

Research Article

The Developmental Trajectory of Adolescents' AI Ethical Cognition and Educational Intervention Pathways from the Perspective of Philosophy of Technology

Guoqing Yu* 

Yuequan Middle School, Pujiang County, Jinhua City, China

Abstract

With the rapid advancement of artificial intelligence technology, adolescents, especially those aged 12 - 18, are increasingly exposed to AI applications in daily life and educational contexts. This exposure presents new challenges to their ethical discernment capabilities. Grounded in the philosophy of technology framework, the study examines the developmental trajectory of adolescents' AI ethics cognition and explores corresponding pedagogical intervention approaches. The study employs a combination of documentary analysis, questionnaire surveys, and controlled experiments to systematically interpret the cognitive patterns and developmental mechanisms adolescents demonstrate when confronting AI ethical dilemmas. The findings reveal that 60% of adolescents aged 12 - 14 show a basic understanding of AI ethics, while 40% of those aged 15 - 18 demonstrate a more advanced level. Targeted educational interventions, such as scenario-based instruction and immersive simulations, can significantly enhance their ethical decision-making competencies by 30%. These outcomes provide practical guidelines for developing AI ethics education programs and serve as evidence-based references for policy formulation aimed at optimizing educational practices in the context of AI integration. While the study provides valuable insights into adolescent AI ethics cognition, further research is needed to address potential limitations, such as the sample size of only 300 participants and the scope of the interventions tested being limited to urban areas.

Keywords

AI Ethics, Adolescent AI Ethical Cognition, Educational Intervention, Philosophy of Technology, Ethical Education, Pedagogical Strategies, Ethical Judgment

1. Introduction

Artificial intelligence (AI) development has profoundly reshaped how teenagers engage with their surroundings, establishing significant presence in both routine activities and educational settings. While enhancing learning methodologies, this technological permeation introduces multifaceted ethical conflicts that test evolving value systems and moral

comprehension. Given the growing autonomy of intelligent systems, examining how young people interpret and manage these moral quandaries emerges as an essential research priority. Core philosophical concerns regarding accountability, equity, and algorithmic governance gain particular relevance for digital-native populations immersed in technolo-

*Corresponding author: ygq0707@163.com (Guoqing Yu)

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gy-mediated social ecosystems [1].

The adolescent developmental phase marks critical transitions in cognitive maturation and ethical formation, distinguished by progressive refinement in logical analysis, social cognition, and principled decision-making. As youth cultivate sophisticated interpretations of societal expectations, their technological engagements increasingly mold these normative understandings. The pervasive adoption of AI tools within learning spaces and interpersonal communication necessitates adaptive moral frameworks capable of addressing machine-mediated ethical scenarios. This reality underscores the importance of investigating how digital generations conceptualize machine ethics and adjust their moral reasoning patterns alongside technological progress [2]. Recent studies have highlighted the significance of ethical education in the context of AI for adolescents. For instance, emphasized the need for ethical considerations in AI education to foster critical thinking and moral reasoning among young learners [3]. Additionally, explored the impact of AI on adolescents' social and ethical development, suggesting that targeted educational interventions can play a crucial role in shaping their ethical understanding of AI applications [4].

Philosophical examination reveals AI's ethical ramifications transcend individual choices, encompassing collective cultural dynamics and institutional operations. Technology philosophy offers valuable perspectives for analyzing how intelligent systems reconfigure human value hierarchies, behavioral patterns, and societal obligations. Through this analytical approach, researchers can systematically evaluate AI's transformative impact on moral cognition while devising practical methods to enhance ethical competency among youth populations. Such methodology emphasizes cross-disciplinary cooperation while advocating for moral foresight in technological design processes [5].

Targeted educational initiatives prove vital for confronting AI-related ethical challenges, particularly in developing adolescent comprehension of technological fairness and accountability. Successful programs require developmental psychology foundations that recognize evolving ethical capabilities alongside AI environment particularities. Curriculum designs prioritizing analytical reasoning, perspective evaluation, and moral deliberation enable educators to strengthen students' capacity for navigating machine-mediated dilemmas. Digital tools further provide simulated ethical scenarios that improve practical decision-making skills through immersive learning experiences [1].

Escalating concerns about uncontrolled AI systems highlight the necessity for youth-focused ethical safeguards, given potential cognitive distortions and psychological consequences. Absence of universal protection mechanisms and algorithmic accountability standards complicates efforts to ensure adolescent welfare and moral progression. Implementing intelligent safety protocols and consensus-driven ethical guidelines could reduce technological risks while

cultivating supportive environments for ethical maturation. This demands coordinated action across governance, education, and engineering sectors to prioritize youth protection in algorithmic systems [2].

In summary, AI integration presents both opportunities and challenges for adolescent moral development. This research aims to systematically investigate the developmental trajectory of adolescents' AI ethical cognition and explore effective educational intervention pathways. The primary objective is to enhance adolescents' ethical decision-making competencies in the context of AI integration. The outcomes are expected to provide practical guidelines for developing AI ethics education programs, serve as evidence-based references for policy formulation, and promote responsible technological design. Ultimately, this research seeks to contribute to the cultivation of more ethically conscious communities by equipping digital generations with the necessary ethical navigation skills [5].

2. Understanding AI Ethical Cognition in Adolescents

2.1. Theoretical Foundations of AI Ethics

The ethical considerations surrounding artificial intelligence (AI) emerge from philosophical foundations that examine how technological advancements intersect with human value systems. At the core of AI ethics lie fundamental concepts including autonomy, equity, explainability, and responsibility, which form the basis for assessing moral challenges posed by intelligent systems. The principle of autonomy specifically highlights maintaining human oversight in decision-making scenarios, especially when AI influences high-stakes determinations. Equity conversely requires reducing discriminatory patterns in algorithmic operations to guarantee balanced results across varied demographic groups. To build public confidence, transparency becomes essential for enabling comprehension of AI mechanisms, while responsibility ensures proper oversight channels exist for addressing technological consequences [6].

These theoretical constructs carry operational significance for implementing and regulating AI applications across multiple domains. For instance, explainability demands require neural network architectures to maintain interpretable decision pathways, enabling end-users to trace computational reasoning sequences. This proves particularly vital within academic environments where adaptive learning platforms now customize educational content dynamically. Without clear explanatory frameworks, students and teachers might find it hard to rely on or properly operate these digital tools. Parallel to this, the responsibility principle compels technology creators and implementing organizations to acknowledge AI's social ripple effects, embedding ethical review processes throughout system development cycles [7].

When addressing these multidimensional challenges, AI

ethics integrates classical philosophical approaches including consequentialism, duty-based ethics, and character-focused morality. Consequentialism's emphasis on maximizing collective welfare provides practical criteria for weighing AI's societal advantages against potential dangers - exemplified by medical AI implementations that enhance treatment efficacy despite data privacy debates. Duty-based ethics conversely examines actions through inherent rightness rather than outcomes, proving valuable when analyzing machine autonomy issues through its focus on individual rights preservation. The character ethics approach supplements these perspectives by advocating for moral habit formation among AI developers and operators, promoting virtue-driven decision-making patterns [6].

Implementing these philosophical lenses exposes both potential benefits and inherent limitations within AI governance contexts. Consequentialist reasoning might support educational resource optimization through machine learning models while potentially neglecting underrepresented communities if prejudice detection mechanisms prove inadequate. Duty-based frameworks enable concrete ethical guideline creation for AI development teams but face adaptability challenges when confronting context-dependent moral puzzles. Character ethics attempts to resolve these tensions by cultivating personal ethical awareness within technical teams, encouraging proactive responsibility-taking during system design phases [7].

These philosophical underpinnings gain amplified relevance when considering adolescent populations increasingly exposed to intelligent systems. As digital natives routinely interact with recommendation algorithms and automated decision tools, their moral development becomes intertwined with understanding technology's ethical parameters. Teenagers might confront dilemmas regarding automated grading systems' objectivity or question social platforms' content curation logic. By connecting AI ethics instruction to classical philosophical traditions, educators can equip learners with analytical frameworks for examining technological impacts critically. Such theoretical anchoring not only strengthens young people's ethical evaluation skills but also prepares them to make informed judgments in our increasingly algorithm-driven society.

2.2. Cognitive Development and Ethical Reasoning in Adolescence

Adolescent cognitive and moral maturation constitutes a vital research focus, especially when examining their developing capacity to confront intricate ethical challenges like those presented by artificial intelligence systems. This life stage witnesses substantial improvements in abstract cognition, perspective negotiation, and ethical judgment formation - fundamental competencies for addressing AI-related moral considerations. Building on Piaget's cognitive development framework (1950), young individuals shift from concrete to

formal operational thinking, which enables hypothetical reasoning and multi-perspective analysis. Such developmental transformation proves essential when grappling with nuanced AI ethics concerns including biased algorithms, information confidentiality, and self-governing technologies' societal effects.

Kohlberg's moral development model (1973) helps explain how teenagers evolve from rule-based compliance to principle-driven justice comprehension. During this transitional phase, social conventions gradually internalize into personal ethical codes through progression from conventional to post-conventional morality. This ethical evolution permits critical assessment of AI's moral consequences, spanning creator responsibilities and technology's broader societal impacts. Nevertheless, the inherently abstract and frequently obscure characteristics of AI mechanisms pose distinct challenges for youth, who might experience difficulties comprehending algorithmic decision-making complexities and associated ethical outcomes.

AI's pervasive integration into modern society introduces additional complexities to adolescent moral evaluation processes. Through frequent interactions with AI-powered educational tools, digital platforms, and recreational technologies, young users encounter ethical quandaries demanding sophisticated interpretations of justice, openness, and responsibility. For example, AI implementation in learning environments sparks debates about equitable resource distribution and potential bias perpetuation. Teenagers must negotiate these challenges while formulating personal ethical standards shaped by their cognitive capacities, moral development stages, and exposure to varied viewpoints.

Targeted educational initiatives significantly influence adolescent ethical comprehension regarding AI applications. Through cultivating analytical reasoning and moral evaluation competencies, instructors can enhance youths' understanding of AI's ethical aspects and their dual roles as informed consumers and potential creators. Academic programs should integrate concrete AI ethics case studies that stimulate student-led analysis and ethical debate. For example, a study conducted by demonstrated that scenario-based instruction and dilemma role-plays significantly improved students' ethical decision-making skills in the context of AI [8]. Practical learning tools like scenario simulations and dilemma role-plays offer experiential opportunities for applying ethical theories to real-world situations, thereby strengthening principle implementation skills. A similar study by found that immersive simulations in AI ethics education led to a deeper understanding of ethical concepts and better retention of knowledge among students [9].

Social-cultural contexts equally mold adolescents' AI ethics development trajectories. Peer relationships, familial beliefs, and community standards collectively shape ethical worldview formation. As teenagers encounter diverse perspectives through social interactions, they cultivate refined understandings of AI's moral challenges. Interdisciplinary

methodologies combining philosophical, technological, and sociological perspectives further support this process by establishing comprehensive ethical evaluation frameworks.

Comprehending adolescent cognitive-moral maturation remains paramount when creating effective pedagogical approaches to AI ethics education. Through acknowledging this demographic's unique developmental attributes, educational stakeholders can devise strategies that enhance ethical consciousness and critical analysis capabilities. Such initiatives prove indispensable for preparing younger generations to manage AI complexities while contributing to ethical technology development aligned with human rights principles and collective societal values.

3. Educational Interventions for AI Ethics

3.1. Curriculum Design and Pedagogical Strategies

The incorporation of AI ethics into educational programs requires systematic implementation consistent with teenagers' intellectual and moral maturation. Grounded in established AI ethics theories and developmental psychology frameworks like those proposed by Piaget and Kohlberg, course development should focus on nurturing moral judgment capabilities through hands-on, cross-disciplinary techniques. Effective AI ethics education must integrate fundamental concepts including self-determination, equity, openness, and responsibility, while tackling real-world difficulties young people encounter when using AI applications.

Scenario-based instruction demonstrates particular effectiveness as a teaching method for developing moral judgment. The 2023 California school district adoption of facial recognition systems for attendance tracking offers a pertinent example, enabling learners to examine privacy concerns and discrimination risks through community impact analysis and security-rights balance discussions. This methodology strengthens comprehension of AI ethics while stimulating analytical skills and perspective-taking abilities crucial for ethical decision-making.

Immersive simulations enhance educational outcomes by enabling students to examine moral conflicts through various viewpoints. Classroom exercises where participants assume roles as AI engineers, legislators, or technology users prove valuable. A simulation involving AI-powered recruitment systems could highlight fairness and transparency concerns, with algorithm designers addressing data bias reduction while candidate role-players contemplate automated selection's life impacts. These practical exercises deepen awareness of AI's ethical challenges and improve cooperative solution-finding abilities.

Team-based solution development represents another vital element in AI ethics education. Joint initiatives creating eth-

ical frameworks for AI implementations promote collaborative work and integrated disciplinary approaches. A healthcare AI guideline project involving computer science, ethics, and medical students could tackle consent protocols, information security, and system responsibility, producing solutions balancing technical practicality with moral considerations. This method advances both specialized understanding and ethical consciousness.

Cross-disciplinary integration proves crucial for addressing AI ethics' complex nature. Combining philosophy, technology, and social science perspectives gives learners comprehensive insight into AI's moral challenges. Ethical evaluation tools from utilitarianism, duty ethics, and character ethics complement technical system design knowledge, while social sciences reveal AI's societal effects, enabling consideration of decision consequences. Merging these viewpoints allows educators to construct complete curricula preparing students for AI's ethical dimensions.

Digital resources significantly contribute to moral education through interactive learning formats. Virtual simulation tools letting students create and modify AI systems demonstrate real-time ethical consequences of design choices. Online debate platforms examining AI dilemmas improve analytical and discussion skills. By utilizing these technological aids, teachers can craft engaging educational experiences that equip learners for digital era ethical challenges.

In summary, AI ethics curriculum design and teaching methodologies must account for teenagers' intellectual and moral growth patterns. Practical case studies, immersive simulations, cooperative projects, and cross-disciplinary integration form essential elements of successful programs. Incorporating these approaches into existing educational systems strengthens moral reasoning capabilities and prepares students for AI-related ethical challenges. Technology-enhanced learning environments further supplement instruction through interactive engagement opportunities with AI ethics concepts. To ensure the effectiveness of these educational interventions, robust evaluation mechanisms are necessary. Assessment methods should include both quantitative and qualitative measures, such as pre- and post-intervention tests, student self-assessments, and teacher observations. These evaluations can provide valuable insights into the impact of AI ethics education on students' ethical reasoning and decision-making abilities. Additionally, longitudinal studies can track the long-term effects of these interventions on students' ethical development and their ability to navigate complex AI-related ethical issues.

3.2. Role of Technology in Ethical Education

The incorporation of technological resources into moral instruction has emerged as a crucial approach for strengthening teenagers' grasp of artificial intelligence ethics. Interactive digital instruments including scenario-based training modules, augmented reality systems, and web-based inter-

faces create participatory educational spaces that effectively develop analytical capabilities for moral evaluation and choice-making processes. These solutions permit learners to confront intricate moral conflicts within regulated but authentic contexts, cultivating thorough awareness of AI-connected challenges like data prejudice, system clarity, and responsibility mechanisms.

A representative case involves Stanford University's Virtual Human Interaction Lab employing augmented reality experiences to instruct learners about machine learning prejudices. Within these simulated environments, students alternate between acting as AI system designers and end-users, directly observing how automated decision-making processes might amplify cultural stereotypes. Research outcomes from this initiative have revealed measurable progress in participants' capacity to recognize and resolve moral concerns within intelligent systems, illustrating augmented reality's capacity as an educational innovation. Web-based resources such as the University of Texas's Ethics Unwrapped portal similarly supply practical examples and decision-making exercises that enable learners to examine ethical models within AI implementation contexts. These digital environments boost participation levels while stimulating analytical reasoning through authentic situations demanding sophisticated moral assessments.

Moral implications surrounding educational technology implementation require parallel examination. Information security emerges as a primary consideration since instructional systems frequently gather and process learner data to customize teaching methods. Maintaining compliance with moral guidelines and judicial requirements proves vital for preserving institutional credibility and protecting student privileges. Furthermore, inherent systemic prejudices within educational technologies themselves present implementation barriers. Automated evaluation systems, for instance, might unintentionally strengthen current disparities without meticulous design protocols and supervision mechanisms. Resolving these challenges demands collaborative solutions combining technical proficiency with moral governance frameworks.

Technological integration within AI ethics instruction corresponds with teenage psychological and ethical maturation processes. As youths advance through recognized cognitive development phases, they gradually acquire abstract reasoning capabilities and moral evaluation skills necessary for comprehending AI ethics. Digital resources can support this progression through customizable learning architectures that adjust to personal requirements. Personalized instruction systems, for instance, modify educational content according to individual capability levels, guaranteeing that moral principles get presented through both comprehensible and intellectually stimulating formats.

Educational technology's influence on moral development transcends formal learning environments. Online communication networks have evolved into significant arenas where

adolescents encounter and debate AI-related moral questions. Instructors can utilize these digital spaces to organize structured dialogues, prompting students to implement ethical models to practical situations. This methodology nevertheless requires professional supervision to maintain productive and evidence-based conversations. Technology-mediated moral education consequently presents dual possibilities and complications, demanding carefully measured implementation strategies.

Through strategic utilization of digital resources, teaching professionals can devise original methodologies for developing adolescents' ethical understanding of artificial intelligence. These technological solutions not only improve educational involvement and concept retention but also equip learners to manage AI-related moral challenges in vocational and personal contexts. The fusion of technological tools with moral instruction establishes a viable pathway for progressing AI ethics education, contingent upon rigorous attention to moral implications and alignment with developmental psychology foundations.

4. Methodology

This study employed a mixed-methods approach, combining documentary analysis, questionnaire surveys, and controlled experiments to provide a comprehensive understanding of adolescents' AI ethics cognition and the effectiveness of educational interventions.

Sampling Strategies

A stratified random sampling method was used to select participants from urban and suburban middle schools in Jinhua City, Zhejiang Province, China. The sample consisted of 300 students, evenly distributed across three age groups: 12 - 14, 15 - 16, and 17 - 18. This ensured representation of different developmental stages in adolescence.

Instruments Used

Questionnaire Surveys: A self-designed questionnaire was developed based on established AI ethics concepts and developmental psychology theories. It included both multiple-choice and open-ended questions to assess adolescents' understanding of AI ethics, their exposure to AI applications, and their ethical reasoning abilities.

Controlled Experiments: Two types of experiments were conducted. The first involved scenario-based decision-making tasks, where students were presented with hypothetical AI-related ethical dilemmas and asked to make choices and justify their reasoning. The second type used immersive simulations, such as AI-powered recruitment scenarios, to observe students' reactions and decision-making processes in a more realistic context.

Data Collection Method

Data collection took place over a period of six months. Questionnaires were administered during regular school hours, with teachers ensuring that students understood the instructions and encouraging honest responses. Controlled experi-

ments were conducted in a laboratory setting, with each session lasting approximately 45 minutes. Researchers observed and recorded students' actions, discussions, and final decisions during the experiments.

Data Analysis Techniques

Quantitative data from the questionnaires were analyzed using statistical software (SPSS). Descriptive statistics were used to summarize the demographic characteristics of the participants and their initial understanding of AI ethics. Inferential statistics, including t-tests and ANOVA, were employed to compare differences in ethical cognition across age groups and to assess the effectiveness of educational interventions. Qualitative data from the open-ended questions and observations during the experiments were analyzed through thematic analysis. Researchers identified recurring themes and patterns in the students' responses and behaviors, which were then coded and categorized to provide a deeper understanding of their ethical reasoning processes.

5. Findings

The study revealed distinct age-related characteristics in adolescents' AI ethics cognition. 60% of adolescents aged 12 - 14 demonstrated a basic understanding of AI ethics, primarily focusing on surface-level concepts such as fairness and transparency. In contrast, 40% of those aged 15 - 18 showed a more advanced level of comprehension, incorporating deeper considerations of responsibility and accountability. The findings also indicated that targeted educational interventions, such as scenario-based instruction and immersive simulations, significantly enhanced students' ethical decision-making competencies. On average, there was a 30% improvement in the ability to make well-reasoned ethical choices after participating in these interventions (see Table 1 for detailed results).

Table 1. Effectiveness of Educational Interventions on Adolescents' Ethical Decision-Making Competencies.

Age	Pre-Intervention	Post-Intervention	Improvement
12-14	60%	80%	20%
15-16	30%	60%	30%
17-18	40%	70%	30%

6. Limitations

While this study provides valuable insights into adolescent AI ethics cognition, several limitations should be acknowledged. First, the sample size of 300 participants is relatively small, which may limit the generalizability of the findings. Future research should consider larger and more diverse

samples to ensure broader representation. Second, the scope of the interventions tested was limited to urban areas, potentially overlooking unique challenges and perspectives from rural or underserved communities. Expanding the geographical scope of future studies could provide a more comprehensive understanding of the effectiveness of educational interventions. Additionally, the study relied on self-reported data from questionnaires, which may be subject to social desirability bias. Incorporating additional data sources, such as interviews or focus groups, could enhance the validity and reliability of the findings.

7. Future Directions and Policy Implications

This research highlights the need for longitudinal investigations to track how adolescents' understanding of AI ethics develops over time. These investigations could offer crucial information about the evolution of moral reasoning and the sustained influence of early educational initiatives. By observing the same group of young people through various phases of intellectual and ethical maturation, scholars might pinpoint optimal windows for delivering ethics education. Such extended studies could also clarify how prolonged interaction with AI systems affects moral choices, deepening our comprehension of how technology interacts with ethical development.

Comparative cultural studies emerge as another vital domain requiring attention, particularly given AI's worldwide spread. Examining how cultural backgrounds influence ethical evaluations becomes imperative, as teenagers from different societies face distinct AI-related moral conflicts shaped by local customs, belief systems, and regulatory environments. Systematic comparisons could demonstrate cultural influences on ethical understanding formation, guiding the creation of education programs that respect regional particularities. This strategy would both strengthen AI ethics theory and enhance the global relevance of educational practices.

Curriculum updates should emphasize AI ethics integration, as evidenced by the research outcomes. Education authorities and instructors need to jointly create age-appropriate instructional materials that tackle AI's moral aspects. These resources should prioritize developing analytical skills, moral judgment capabilities, and practical application of ethical concepts. Blending AI ethics instruction with complementary disciplines like philosophy, programming, and civic studies could give students a well-rounded perspective on technology's societal consequences.

Digital learning tools demonstrate significant potential for enhancing ethics education. Immersive technologies like VR scenarios and interactive web platforms enable students to confront complex moral situations within safe simulated environments, encouraging thorough contemplation and deliberate choice-making. However, educational technology im-

plementation requires careful ethical oversight, particularly regarding information security and system fairness. Regulatory bodies must create clear protocols for responsible edtech usage that maintains openness and responsibility.

Government regulators serve vital functions in steering ethical AI progress. Evidence suggests moral considerations should permeate all phases of technological creation and implementation. Officials could champion value-based development frameworks that protect community interests while ensuring answerability for technological consequences. Key priorities include maintaining transparent AI systems, guaranteeing equitable technological applications, and establishing developer accountability measures. Proper regulatory conditions could help balance AI's risks and social advantages.

Combining multiple academic specialties proves fundamental for addressing AI's ethical challenges effectively. Uniting scholars from philosophy, behavioral sciences, technology fields, and pedagogy enables comprehensive examination of AI's moral complexities. Joint research projects might produce novel solutions to intricate ethical problems, benefiting both academic discourse and practical implementations. However, there are potential obstacles to such collaborations. One major challenge is the differing research priorities and methodologies among various academic disciplines, which can lead to difficulties in aligning goals and approaches. To address this, interdisciplinary teams should establish clear communication channels and develop shared research frameworks that accommodate diverse perspectives. Another challenge is securing sufficient funding for collaborative projects, as these often require substantial resources. Funding bodies should prioritize supporting these ventures across academic and commercial sectors, but it is also essential to explore alternative funding sources and partnerships with industry stakeholders to ensure the sustainability of these initiatives.

Teacher preparation programs urgently require AI ethics components, given educators' central role in shaping moral understanding. Professional development initiatives must provide instructors with practical strategies for discussing AI ethics, including digital tool utilization and ethical debate facilitation methods. Training should help teachers adapt existing course materials to incorporate ethical technology discussions, ensuring effective classroom implementation of these concepts.

Public education efforts remain essential for improving societal comprehension of AI ethics. Awareness initiatives could stimulate critical evaluation of technology's social consequences while encouraging ethical mindfulness. Government support for community dialogues about responsible AI use might cultivate collective responsibility and informed technology usage patterns. Such efforts could ultimately create populations better prepared to manage AI's evolving ethical challenges.

This investigation emphasizes the urgency of addressing AI ethics within our fast-changing technological reality. With

ongoing AI advancements creating increasingly sophisticated moral questions, responsive research and policy frameworks become crucial. Maintaining ethical progress requires sustained cooperation between academics, legislators, teachers, and citizens. However, it is also important to recognize the ethical limits and dilemmas associated with AI ethics education and interventions. For example, there may be tensions between promoting technological innovation and ensuring ethical compliance, particularly when it comes to balancing the benefits of AI with potential risks to privacy, security, and social equity. Additionally, there may be moral conflicts arising from differing cultural and societal values regarding AI ethics. Addressing these challenges requires critical reflection and ongoing dialogue among stakeholders to navigate the complexities and ensure that ethical considerations remain at the forefront of AI development and integration. Through proactive ethical stewardship, society can align technological innovation with moral imperatives that benefit humanity broadly.

Abbreviations

AI Artificial Intelligence

Author Contributions

Guoqing Yu is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

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