

The Current Situation, Optimization Strategies, and Implications of Artificial Intelligence Ethics Education for Adolescents

-- Based on the Scarecrow Model

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Abstract

AI is rapidly transforming education, and understanding AI ethics is crucial for teenagers' future growth. This study analyzes the current state of AI ethics education for adolescents globally, finding that while they are widely exposed to AI, their knowledge is limited and regional differences exist. This leads to ethical issues like data privacy, algorithmic bias, and emotional dislocation. Based on the "Scarecrow" framework and Bloom's learning objectives, the study proposes optimization strategies and designs the AIED Toolkit to support ethical education for youth in the AI age.

Keywords

Youth AI Ethics Education; Scarecrow Model; Optimization Strategy; Toolkit Design; Ethical Awareness Development.

1. Introduction

In the digital age, AI technologies like personalized learning platforms and facial recognition are transforming education. However, deeper AI application brings ethical and social issues, especially for teenagers in their critical value formation period. Understanding AI ethics is crucial to mitigate potential negative impacts on their values and behaviors. This project investigates the current status of AI ethics education for youth, proposes optimization strategies, and develops learning resources to address existing research gaps and future development.

2. Analysis of the Current Situation of Artificial Intelligence Ethics Education for Youth at Home and Abroad

This paper analyzes the current situation of AI ethics education for teenagers both domestically and internationally using literature and questionnaire surveys (1725 questionnaires). It examines domestic exposure to AI, existing curricula and ethical issues, and international advanced practices and policies. The study identifies common problems and challenges in current education practices.

2.1. Current Situation in the Country

2.1.1. The Current Situation of Domestic Youth Exposure to AI

According to the literature analysis and summary, at present, the domestic youth group contact with artificial intelligence exists in a wide range, wide range of ways, strong initiative, cognition and other significant characteristics, showing a mixed but overall trend continues to be good pattern, youth sports and education, emotional and health fields, medical and protective fields and other aspects of development are closely related to the training and application of artificial

intelligence. The findings of the "Blue Book for Youth: Report on Internet Use by Chinese Minors (2024)" and the "Survey Report on Internet Use by Youth (2024)" show that 45.1% of minors have used AI products, which indicates that AI has already had a high popularity rate among the youth group.

The questionnaire data show that youth's average understanding of AI is 2.796, indicating some knowledge but room for improvement. Compared to developed countries, China's AI ethics education in schools is still in its early stages. Regarding AI applications in education, teenagers have more contact with intelligent tutoring (average value 0.790) than with adaptive learning or educational virtual reality. The table below:

Table 1. Current status of youth exposure to AI in the country

STATISTIC	AVERAGE VALUE	STANDARD ERROR	(STATISTICS) STANDARD DEVIATION	VARIANCE (STATISTICS)	SKEWNESS	KURTOSIS
GRADE	6.051	0.0817	1.0240	1.0487	0.0422	-1.653
INTELLIGENT TUTORING	0.790	0.0326	0.4087	0.1671	-1.436	0.063
ADAPTIVE LEARNING	0.363	0.0385	0.4824	0.2327	0.5751	-1.691
EDUCATIONAL VIRTUAL REALITY	0.395	0.0391	0.4904	0.2405	0.4341	-1.835

In addition, the majority of adolescents held negative or very negative attitudes toward generative AI. Specifically, 1,184 (about 75.5%) of the sample of 1,568 held negative or very negative attitudes toward GAI. This suggests that despite the increasing use of AI technology in education and daily life, a large number of adolescents still have reservations or negative views about it.

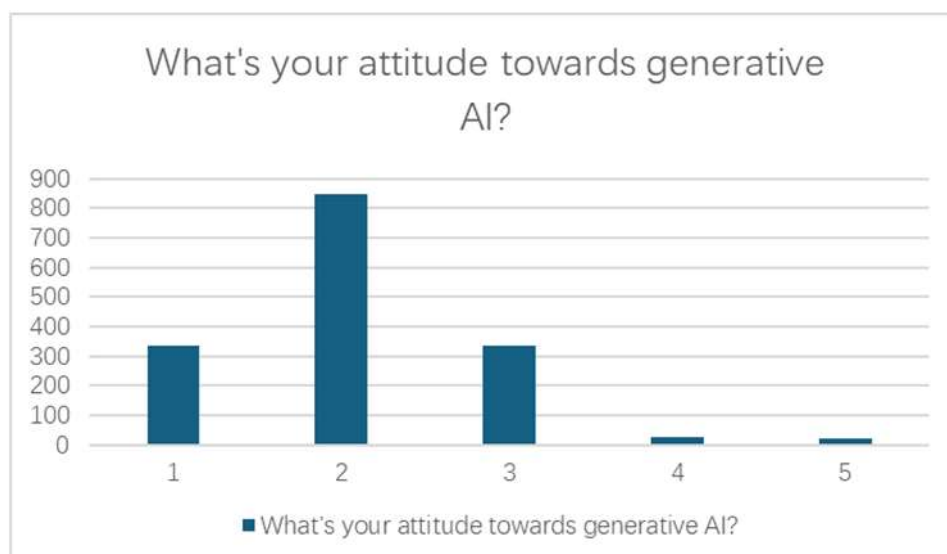


Figure 1. Teenagers' Attitudes Toward Artificial Intelligence

2.1.2. Existing AI Ethics Education Programs and Practices in China

In recent years, the education sector has increasingly emphasized the application of AI. The Beijing Municipal Commission of Education and four other departments issued a program aiming to make AI applications common in Beijing's schools by 2025. Globally, schools are also incorporating AI into curricula and organizing activities to cultivate students' interest and innovation in technology.

Compared to developed countries, China's AI ethics education in primary and secondary schools is still in its early stages, with issues like lack of systematic materials, weak teacher expertise, and unbalanced resources. Current research mainly focuses on curriculum integration into daily teaching through lectures and discussions. In higher education, AI ethics courses are often combined with other disciplines to develop interdisciplinary thinking and better understand AI's ethical issues.

2.2. Status Abroad

2.2.1. International Advanced Experience in AI Ethics Education.

International experience in the development of ethics education for AI is worth learning from. As early as the 1950s, Alan Turing (1950) proposed the Turing Test (Turing Test) in assessing whether a machine has the criteria of intelligence, which is an important contribution to the advancement of the development of computer science and artificial intelligence. [1] On November 24, 2021, the Recommendation on the Ethics of Artificial Intelligence was unanimously adopted by the 193 Member States of the 41st General Conference of UNESCO. [2] The development of AI ethics education has become an international consensus in most countries. According to the analysis of the literature search, the current international advanced experience in four main areas, namely, framework construction, curriculum development, educational practices and activities, and interdisciplinary and collaborative research, is worth learning from.

(1) Framework construction

International research on ethical frameworks for AI in education has an early history of nearly 30 years, with a wealth of research experience and results. In 2000, Epstein and Aiken proposed the first ethical framework for AI in education, pointing to the ways in which AI might play a role in the lives of learners and educators, as well as in their place in the future education system place [3]. Since the 1990s, the framing of AI ethics education has gone through three main phases - borrowing and reflection, following and imitation, and inheritance and independence. [4] To date, the "Scarecrow" Draft Framework for Educating on the Ethics of Artificial Intelligence" by Wayne Holmes et al. at University College London focuses on ethical issues at the intersection of the four major areas of education, algorithms, and big data.

(2) Curriculum Development

The United States is a leader in AI ethics education, with many colleges and educational institutions developing specialized AI ethics courses. For example, Stanford University offered a course on "Philosophy, Ethics, and Implications in Artificial Intelligence" in 2014. [5] The Massachusetts Institute of Technology (MIT) opened an "Artificial Intelligence Institute" in 2019. [6] In 2018, its Personal Robots Group (PRG) partnered with middle schools to conduct an "Ethics of Artificial Intelligence Curriculum for Middle School Students" in grades 5 to 9. In 2021, the project "Responsible AI for Social Empowerment and Education" (Responsible AI for Social Empowerment and Education, or RAISE) will be launched in 2021, and based on PRG's practices, we are actively exploring pedagogical practices in interdisciplinary fields.

2.2.2. Policies and Practices in Ethics Education for Young People in Different Countries

The EU set up an independent High Level Expert Group in 2018 to develop EU Ethical Guidelines on AI, and in April 2019 published Ethical Guidelines for Trustworthy Artificial Intelligence. In 2022 the EU developed a standard for AI systems based on the principles of human rights, democracy and the rule of law, the Ethical Guidelines for Educators on the Use of Artificial Intelligence (AI) and Data in Teaching and Learning. [7] This standard frames the principles of humanism, transparency and responsibility. The Family Educational Rights and Privacy Act (FERPA), enacted by the U.S. federal government, protects student educational privacy by requiring educational institutions to obtain written parental or student consent before disclosing educational records and personally identifiable information.[8]

Youth AI ethics education is crucial but faces global challenges. Despite wide AI exposure, teenagers have limited knowledge, and regional differences cause ethical issues like data privacy and algorithmic bias. Educational practices also face incomplete curricula, lack of materials, insufficient teachers, weak interdisciplinary research, and low social participation. Targeted strategies are urgently needed for high-quality AI ethics education.

3. Optimization Strategies for Youth Artificial Intelligence Ethics Education

3.1. Rationale for Optimization Strategy

3.1.1. Theoretical Basis

(1) "Scarecrow" framework model based on AIED ethics

As AI technology advances in education, ethical issues around data, algorithms, and educational values are becoming more prominent. Young people, as core stakeholders in digital education, need scientific frameworks like the "Scarecrow" model to enhance their ethical awareness. This model addresses issues such as data privacy, algorithmic bias, and educational equity, helping achieve a balance between technological empowerment and humanistic care. For instance, in data privacy, youth should understand what data protection regulations are reasonable when using AI.

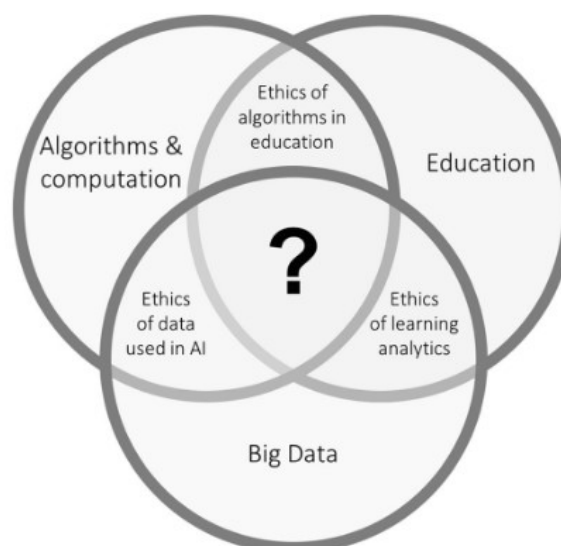


Figure 2. Scarecrow framework model based on AIED ethics

(2) Bloom's Theory of Categorizing Learning Objectives

The AIED ethical "scarecrow" framework addresses youth ethics education content, but a scientific theory is needed for teaching. Ralph W. Tyler's four basic curriculum design issues, starting with educational objectives, highlight that teaching goals are central to design, implementation, and evaluation. Bloom's learning objectives classification further refines multi-level goals for operability in teaching.

Bloom divided the learning objectives into three major domain. Correct cognition is a prerequisite for motor skill and emotional development, and only through deep cognition can we cultivate strong values, so in the education of AI ethical awareness, it is especially crucial for adolescents to be educated on the cognition of AI ethics. This study focuses on the design of instruction in the cognitive domain using Bloom's learning objectives.

3.1.2. Rationale

The questionnaire data shows that despite teenagers' interest in AI, their overall understanding is shallow and many have negative attitudes towards generative AI. Youth AI ethics education faces common problems in three areas: curriculum and resources, faculty and research, and policy and social support.

In curriculum and resources, there is a lack of a systematic curriculum, uneven distribution of resources, and a need for more diverse and practical teaching methods. In faculty and research, there is a shortage of qualified teachers, insufficient interdisciplinary research, and a need for better teacher training. In policy and social support, there is a lack of specific policies for AI ethics education and low social participation, making it hard to create a favorable environment. To address these issues, optimization strategies should focus on improving curriculum design, faculty development, and social support to promote systematic and diversified AI ethics education for youth.

3.2. Specific Elements of the Optimization Strategy

3.2.1. Curriculum Design Optimization

To address AI ethics education complexity, curriculum design needs adjustments in goals and content. AI ethics should be integrated to develop students' ethical awareness, responsibility, and decision-making skills, covering topics like algorithmic fairness and data privacy. A systematic, staged curriculum is being developed across education levels, informed by age-level studies in China. Multidisciplinary teaching and case studies enhance practicality. Curriculum design should also be flexible and diversified to meet local needs through localized and school-based approaches.

3.2.2. Teacher Training and Support

Enhance teachers' AI ethics literacy and provide training resources. Stakeholders should collaborate to build an inclusive AI ecosystem in education and support AI integration. Construct a high-quality professional development resource system for teachers and provide financial, technical, and policy support for their research projects. Organize teaching competitions and innovation awards to motivate teachers to explore new methods and improve teaching quality. Establish a regulatory mechanism with public participation, a reporting and reward system, and ensure regulations are forward-looking and flexible through expert forums and interdisciplinary research.

3.2.3. Optimizing the Implementation Path of the Strategy

China's youth AI ethics education is in its early stages and needs a multi-party governance framework. Schools should integrate AI ethics into moral education through curriculum reform, embed it in IT or AI courses, and design it based on Bloom's theory. Interactive methods like situational simulation can build AI ethics awareness. High-quality teacher training is essential. Clear regulations and accountability mechanisms are needed to ensure data privacy and AI

ethics implementation, with multiple stakeholders collaborating to promote AI ethics through social practices and distributing ethics guides.

4. Design of the AIED Toolkit Learning Toolkit

4.1. Toolkit Design Concept

4.1.1. Design Objectives of the Learning Toolkit based on the "Scarecrow" Framework Model.

Creating a useful AIED ethics framework requires incorporating known ethical issues and allowing flexibility for new knowledge. AIED is both an empirical and design science, focused on creating adaptable educational tools for specific users and contexts, emphasizing practical, human-centered design to promote positive behavioral change.

(1) Guarantee of trustworthiness

Building trust at the information level requires improving the robustness and reliability of technology products. Teachers collect learner data, necessitating robust and secure technology to prevent privacy violations and data leaks. Poor AIED system design or quality can erode public trust and trigger skepticism. Therefore, AIED must ensure robustness, comply with regulations, and avoid issues like data leakage and bias. The learning toolkit's transparent reasoning allows students to control their learning and teachers to better understand and manage students.

The toolkit needs to develop personalized learning plans through multimodal data integration and learner profile construction, accurately identifying each student's weak knowledge points via data analysis and dynamically recommending tailored learning paths. It adapts to the learner's cognitive level and style, achieving the goal of personalized "tailored to the needs of each individual." Meanwhile, "Digital Bloom" combines various APP tools with Bloom's cognitive objectives, supporting digital teaching and learning on one-to-one devices. It focuses on student core literacy through instructional design, covering low-order knowledge to high-order innovation. The toolkit promotes cognitive development using task design and feedback mechanisms.

A complete AIED ethics must address both known and unknown ethical issues beyond data, computation, and education. It requires interdisciplinary dialogue and input from learning sciences, cognitive neuroscience, and philosophy. The toolkit should include ethical reflection modules to promote critical thinking and responsible AI use, and consensus and monitoring of AI education ethics should be established based on ethical norms and principles.

4.1.2. Specific Contents of the Toolkit

The development of a systematic learning toolkit is crucial in the practice of AI ethics education for youth. The toolkit aims to help adolescents gain a deeper understanding of the core concepts of AI ethics and develop their ability to address ethical challenges in practical applications through diverse learning resources, personalized learning paths, and timely feedback and analysis. Below are the specific contents of the toolkit:

Table 2. Toolkit Specifics

	Multimodal Learning Resources	Personalized Learning Pathways	Learning analysis and assessment
essential properties implied or reflected by a notion	The integration of multimodal macromodels (video, voice, text, etc.) helps to integrate multiple forms of data from different channels to achieve a more complete picture of the learner .	Personalized learning path recommendation is to adaptively adjust the learning resources and activity sequences according to the constructed learner portrait model by exploring the learner's personality characteristics to form a learning path suitable for each learner.	Learning analysis and assessment is the process by which teachers and students gather and interpret evidence as a means of determining the current level of learning of teachers and students and the learning goals they will subsequently aim to achieve, and how they will achieve the learning goals they are pursuing.
thrust	Video materials: resources such as vivid animations, documentaries, micro-lessons or classroom transcripts.	Learning level assessment: a questionnaire and a simple test to assess students' current level of understanding of AI and ethics knowledge and to determine a learner profile.	Learning Status Report: The report includes the student's mastery of each knowledge point, strengths and weaknesses in the learning process, and suggested learning directions.
	Audio materials: audio content in the form of expert lectures, podcasts, etc.; audio compilations of important knowledge in the form of songs and jingles.	Customized learning content: Dynamically adjusting the difficulty and depth of learning resources through, for example, feature matching methods or knowledge modeling methods.	Real-time feedback mechanism: During the learning process, the system helps students to correct errors and deepen their understanding through instant feedback; there are also regular stage-by-stage assessments and summative assessments.
	Textual materials: organize and analyze the teaching materials, popular science books, typical case studies, relevant academic papers, etc. involved; appropriately develop illustrated books, popular science books and other books of interest.	Learning progress tracking: Students' learning progress is recorded through the Learning Management System (LMS), whereby teachers provide personalized guidance and feedback to students.	

5. Summary

This study has thoroughly explored the current state of ethics education for youth AI applications both domestically and internationally, and proposed optimization strategies and toolkit design solutions. It was found that although global attention to youth AI ethics education has increased, it remains in the early stages, with significant differences in curriculum, teaching resources, and educational concepts across countries and regions. Based on these findings, a series of optimization strategies have been proposed to improve the curriculum system, strengthen teacher training, and develop diversified teaching tools to promote the systematization and standardization of ethics education.

Acknowledgments

Fund Project: The Current Situation, Optimization Strategies, and Implications of Artificial Intelligence Ethics Education for Adolescents -- Based on the scarecrow model.

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