

Title: Cultivating AI Literacy among Management Students: Student Experiences and Challenges in a Business-focused AI Literacy Module

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Summary:

Artificial Intelligence (AI) technologies are rapidly changing the business world. To empower future leaders with the skills required to leverage AI technologies in business, equipping them with AI literacy has become imperative. This study aims to critically evaluate the teaching approaches of an AI literacy module designed for management students, highlighting the experiences and challenges encountered by the students. This study utilises a mixed-methods approach to gather insights into students' experiences and challenges they faced, with the goal to inform the curriculum design for AI education. This comprehensive analysis enables the development of a more effective and engaging learning environment tailored to students from a diverse background.

Word Count: 1918

Introduction

The pervasive integration of Artificial Intelligence (AI) into various facets of daily life has positioned it as an indispensable component across diverse sectors. This widespread application has not only transformed the way individuals interact with technology but has also catalyzed a burgeoning interest in AI literacy education. According to a study conducted by McKinsey Global Institute, 70% of companies will adopt AI by 2030, potentially automating 60% of jobs (Bughin et al., 2018). This growing interest is evident in the increasing emphasis on AI literacy across different domains, including business, healthcare, art and education (Secinaro et al., 2021; Cetinic and She, 2022; Naim, 2022; Casal-Otero et al., 2023).

AI literacy encompasses acquiring the necessary knowledge, skills, and abilities to comprehend, engage with, and utilize AI technologies effectively. Long and Magerko (2020) define AI literacy as "a set of competencies that empowers individuals to critically assess AI technologies; communicate and collaborate effectively with AI; and leverage AI as a tool online, at home, and in the workplace.". Ng et. al. (2021) proposed four aspects that are crucial in fostering AI literacy. This includes foundational knowledge of AI concepts, practical applications of AI technologies, critical assessment and creation of AI solutions, and ethical issues with AI technologies. These aspects provide a foundation for the constructing an AI module, ensuring a holistic approach to the development and understanding of individuals' AI literacy.

AI literacy education, once primarily confined to computer science students due to its technical complexity, has expanded its reach to encompass a broader spectrum of individuals, including K-12 students, non-CS (computer-science) students and the general public. Business schools are increasingly prioritizing the development of AI literacy curricula (e.g. business analytics), to serve a broader audience beyond CS students. However, teaching AI literacy to students in business school has posed several challenges. Firstly, students arrive with diverse backgrounds, particularly at the postgraduate level, having varying levels of statistical or technical foundations. This makes it difficult to determine the starting point or strike a balance between depth and breadth of coverage in a course focused on AI literacy. This necessitates a delicate equilibrium in business school curricula – striking a balance between avoiding excessive technical depth and ensuring students acquire a comprehensive grasp of AI applications and interpretations, enabling them to extract valuable business insights.

In this study, an AI literacy module has been re-designed for postgraduate management students using the four aspects that foster AI literacy proposed by Ng et. al. (2021), emphasizing machine learning concepts and their practical application in business settings. The module employs two prominent teaching approaches: problem-based (PBL) and project-based learning (PjBL), to bridge the gap between theory and practice by immersing students in real-world cases and collaborative projects. The aim of this research is to evaluate the effectiveness of the teaching approaches used in the AI literacy module. Specifically, we would like to gain an in-depth understanding of management students' experiences and challenges they encountered throughout the module.

Related Literature

Constructivism

Constructivism, as a learning theory, has been widely applied across various educational contexts to enhance student learning experiences (Honebein, 1996; Tam, 2000; Hof, 2021). This theory serves as a foundational philosophy rather than a specific pedagogical approach (Gijbels et al., 2006). It underpins various pedagogies such as problem-based learning, project-based learning, game-based learning, and flipped classroom learning, which have gained prominence in recent years for teaching AI literacy (Glazewski et al., 2022; Younis et al., 2021; Alam 2022; Bye 2018). Nyikos and Hashimoto (1997) explored how the theory of constructivism can be applied to collaborative learning and suggested it helped students engage in reflective thinking. In the constructivist model, the focus shifts from the teacher to the student, emphasizing active student involvement in their own learning, the teacher then takes on a facilitating role, guiding and supporting their learning journey (Bada and Olusegun, 2015). Tam (2000) emphasized the features of constructivist learning environments, where both teachers and students collaboratively share knowledge and authority. Learning groups are typically composed of small numbers of students, encompassing a heterogeneous mix. Notably, problem-based learning and project-based learning are widely implemented and have demonstrated greater effectiveness in fostering student engagement and honing problem-solving skills in AI related education (Yeom, Herbert and Ryu, 2022; Sari and Rusnilawati, 2022; Ng et al., 2023).

Problem based learning

Problem-based learning (PBL) is a recognized effective approach for enhancing students' skills and knowledge in various fields, which involves presenting students with real-world problems that require critical thinking, collaboration, and problem-solving skills to solve (Savery, 2015). PBL is particularly suitable for computer science education (Zendler, 2019). Vihavainen et al. (2014) conducted a systematic review on teaching methods in introductory programming courses and emphasized the effectiveness of PBL in teaching programming, highlighting its significance in enhancing student success. Fernandes (2016) implemented PBL in an AI course at the undergraduate level, and the study shows that the students had positive attitudes toward this approach, but the effectiveness of PBL has not been discussed. Despite extensive research on PBL for teaching AI, the emphasis has largely been on programming and algorithms, restricting its reach to computer science students. While scholars and practitioners have begun exploring the use of PBL to teach AI to non-major students across various educational levels, the existing number of studies on this subject remains limited (Kong, Cheung and Zhang, 2021). For example, Yetişensoy and Rapoport (2023) have examined the application of PBL for teaching literacy in the realm of social studies. However, the content they deliver regarding AI is at a very rudimentary level. Chen and Qin (2023) employed PBL to instruct AI literacy to postgraduate business students, and the results indicate a deeper comprehension of AI concepts and their practical applications.

Project based Learning

Project-based learning (PjBL) is an instructional approach that involves students in acquiring knowledge and skills through the investigation of genuine questions, problems, or challenges,

which encourages individual or group work, fostering a deeper and more practical understanding of the subject matter (Krajcik and Blumenfeld, 2006). Studies have shown that PjBL can be an effective tool for teaching programming and soft skills to computer science students, and this approach has also been used to teach non-major students with different levels (Pucher and Lehner, 2011; Ng et al., 2023). Sakulkueakulsuk et al. (2018) implemented PjBL in the instruction of machine learning to middle school students. The outcomes revealed that students experienced greater enjoyment, engagement, and hands-on interactivity in comparison to their traditional classroom setting. Through the incorporation of real-world projects, Chen and Qin (2023) demonstrate that PjBL positively impacts students' acquisition of AI literacy and their ability to critically apply AI solutions to business problems. Several studies have integrated both PBL and PjBL into the curriculum for teaching AI literacy to non-major students (de Freitas and Weingart, 2021; Lin et al., 2021; Chen and Qin, 2023), however limitations remain. Firstly, some studies suffer from small sample sizes, limiting the generalizability of their findings. Secondly, a focus on very basic AI concepts is evident in certain studies, neglecting opportunities for deeper learning and in-depth application to real-world problems. Addressing these gaps is crucial to fully harness the potential of these approaches in equipping non-major students with a robust understanding of AI.

Methodology

Curriculum Design

Using PBL and PjBL strategies, the AI Literacy module is facilitated through a blend of hands-on workshops and collaborative project. This pedagogical approach enable students to engage with the module content by applying theoretical knowledge to practical scenarios. Specifically, students are encourage to engage with software tools to build and evaluate machine learning models to solve business problems. This not only allow students to familiarise with the tools and techniques that are essential in AI and machine learning but also cultivates critical thinking, problem solving, team work and creativity. To further support students learning, the module provides multiple opportunities for formative assessments that were strategically placed throughout the curriculum. These assessments serves as checkpoints for students to assess their understanding on the topics, at the same time tutors can gain insights into areas where students require additional support.

Research Design

This study employed a mixed method approach to gather in-depth analysis on management students' perceptions and experiences in the AI literacy module through a two-phase data collection process: a quantitative research survey design is applied to collect survey data anonymously followed by a qualitative research design using focus group interviews. The first phase begins with the collection of survey data using an online survey tool, Qualtrics. The survey includes items measuring self-assessed AI literacy skills before and after attending the module, understanding of AI concepts, ethics and applications in business, confidence in evaluating and creating AI solutions and communicate the proposed solutions, learning experience in the PBL and PjBL workshops and the challenges that the students faced in this module. After receiving ethical clearance by the research ethics committee, the survey was administered to a group of 76 students who are taking the AI literacy module. 30 complete responses were received, representing approximately 40% response rate. The second phase of data collection involves collecting qualitative data using semi-structured interviews. 20 interviews of 60-minutes were conducted

with students who attended the AI literacy module. The interview complements the survey with open-ended questions to elicit detailed responses about students' learning experience in the PBL and PjBL workshops and the challenges they faced in the AI literacy module.

Reliability and Validity of Data Collection Instruments

For reliability and validity purpose, a pilot testing of the survey with a small group of students who previously completed the AI module was conducted. Feedback from this pilot test was used to improve the questions in the questionnaire for clarity and avoid ambiguity. For the qualitative data, interview questions are examined to ensure they align with the items included in the survey. Both survey questions and interview questions are designed by the researchers who have subject knowledge in artificial intelligence and they are both qualified researchers with extensive experience in teaching.

Data analysis

The researchers have completed the data collection process. Currently, they are in the process of analysing the data. Quantitative data from the survey is analysed using descriptive and inferential statistics to assess the impact of the PBL and PjBL approach on developing students' AI literacy skills and their confidence in prescribing AI solutions to specific business problems and communicating the results and recommendations to stakeholders. Qualitative data from interviews are analysed using thematic analysis to identify themes related to students' perceptions and experiences of the learning activities of the module. To assess the reliability of the survey, a widely used metrics such as Cronbach's Alpha will be used to measure internal consistency before performing data analysis to verify that the survey questions captured the intended dimensions of the study (Cronbach 1951). For interview data, an inter-rater reliability approach will be used. To ensure consistency, the degree of agreement between coders is measured with the use of Cohen's Kappa (Cohen 1960).

Practical Implications of this Research

The results of this research are expected to inform the curriculum design of AI education, ensuring students are not only technically competent but also able to effectively communicate complex information to a diverse audience. By specifically examining the effectiveness of PBL and PjBL, educators will gain insights into how these pedagogical approaches can foster a deeper understanding of AI literacy. Further, the findings of this study can offer effective strategies to engage students from a diverse background in AI education, leading to the development of inclusive teaching approach that accommodate learners with different prior knowledge levels.

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