing future AI workshops tailored to professional leaders that not only increase AI knowledge but also promote ethical perspectives and positive attitudes toward AI. Although the findings are exciting, this study is not without limitations. Self-reported data may be subject to response bias, and the sample size, while adequate, represents a single organization, which may limit the generalizability of the results. Continuing to refine these educational experiences is crucial as we prepare leaders to navigate the complex and ever-evolving landscape of AI.

Conclusion and Future Work

The Learning Machines curriculum as outlined in this paper included 13 interactive sessions over a span of three days, each designed meticulously following our three fundamental principles - experiential learning, inclusion of workplace-relevant ethics and policy discussions, and accessible learning for all technical aptitudes. Our emphasis on experiential knowledge was embodied in the hands-on activities, project-based learning and relevant to the learners real-world case studies woven into each session. Ethics and policy aspects were highlighted through lectures and group discussions that delve into key issues like bias, privacy, and accountability in the use of autonomous robots and AI.

The results show that tailored pedagogy can make professional leaders more knowledgeable about AI, allowing for better informed decisions. The hands-on activities and real-world case studies helped participants understand AI technologies. The workshop's approach, emphasizing hands-on, experiential learning with AI technologies, presents a valuable model for professional development, Although primarily targeted at USAF participants, the findings and methodology of this workshop may also serve as valuable insights for faculty and educational professionals developing AI curricula and related fields for non-traditional adult students.

However, areas for improvement were identified, such as providing comprehensive technical content, better time allocation, enhanced technical implementation, and potentially extended

workshop durations. Further training is suggested to achieve AI readiness, highlighting the need for a comprehensive AI education framework. As AI continues to evolve rapidly and impact society and organizations, it's crucial for leaders to be well-educated to navigate this complex landscape.

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