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Designing AI Literacy Curriculum for Multidisciplinary Undergraduates: Insights from a Case Study on General AI Courses

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1. Introduction

Artificial intelligence (AI) is increasingly integrated into human activities. Generative AI, particularly industry-specific large models, has entered a phase of rapid growth and is now embedded across various sectors, including finance, healthcare, education, and law. According to the IBM *2023 Global AI Adoption Index* [1], approximately 42% of enterprise-level companies (with more than 1,000 employees) have already implemented AI in their operations, while an additional 40% are actively exploring or testing AI technologies. These developments are driving new economic opportunities and innovation globally. For instance, the latest report from the International Data Corporation (IDC), *China Model as a Service (MaaS) and AI Large Model Solution Market Tracking* [2], indicates that, in the first half of 2024, China's MaaS market reached 250 million RMB, while the AI large model solution market totaled 1.38 billion RMB. This growing market for large model services reflects an increasing investment by enterprises, underscoring the transformative and disruptive impact of AI across industries.

The social transformation driven by AI has made AI literacy a crucial competency for individual development, turning its cultivation into a "human issue [3]." This need is particularly urgent for higher education students [4], as industries worldwide require top talents with AI literacy to drive the intelligent transformation of business processes and products, while making trustworthy and ethical decisions [5]. In response, students are calling for AI literacy to be integrated into their higher education curricula to better prepare for the challenges of the intelligent era and future careers. For instance, a survey on the use of generative AI among undergraduates [6], found that students most commonly recommended offering relevant courses and lectures, with a particular focus on developing skills in using AI tools. Further research has highlighted the importance of incorporating AI literacy into educational programs to foster innovation [7] and enhance the sustainable development potential of management students [8]. Clearly, it is necessary to expand the scope of AI literacy development beyond specific disciplines such as computer science and engineering [9].

In response to the urgent demands of both industries and students, universities worldwide have begun developing general AI courses. The objective is to promote AI literacy through general courses accessible to all students, rather than offering elective courses tailored to specific disciplines. This approach not only acknowledges the universal importance of AI literacy in the intelligent era [10], but also represents an efficient use of the limited AI teaching resources available within universities [11]. However, universities are still in the exploratory phase of AI literacy education, encountering challenges such as discrepancies in students' AI proficiency, diversity in learning objectives, and difficulties in integrating multidisciplinary resources. Designing curricula that effectively foster AI literacy among students from multiple disciplines has become a significant challenge in engineering education.

Existing literature offers limited practical solutions to this issue. Firstly, case studies on the design of AI literacy courses at the higher education level are scarce. Most research has concentrated on K-12 education, focusing on curriculum design [12], implementation [11], and management collaboration [13]. While these insights are valuable, they are not directly applicable to the design of general courses in higher education, which cater to students with diverse academic backgrounds. Additionally, as higher education institutions and educational organizations have only recently initiated AI literacy education efforts, existing studies mainly focus on faculty and student surveys to inform course development [14], [15], or on the impact of teaching method improvements on AI literacy [16], [17]. Few studies examine the overall design, implementation, feedback of AI literacy courses at the curriculum level.

In the context mentioned above, this study adopts an exploratory single-case approach, focusing on a series of undergraduate general AI courses at a leading Chinese university. Employing data collection methods such as documentary materials, surveys, and semi-structured interviews, this study examines the overall design, implementation, and feedback of the courses, and summarizes a curriculum design approach characterized by "hierarchical content, classified objectives, centralized management." This case represents one of the pioneering efforts in AI general education at Chinese universities. Through the case analysis, this study proposes a feasible curriculum design plan for cultivating AI literacy among students from multiple disciplines at comprehensive universities, aiming to contribute solutions to the global shortage of AI talent. Furthermore, the findings of this study can also contribute to the development of multidisciplinary general courses in other engineering fields by drawing on the successful characteristics of this case.

2. Literature Review

2.1 Definition and Framework of AI Literacy

The definition of AI literacy has been widely studied in the past five years, but a consensus has yet to be reached. In the literature and related reports, the concept of "AI competence" is also frequently used. Notably, due to the ambiguity of the definitions, the two terms are not specifically distinguished in our study.

When AI literacy was first introduced, it was closely associated with concepts such as digital literacy [18], media and information literacy [19], and data literacy [20], often focusing on its technological orientation. For instance, in *Beijing Consensus on Artificial Intelligence and Education* [21], AI literacy was considered the ability required for effective human-machine interactions. In the *2020 International Forum on AI and the Futures of Education* [22], UNESCO defined AI literacy as encompassing both data literacy, which refers to the ability to understand how AI collects, cleans, manipulates, and analyzes data, and algorithm literacy, which refers to the ability to understand how AI algorithms find patterns and connections in the data. With the initiative to cultivate AI literacy for global citizens, researchers have expanded the concept of AI literacy into more diverse societal contexts, targeting the general public rather than just experts, without requiring programming or development skills. AI literacy has thus become a balance of human-oriented and technology-oriented competencies. A commonly used definition describes AI literacy as a set of competencies that enables individuals to critically evaluate AI technologies, communicate and collaborate effectively with AI, and use AI as a tool in various contexts such as online, at home, and in the workplace [23].

Building on the discussion of definitions, AI literacy or competence frameworks have begun to emerge in order to better support the practice of cultivating AI literacy. A framework means that AI literacy is deconstructed into specific dimensions, which clarify the connotations of AI literacy and make the actions for its cultivation more targeted, thus providing helpful guidance for policymakers and educators. Based on previous research, Ng et al. [24] proposed an AI literacy framework that is highly influential. They suggested that AI literacy consists of four dimensions: Know & understand AI, Use & apply AI, Evaluate & create AI, and AI ethics. Relevant organizations from various countries have also offered insights. For instance, the Digital Promise has had a significant international impact on the development of AI literacy frameworks through its report *AI Literacy: A Framework to Understand, Evaluate, and Use Emerging Technology* [25] in 2024 . They proposed that AI literacy includes the knowledge and skills that enable people to critically understand, evaluate, and use AI systems and tools in order to participate safely and effectively in an increasingly digital world. In addition, AI literacy frameworks tailored to specific groups, such as learners, educators, and public sectors, as well as those for different educational stages, have also received special attention. For instance, UNESCO has released the *Artificial intelligence and digital transformation: competencies for civil servants* [26], as well as *AI competency framework for students and teachers* [27], [28].

Our study focuses on the undergraduate general AI courses at Zhejiang University. Accordingly, as shown in **Table 1**, the definition of AI literacy used in this study aligns with that presented in Zhejiang University's publication [29], *Red Book on Artificial Intelligence Literacy of College Students (2024 Edition)*, which defines AI literacy for students in the AI era as the comprehensive abilities to understand, use, innovate with, and ethically engage with AI. This definition also corresponds to an AI literacy framework encompassing four dimensions: systematic knowledge, constructive ability, creative value, and human-centered ethics.

Table 1 the Framework of AI Literacy Proposed by Zhejiang University [29]

Definition	**Dimensions**	**Meanings**
Understand AI	Systematic Knowledge	● Data and knowledge ● Algorithms and models ● Computing power and systems ● Interdiscipline and applications ● Trustworthiness and security
Use AI	Constructive Ability	● Abstraction and modeling ability for solving problems ● Decomposition and modularization ability for solving processes ● Verification and hypothesis ability for solving methods ● Interpretation and feedback ability for solving results ● Ability to use generative artificial intelligence to solve problems

Innovate with AI	Creative Value	● Content reconstruction under goal guided dialogue ● Enhancement of cognitive subjectivity in teacher-machine-student interaction ● Autonomous integration of personalized learning experience ● Practical initiative experience in problem-solving ● Selective introspection without relying on intelligent tools
Ethically engage with AI	Human-centered Ethics	● Awareness of data security and privacy protection ● Vigilance against algorithm bias and model illusion ● Alignment of AI for goodness and people-oriented ● AI&All concept of human-machine symbiosis and integration ● Pursuit of human knowledge accumulation and universal sharing

2.2 AI Literacy in Higher Education Practice

AI literacy education is part of AI education, aimed at cultivating talent to meet the demands of AI technological advancements and industrial development. However, it is important to note that the AI literacy discussed in this study, in the context of higher education practice, is not focused on AI courses or degree programs designed for "expert" disciplines like computer science or for any single "non-expert" field [30], but rather for the broader, multidisciplinary students in general education.

In contrast to the intense focus of researchers on AI literacy education in K-12 [12] and childhood education [31], AI literacy education in higher education has not been as widely explored. Nevertheless, existing research has laid the groundwork for the introduction of AI literacy courses for multidisciplinary students at universities, covering various aspects such as faculty and student intentions [4], [6], teaching methods [16], [17], and assessment approaches [32], [33]. From previous research, it is clear that faculty and students have expressed positive attitudes toward AI literacy education, which serves as an important driving force for the development of AI literacy courses. For example, Salhab [4] investigated college instructors' perspectives on AI integration into curriculum design at a higher education institution. His findings indicated that most participants showed positive views toward implementing AI literacy across the curriculum. Southworth et al. [34] explored possible pathways to address gaps in AI literacy across the curriculum at a traditional research university. Their results revealed that integrating AI across the curriculum would make AI education a cornerstone opportunity for all students, helping to create an AI-ready workforce equipped with essential 21st century competencies.

However, it is important to recognize the inadequacy of case studies on AI literacy education in current higher education practice. This shortcoming is mainly reflected in the limited number of course cases and the lack of research on the overall design, implementation, and feedback of these courses. Few studies, like that of Kong et al. [35], report on the process of designing, implementing, and evaluating an AI literacy program. This gap stems from a major challenge: AI literacy education at the higher education level is a multidisciplinary issue [9]. This means that universities and educational institutions worldwide face obstacles such as discrepancies in students' AI proficiency, diversity in learning objectives, and difficulties in integrating multidisciplinary resources. Therefore, we pay special attention to case study of AI literacy courses targeting multidisciplinary students, and focus on three key issues, namely how to design, how to implement and what's the feedback.

3. Research Design

3.1 Research Method

This study employs an exploratory single-case study approach, using qualitative and quantitative data obtained through documents, interviews and surveys for case description and analysis. The choice of this research method is based on two main reasons. Firstly, the goal of this study is to explore how comprehensive universities design and implement courses aimed at cultivating AI literacy for students from multiple disciplines, and to gain the feedback of these courses. This is a process-oriented issue that requires in-depth investigation, making it well-suited for a single-case study. Secondly, as mentioned earlier, research on AI literacy education in higher education is still in the exploratory stage, and thus, it is appropriate to use exploratory case study to derive insightful AI literacy course design solutions. This approach will help summarize emerging and enlightening design strategies and provide valuable guidance for the development of AI literacy courses in other higher education institutions.

3.2 Case Selection

This study focuses on a series of general AI courses offered at Zhejiang University, a leading comprehensive university in China. The reasons for selecting this case are as follows:

First, the background of this case is highly representative. China has a well-established industrial system and is currently the largest and most complete industrial country in the world. The government is striving to create a new "AI + industry" ecosystem, and there is a significant gap in multidisciplinary talent with AI literacy, which presents a major challenge. Against this backdrop, this case responds to the substantial demand, and has the potential to offer valuable insights for higher education practices in other countries, especially in developing countries.

Second, this case is highly relevant to the research question. The course series in this case is one of the first general AI courses offered by Chinese universities, and its content is closely centered on AI literacy cultivation. Additionally, Zhejiang University is a leading comprehensive university in China, with the most complete range of disciplines. The course series is open to all undergraduate students across the university, aligning with the multidisciplinary focus of this study.

Third, the data availability for this case is robust. On one hand, the case is well-documented, with extensive materials, including course documents, presentations, and teaching resources. On the other hand, the research team of our study consists of faculty and students from Zhejiang University, some of whom were directly involved in designing and implementing the courses. This allows us to access authentic, reliable, and comprehensive data for the case study.

3.3 Data Collection

To ensure the reliability of the research conclusions, this study employs triangulation, with data drawn from three sources:

(1) Interview. We conducted 5 semi-structured interviews with 3 course teachers and 2 students who attended the course. Notably, two of the teachers were not only responsible for teaching but also directly involved in the course design process, serving as course designers and team managers. These interviewees had a comprehensive understanding of the course series.

(2) Questionnaire. We distributed questionnaires to students enrolled in the general AI courses, receiving 246 valid responses. The questionnaires included self-assessments of students' understanding in AI literacy, as well as evaluations and suggestions regarding the course series.

(3) Other documentary materials. Through internal channels and the official website, we obtained 7 relevant course documents, which cover course outlines, teaching objectives, assessment methods, teacher training, platform support, and other materials, providing insights into the course design and implementation process.

Table 2 Overview of the Data Collection

Type	**Source**
Interview	5 semi-structured interviews (3 from course teachers and 2 from students who taking the courses)
Questionnaire	246 from students who taking the courses (42.28% from freshman year, 29.67% from sophomore year, 19.51% from junior year, 8.54% from senior year)
Other documentary materials	7 relevant documents from internal channels and the official website (3 course outlines, 3 course schedules, and 1 course introduction PPT)

Overall, as shown in **Table 2**, based on 7 course-related documents collected from internal channels and the official website, we gained a comprehensive understanding of the entire course design and implementation process. Additionally, through the 246 questionnaire responses and 5 semi-structured interviews with course designers, team managers, instructors, and students, we obtained valuable feedback of the courses.

4. Case Study Results

This case presents a unique AI literacy curriculum design, consisting of three courses in a series, named "AI Fundamentals A, B, C." We followed the research framework of course design, implementation, and feedback to reveal the exemplary practices of this case in cultivating AI literacy for multidisciplinary students.

Table 3 Overview of AI Fundamentals Course Series

Courses	**AI Fundamentals A**	**AI Fundamentals B**	**AI Fundamentals C**
Recommended Disciplines	Science, Engineering, Agriculture, and Medicine	Humanities, and Social Sciences	Humanities, and Social Sciences
Prerequisites	Python or C language Fundamentals of Computer Science	Python	No requirements
Instructional Contents	In depth lectures on the basics of AI, machine learning, deep learning, and their applications in engineering	Explore the foundation, development, and applications of AI in social sciences	Explain the foundation, history, core concepts, and applications of AI in the humanities
Learning Objectives	1. To read and understand basic algorithm code. 2. To modify and optimize algorithm code. 3. To deploy and apply open-source AI algorithms. 4. To apply AI technology for **innovative activities** in engineering projects.	1. To **use** open-source AI algorithms. 2. To **use** AI tools for text analysis, social simulation, etc. 3. To understand the application of AI in social science research.	1. To **understand** the basic ideas and concepts of AI. 2. To select appropriate AI tools to solve problems in the humanities field. 3. To **understand** the application of AI in humanities research.
Assessment Methods	67.5% for theoretical exam, 32.5% for project, and 20% bonus for competition	60% for theoretical exams, 30% for theoretical assignments or projects (optional, the latter requiring programming), and 10% for oral presentations	40% for theoretical exam, 30% for theoretical assignments, 30% for project

4.1 Design

Differentiated disciplinary characteristics are an essential consideration when designing general AI courses for multidisciplinary students. As shown in **Table 3**, the course series in this case includes three categories: A, B, and C. These categories adopt different designs in terms of prerequisites, instructional contents, learning objectives, and assessment methods, with a focus on cultivating different dimensions of AI literacy to meet the specific needs of students from various fields. Course A is recommended for students from science, engineering, agriculture, and medicine, while Course B and C is recommended for students from the humanities and social sciences. Overall, the course design reflects the characteristics of "hierarchical content" and "classified objectives."

4.1.1 Hierarchical Content

Given the varying levels of AI proficiency among students, the course difficulty is designed in a stepped progression, particularly with regard to the prerequisites for programming and the teaching content. The prerequisite requirements for the “AI Fundamentals” decrease in sequence with the course categories. For students in engineering, science, agriculture, and medicine, Course A offers an in-depth technical perspective and requires a basic understanding of Python or C programming and computer science. In contrast, the courses for humanities and social science students have lower or even no programming prerequisites, significantly lowering the entry barrier for students from non-technical fields and making AI learning more accessible.

Table 4 Course Schedule for “AI Foundations C” on Tool Applications

Module	**Learning Points**	**Learning Hours**
Typical AI Tool 1: Large Language Models (LLMs)	Introduction to LLMs and multimodal large models; Basic principles of LLMs; The use of LLMs; Prompt engineering; The influence of LLMs on humanities and social sciences research	4
Typical AI Tool 2: AI-Generated Content (AIGC) Models	Introduction to text-to-image/text-to-video; Basic principles of text-to-image/text-to-video models; Usage of text-to-image/text-to-video models and their impact on humanities and social sciences research	4
AI application cases	Case study of text analysis, image analysis, and social simulation	6
Project Presentation and Discussion	Design and implement a humanities and social science research project based on AI tools, including project planning, data collection and processing, analysis and summary; Display and discuss project results	2

At the same time, the teaching content has been adjusted according to the different disciplines. For students in engineering, science, agriculture, and medicine, the emphasis is placed on the underlying algorithms of AI technology and the development of students’ engineering and practical skills. In contrast, for students in the humanities and social sciences, the focus is on the appropriate application of AI tools.

As illustrated in **Table 4**, Course C is structured to emphasize large language models (LLMs) and AI-generated content (AIGC) for text-to-image and text-to-video generation, with particular attention to how these tools impact research in the humanities and social sciences. Apart from theoretical knowledge introduction and discussions, the course also includes modules such as AI application case analysis, project presentations, and discussions. Students are required to design projects based on humanities and social science research, such as using AI technology for social simulation. These components account for 16 learning hours, which constitutes half of the total. This clearly shows that in the general AI course designed for humanities and social science students with little to no prior knowledge, the tool-based nature of AI is strongly emphasized, focusing on the use of existing tools without delving into algorithms or innovation.

Table 5 Course Schedule for "AI Foundations A" on Underlying Principles of AI

Module	**Learning Points**	**Learning Hours**
Overview of AI	The basic concepts of AI; The history of the development of AI; The research areas of AI; The fields of application of AI; The impact of AI on social development and future trends; The three schools of AI.	2
Foundations of Mathematics, Computer Science, and Programming Languages in AI	The mathematical foundations include calculus, linear algebra, probability theory and statistics, among others; The basics of computer science, such as system architecture, data structures, and algorithms; Basic Python programming; Python IDEs like Anaconda, PyCharm, and PyQT; NumPy, Pandas, Matplotlib.	2
Open-Source AI Tool Framework	Basic concepts of scikit-learn; Open-source DL frameworks like TensorFlow, PyTorch, Keras, Caffe, MXNet; Open-source NLP frameworks like HuggingFace Transformers, AllenNLP, PaddlePaddle; MindSpore AI computing framework.	2
Rule-based Exploration and Problem-solving	Concepts of problem-solving and search; Graph search algorithms like heuristic search and blind graph search; Game search algorithms such as game tree search, minimax search, and alpha-beta search.	2
Fundamentals of Machine Learning	The basic concepts of ML; Linear regression; Logistic regression.	2
Classic Machine Learning Models	The overfitting problem in ML; Ridge regression and lasso regression; Decision tree models; SVM models; Probabilistic models; The application of ML in complex engineering systems.	2
Machine Learning Based on Artificial Neural Networks	The concepts of neural networks (NN) and artificial neural networks (ANN); The history of ANN; The concepts of topology and dimensions; Backpropagation algorithm (BP);	2

	Perceptron; Neurons and activation functions; NN applications.	
Deep Learning	The basic concepts of DL, CNN, RNN; RNN variants such as LSTM, GRU, bidirectional RNN, and multilayer RNN; NLP, Transformer, attention mechanisms; DL applications.	4
Reinforcement Learning	The basic principles of RL; Q-learning algorithm; The development of RL applications.	2

In contrast, as illustrated in **Table 5**, Course A not only includes a review of mathematics, computer science, and programming basics at the beginning of the course, but also dives deeper into the details of AI knowledge, focusing on the implementation logic of AI algorithms and tools. This means a more in-depth exploration and explanation of the underlying principles of AI.

4.1.2 Classified Objectives

The "Learning Objectives" in **Table 3** outlines the primary focus areas for each of the three courses, which are "Understand," "Use," and "Innovate." These goals were developed based on the AI literacy framework for university students. The course design translates the comprehensive competencies of AI literacy, which includes understand, use, innovate with, and ethically engage with AI, into practical learning objectives. This creates a literacy-oriented, or competency-oriented, teaching approach.

To achieve these specific learning objectives, the assessment methods are also adjusted accordingly. As the course difficulty increases, the weight of both theoretical exams and practical projects has also been elevated. Notably, the weight of theoretical knowledge has increased from 40% to 67.5%, with a significant rise in the proportion of process-based assessments. This adjustment reflects the learning objective of Course A, which is to develop students' ability to read, comprehend, modify, and optimize basic algorithm code—skills that require a robust and systematic theoretical foundation.

In addition to theoretical exams and practical projects, the courses tailored different assessment methods for students from various disciplines. For example, Course A includes an additional 20% of extra credit, which students can earn by working on real-world AI projects or participating in relevant AI competitions. In Course B, there is a 10% weight for oral presentations, and a 30% weight for course assignments or practical projects (with programming required). This allows students to choose assessment methods that align with their research focus and AI literacy needs, thus catering to their multidisciplinary backgrounds.

In addition to theoretical exams and practical projects, the three courses (A, B, and C), designed for different disciplines, employ distinct assessment methods. For example, Course A offers a 20% bonus, where students can earn extra points based on their participation in AI-related projects or competitions, with points awarded according to the results. Course B includes an oral presentation for 10% and provides a theoretical assignment or practical project (which requires programming) that accounts for 30%. Students are allowed to choose assessment options based on their research interests and AI literacy needs, aligning with their multidisciplinary backgrounds.

4.2 Implementation

The implementation of this series of courses relies on a centralized management system through a university-level center, specifically “Zhejiang University Research Center of Artificial Intelligence for Education and Teaching” (hereinafter referred to as the “center”). Since its establishment, the center has focused on building a high-level interdisciplinary faculty team and strengthening core practical and innovative capabilities. Based on this center, the series of courses is supported by a comprehensive teaching staff and an online AI training platform, integrating resources from various disciplines across the university to achieve “centralized management” of the three courses.

4.2.1 Interdisciplinary Faculty

Faculty is a key challenge in the implementation of multidisciplinary AI literacy courses. On the one hand, the number of teachers in AI or computer science disciplines is limited, and teaching time slots are constrained, making it difficult to deliver university-wide general courses. On the other hand, students from different disciplines require varying levels of AI literacy, and a teacher from a single discipline cannot meet these diverse needs. Therefore, with the support of the center, this case has implemented the following strategies to build an interdisciplinary faculty team.

First, recruit interdisciplinary faculty and provide transformation support. Special emphasis is placed on attracting faculty members with diverse academic backgrounds. On one hand, there is encouragement for faculty from related disciplines such as computer science, automation, and electronic information to transition into AI teaching. On the other hand, efforts are made to bring in outstanding faculty from other fields, such as mathematics, physics, biology, medicine, economics, management, sociology, and art design, to participate in AI general education and interdisciplinary teaching. Unified training and other preparations for courses will be provided to ensure consistency and high quality of the faculty.

Second, implement appropriate policy adjustments and incentives. To motivate faculty involvement in AI general education, the center has developed corresponding incentive policies. When meeting the basic requirements, the evaluation and awarding processes will give preferential consideration to faculty members teaching AI courses. Additionally, the performance of these faculty members in undergraduate teaching will be assessed separately to ensure their contributions to AI literacy cultivation are fully recognized.

4.2.2 Online Training Platform

The center has developed an AI science and education innovation platform called “MO” (hereinafter referred to as the “MO platform”), which consolidates case resources, computing power, and environmental resources to support this series of general education courses, offering students an integrated online practical training environment.

As noted previously, the courses in this series employ a case-driven, hands-on teaching approach, incorporating engaging, practical cases for each knowledge area. The MO platform functions as the repository for course case resources, providing each case with relevant datasets, example code, and running environments via Jupyter. Students can follow the instructor’s guidance to progressively learn the syntax and functionality of the example code. Additionally, they have the opportunity to modify the example code in an independent workspace and utilize platform-allocated GPU resources and environments to train their own models.

Through its coordination, the MO platform ensures that the three courses do not duplicate case development. It integrates real-world AI cases and dynamically adjusts computing power and environmental resources for all students across the courses. The platform’s resource management, based on the time and space complexity of running code, guarantees an equitable practical training experience. This hands-on learning based on the real-world context is essential for fostering AI literacy.

4.3 Feedback

As one of the first AI general education courses launched nationwide, this course has already been piloted for one semester, with more than 300 faculty and students from multiple disciplines participating. Starting next year, this series of courses will replace the existing computer science general education requirement, becoming a mandatory course for all undergraduates. This change represents one of Zhejiang University’s key initiatives in reforming and iterating its AI general education for undergraduates. Therefore, evaluating the feedback of this semester’s course is crucial for shaping future developments.

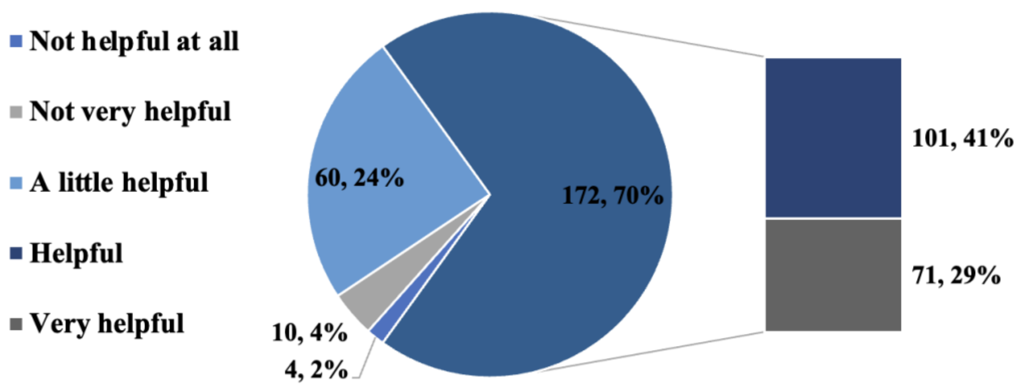

Figure 1 Results on the degree of assistance provided by courses in improving students’ AI literacy

As shown in **Figure 1**, the survey results indicate that among the 246 students surveyed, over 70% found the AI general education course beneficial, with 29% considering it highly valuable. Additionally, the case-driven, hands-on teaching approach received unanimous praise from students, which is encouraging for the pilot implementation of the course.

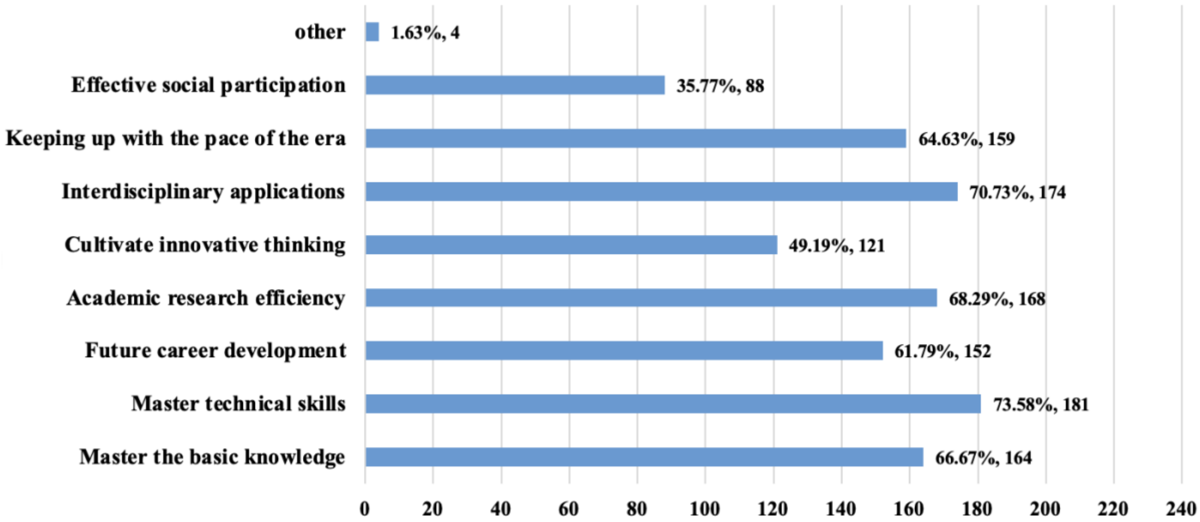

Figure 2 Results on the reasons for students improving AI literacy

However, it is essential to acknowledge the course's current limitations in enhancing students' AI literacy (see **Figure 2**). In terms of learning objectives, the majority of students focus on acquiring AI technical skills and applying them in interdisciplinary contexts. Fewer than half, however, express interest in improving their social participation or fostering innovative thinking through the course. This suggests that most students still view AI literacy primarily as a body of systematic knowledge related to the use of AI tools and the development of technical skills, rather than as a "basic grammar" that incorporates creative ethics and human-centered values, preparing learners for life and work in the AI-driven future.

Interviews with course designers, teaching team managers, and teachers identified two key areas for improving the course kit. First, there is a need to provide students with a practical course selection guide. since the courses are chosen by students themselves, and many students are unclear about their level of proficiency in AI, they often end up selecting courses that are either too advanced or too basic, resulting in wasted time on course withdrawals or transfers. Therefore, when promoting these courses to all the undergraduates, it is essential to offer self-assessment tools and course selection guides prior to enrollment. Second, the application of AI tools within the course should be emphasized. Both course designers and teaching team managers suggested that, as a course aimed at enhancing AI literacy, AI tools should be integrated into the teaching process as a pedagogical approach. For instance, incorporating LLMs or teacher agents into the course design could enhance AI literacy for both teachers and students. Also, it allows students to experience firsthand the benefits and limitations of AI technology in a controlled classroom environment.

5. Discussion

Faced with the rapid iteration of generative AI technologies and the growing ethical risks, countries around the world have been hesitant in advancing AI literacy development.

According to a UNESCO survey, by 2022, only 15 countries were developing or implementing AI courses within their public education systems [27], and only 7 countries had established AI literacy frameworks or training programs for teachers [28]. The challenges in higher education are particularly pronounced, with key difficulties arising from the discrepancies in students' AI proficiency, diversity in learning objectives, and difficulties in integrating multidisciplinary resources.

Against this backdrop, our study presents a robust attempt to cultivate AI literacy among university students through general AI courses. By analyzing the course's overall design, implementation, and feedback, we propose a feasible curriculum design for fostering AI literacy in multidisciplinary students at comprehensive universities. The key features of this curriculum design can be summarized as "hierarchical content, classified objectives, centralized management." First, the course difficulty is set in a stepwise manner, particularly in terms of prerequisites for programming and the instructional content. Second, to accommodate the different learning objectives of multidisciplinary students, various teaching and assessment methods are employed, including papers, projects, and competitions. Finally, based on a comprehensive faculty team and an integrated online AI platform, the resources from multiple disciplines across the university are consolidated, enabling centralized management of the three-course resources. During the pilot phase of the course, both faculty and students provided positive feedback, which helped to further improve the selection of artificial intelligence application cases and course kit construction in the course.

In addition to providing a curriculum design characterized by "hierarchical content, classified objectives, centralized management," this case also demonstrates a high degree of alignment with the concept of AI literacy for university students, which is equally noteworthy. In this study, AI literacy for university students refers to the comprehensive abilities required in the AI era to understand, use, innovate with, and ethically engage with AI. It consists of four dimensions: systematic knowledge, constructive abilities, creative values, and human-centered ethics [29]. These dimensions are reflected in various aspects of course design for the general AI course series, including prerequisites, instructional content, learning objectives, and assessment methods. These elements further define the distinctions and connections within the series of courses. It can be observed that in this comprehensive university, the design and organization of general AI courses are highly aligned with the definition of the concept of AI literacy. According to our interviews, this alignment stems from the consistency between the leaders and driving managers and experts of the two. This centralized approach and the power of core drivers may be the key to ensuring that curriculum design does not deviate and curriculum implementation is not hindered.

6. Conclusion

This study adopted an exploratory single-case study method, taking a series of general AI courses conducted at a top comprehensive university in China as the research object, to explore how comprehensive universities can cultivate AI literacy for multidisciplinary students. Through documentary materials, questionnaires, and semi-structured interviews, this study analyzed the overall design, implementation, and feedback of the course, summarizing the design characterized as “hierarchical content, classified objectives, centralized management.” Additionally, the study investigates the alignment between the courses and AI literacy, summarizing the specific practices and successful features of the case. Overall, this study proposed a feasible curriculum design approach for comprehensive universities to cultivate AI literacy for multidisciplinary students, attempting to alleviate the shortage of talents with AI literacy worldwide in the intelligent era. In addition, the findings of this study are not limited to the field of AI and can also empower the construction of general education courses in other engineering fields.

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