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REINVENTING COMPREHENSIVE HUMAN EDUCATION IN THE AGE OF ARTIFICIAL INTELLIGENCE: A REALISTIC HUMANISM FRAMEWORK INTEGRATING EDUCATION, TECHNOLOGY, AND SOCIAL RESPONSIBILITY

(Research article)

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Abstract

Artificial intelligence (AI), big data, and algorithmic technologies are transforming contemporary education by expanding access to knowledge, enabling personalized learning, and improving educational management. However, these technologies also raise fundamental concerns about human autonomy, reflective judgment, moral responsibility, social cohesion, and the technocratic reduction of education to efficiency and labor-market adaptation. This study aims to develop the Realistic Humanism Framework as a conceptual and normative foundation for reconstructing comprehensive human education in the age of artificial intelligence. Rather than conducting empirical measurement, the study employs philosophical analysis, literature-based synthesis, interdisciplinary interpretation, and normative theoretical construction. Drawing on classical theories of humanistic education and contemporary studies on AI, data society, and algorithmic governance, the article clarifies the relationship among education, technology, human subjectivity, and social responsibility. The analysis shows that education in the AI era should simultaneously cultivate four core capacities: cognitive capacity, reflective capacity, creative capacity, and responsibility capacity. The study concludes that comprehensive human education is necessary for orienting technological development toward human dignity, social justice, democratic participation, and the common good.

Keywords: Education; humanities; reflection; responsibility; Artificial Intelligence

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1. Introduction

The rapid development of artificial intelligence (AI), big data, and algorithmic technologies is creating profound transformations in the education sector. Intelligent learning platforms and AI tools not only expand access to knowledge but also promote personalized learning and improve the efficiency of educational management. Besides those opportunities, many fundamental issues of education have not been adequately addressed. The trend toward technocratic education is increasing as efficiency, productivity, and the ability to meet labor market needs become the main evaluation criteria. This raises the risk of narrowing the goal of education to mere human resource training. In contrast, the role of education in character formation, moral development, and nurturing social responsibility may be overlooked. At the same time, the explosion of information, coupled with increasingly deep algorithmic intervention in the learning process, is posing new challenges to learners' capacity for reflection, independent thinking, and autonomy. The urgency of the problem comes not only from the speed of technological development but also from the social and human consequences it creates. If education does not adapt to the digital environment, learners may be equipped with many technical skills. However, they may not be able to orient their values and sense of responsibility, or master technology. In the long run, this can increase reliance on algorithmic systems, reduce human subjectivity, and widen the inequality gap in access to development opportunities. Although there has been extensive research on the application of AI in education, there remains a lack of an integrated theoretical framework that connects technological development, human development, and social responsibility. This gap requires new approaches to redefine the purpose of education in the data society. From that practice, the study proposes the Realistic Humanism Framework to recreate comprehensive human education in the era of artificial intelligence, towards sustainable development, human dignity, and common good.

2. Literature Review and Research Gap

Research on education in the context of digital transformation and artificial intelligence has attracted growing interest from scientists worldwide in recent years (Selwyn, 2022). Many of the papers focus on analyzing the potential of AI to personalize learning, support teaching, and improve the effectiveness of educational management (Luckin et al., 2016). These studies show that technology can expand access to knowledge and improve learners' learning outcomes (Zawacki-Richter et al., 2019). Besides the technical benefits, many scholars also point to the risks of digitizing education to privacy, autonomy, and social justice (Williamson & Eynon, 2020). The proliferation of data- and algorithm-based evaluation systems poses the risk of homogenizing education through measurable performance indicators (Knox et al., 2020). This raises the need to reconsider the goals of education in the context of a data society (Biesta, 2020).

From the perspective of educational philosophy, many studies emphasize that education is not only aimed at imparting knowledge but also towards the formation of human personality and civic capacity (Dewey, 1916/2007). Education is understood as the process of developing human autonomy and the capacity to reason in social life (Kant, 1803/2007). At the same time, education is seen as a means of liberating people from forms of oppression and dependence in modern society (Freire, 1970). Recent studies of algorithmic society show that the power of technology is increasingly profoundly impacting human cognition, behavior, and decision-making processes (Beer, 2017). Reflective capacity is considered an important condition for maintaining subjectivity in an increasingly complex digital environment (Archer, 2012). Many scholars argue that education needs to focus on developing critical thinking, creativity, and social responsibility rather than just training technical skills (Biesta, 2022).

Although there has been extensive research on AI in education, humanities education, and the data society, most work still treats these issues as relatively separate fields (Williamson, 2016; Williamson & Eynon, 2020). Current studies have mainly focused on technological efficacy or individual ethical aspects, without yet developing an integrated theoretical framework linking technological development, human development, and social responsibility (Floridi, 2023). This research gap highlights the need to develop a new theoretical paradigm that integrates cognitive, reflective, creative, and responsibility capacities into a unified system. On that basis, this study proposes the Realistic Humanism Framework as a theoretical approach to reconstruct comprehensive human education in the age of artificial intelligence. Accordingly, the study addresses the following research question: How can comprehensive human education be reconceptualized through a Realistic Humanism Framework that integrates cognitive, reflective, creative, and responsibility capacities in the age of artificial intelligence?

3. Methodology

This study uses a qualitative, interdisciplinary, conceptual approach to analyze the relationship among education, artificial intelligence, human development, and social responsibility in the context of digital transformation. It is a theoretical inquiry rather than an empirical study or systematic review. The literature was selected purposively for conceptual relevance to education in the age of AI, the philosophy of education, the data society, technological ethics, and human development. Sources include the classic works of Aristotle (1999), Kant (1803/2007), Dewey (1916/2007), and Freire (1970), as well as contemporary studies of artificial intelligence and education. The study also applies philosophical analysis and interpretation to clarify assumptions about human nature, educational goals, and the role of technology in social life. The analysis adapts Pound and Campbell's (2015) theory-synthesis procedure in three stages. First, synthesis preparation identifies concepts concerning human nature, educational aims, technological mediation, and social responsibility. Second, synthesis compares points of

convergence and divergence across philosophical, pedagogical, sociological, and technological-ethics perspectives. Third, synthesis refinement organizes the recurring concepts into four interrelated capacities: cognitive, reflective, creative, and responsibility capacities. The resulting Realistic Humanism Framework is assessed for internal conceptual coherence and normative relevance; it has not yet been empirically validated.

THE REALISTIC HUMANISM FRAMEWORK (RHF)

Reconstructing Holistic Human Education in the Age of Artificial Intelligence

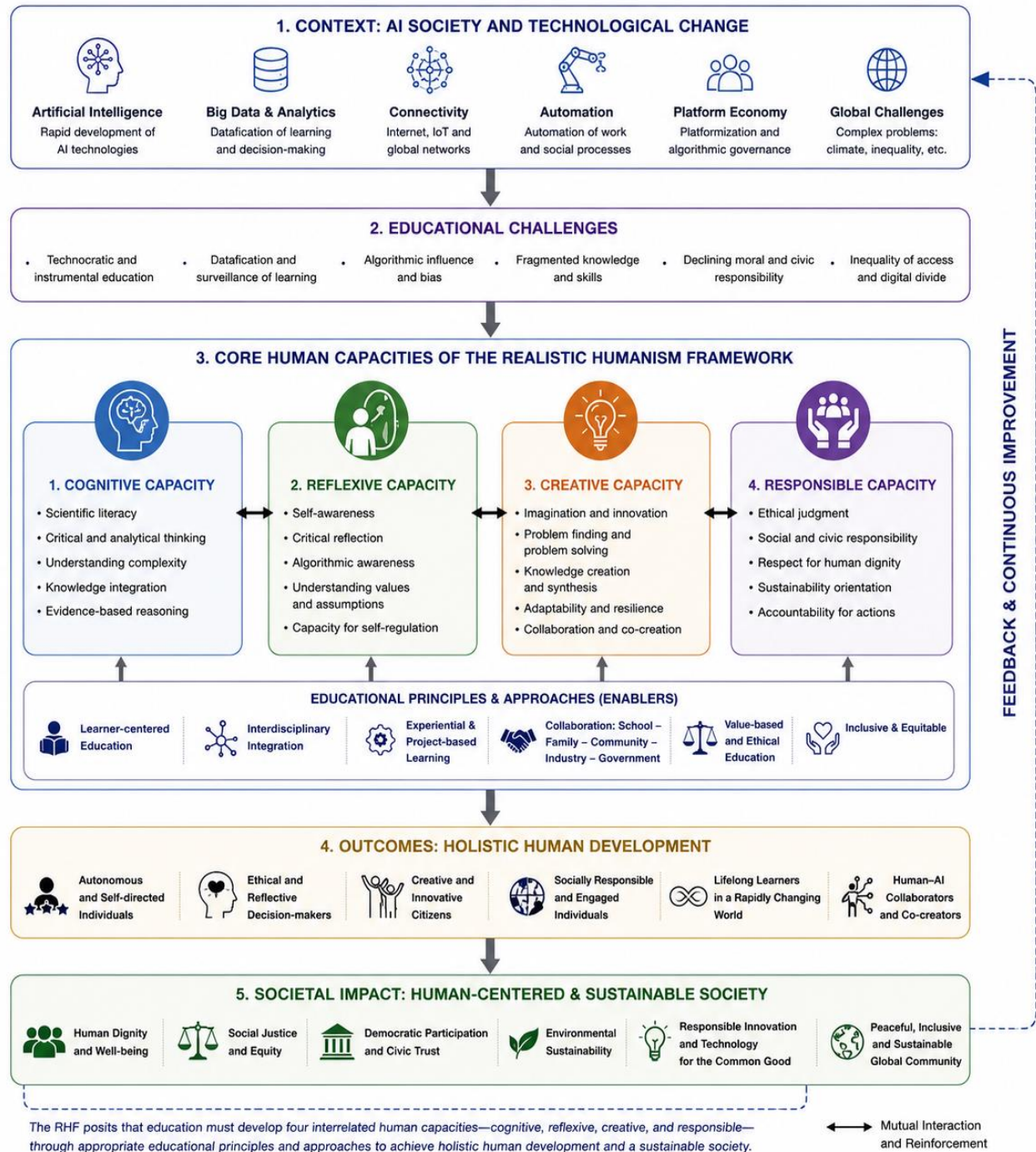


Figure 1. Realistic Humanism Framework integrating education, technology, and social responsibility. Source: Author's conceptualization.

4. Analysis and Discussion

The conceptual analysis suggests that the development of artificial intelligence is creating fundamental changes to the goals, content, and methods of organizing education. It also indicates that the current technocratic education model tends to prioritize technical competence and economic efficiency, while capacities for reflection, creativity, and social responsibility have not received commensurate attention. Based on the synthesis of approaches to educational philosophy, data society theory, and technological ethics, the study proposes the Realistic Humanism Framework illustrated in Figure 1. It consists of four core capacities: cognitive, reflective, creative, and responsibility capacities. The framework suggests that education in the AI era should be oriented toward the comprehensive development of humans as free subjects capable of mastering technology, acting responsibly, and actively participating in the sustainable development of society.

4.1. Overcoming the technocratic education model in the era of artificial intelligence

One of the biggest challenges of contemporary education is the rise of a technocratic education model amid rapidly advancing science, technology, and artificial intelligence. In this model, education is increasingly evaluated by criteria such as efficiency, productivity, the ability to meet labor market needs, and adaptability to technological change. Those criteria are not without value, because modern society requires people to have professional capacity, the ability to use technology, and the ability to compete in a globalized environment. As technical objectives become the sole center of education, the humanistic nature of education begins to shrink (Biesta, 2020, 2022). Humans are increasingly seen as a productive resource, an object to be optimized, or a set of data that can be measured, analyzed, and predicted. The development of artificial intelligence makes the technocratic trend in education more pronounced. Intelligent learning systems can track learning behavior, analyze learning outcomes, and make increasingly accurate personalized recommendations. Many schools and educational institutions have used big data to evaluate teaching quality, forecast learning outcomes, and develop education management strategies (Luckin et al., 2016; Zawacki-Richter et al., 2019).

These technologies offer many practical benefits, but they also create the risk of homogenizing education into information processing. When education is understood primarily as the transmission and optimization of knowledge, other dimensions of human beings, such as emotions, morality, responsibility, freedom, and creativity, are easily overlooked. The core problem with the technocratic education model does not lie in the technology itself but in how people define the goals of education. If the ultimate goal of

education is to create a highly productive workforce, then education will be limited to economic function (Biesta, 2020, 2022). If the goal of education is to develop people as free and responsible subjects, then technology is only a means to that development. The difference between these two approaches determines the entire orientation of the education system. In the history of thought, education has never been just an activity of imparting knowledge. Since ancient times, education has been seen as the process of forming people (Aristotle, 1999; Dewey, 1916/2007; Freire, 1970; Kant, 1803/2007).

Aristotle (1999) argued that the goal of education is to help people develop the virtues necessary to achieve a good life. Kant (1803/2007) saw education as a condition for people to rise out of their state of dependence and become subjects capable of using their own reason. Dewey (1916/2007) emphasized the role of education in shaping citizens capable of participating in democratic life. Freire (1970) saw education as the means to liberate people from oppression and dependence. Despite their differences in approaches, they all share one thing in common: education must be geared towards the holistic development of the human person, not just technical or economic goals. In the context of a data society, the need to reaffirm the human nature of education is more urgent than ever. Algorithms are increasingly involved in the decision-making process in education, from enrollment, assessment, and learner classification to curriculum design. These systems are often built on quantitative criteria to optimize efficiency (Knox et al., 2020; Williamson, 2016).

Not every value of education can be quantified. Empathy, a sense of responsibility, a spirit of cooperation, honesty, or the capacity for reflection are qualities that are decisive for human development. However, they are difficult to measure with technical indicators. Values and virtues are fundamental elements of human motivation and action, indicating that educational value extends beyond measurable performance (Aristotle, 1999; Biesta, 2020). When what is measurable becomes central to education, what is not measurable is easily seen as unimportant, one of the great paradoxes of modern education. Many education systems achieve high results in testing, assessment, and standardization, but face serious problems with ethics, social beliefs, and mental health. Technical success is not synonymous with human development. Education should be understood as the process of forming the capacity to master oneself in specific conditions (Gross, 2025).

Humans do not exist in the void, but always live in biological, social, economic, and technological networks. Education not only helps people understand the world but also their own place in it. A person can possess a great deal of knowledge, but cannot direct life without the capacity for reflection and moral responsibility. A person with the ability to think independently and with a sense of responsibility can use knowledge and technology more effectively to solve practical problems. In the AI era, education needs to shift from a knowledge-accumulation model to one that develops reflective capacity. In the past, knowledge was often seen as a scarce resource, and education was responsible for imparting knowledge to learners. Nowadays, with the development of the Internet

and AI, knowledge is more accessible than ever. What humans lack is not information but the ability to evaluate, select, and use information responsibly. The most important capacity of education is no longer memorization, but reflection. The capacity for reflection enables people to recognize the conditions that govern their thoughts and behavior. In the digital environment, this is especially important because algorithms often shape people's attention, preferences, and behavior in ways they do not realize. Algorithms can confer informational and decision-making advantages that shape social environments and human behavior (Beer, 2017).

An education that focuses only on technology skills without helping learners understand how technology works will inadvertently create subjects that depend on technology. Reflective education will help people use technology without being dominated by it. In addition to the capacity for reflection, comprehensive education must also develop creativity. The development of AI is changing the nature of intellectual labor. Many repetitive tasks can be automated, while creative, interdisciplinary, and humanistic competencies are becoming increasingly important and require education to move beyond the stereotypical training model to encourage independent thinking, the ability to ask questions, and the capacity to create new knowledge (Luckin et al., 2016; Selwyn, 2022). Another often neglected aspect of the technocratic education model is social responsibility. In many cases, modern education focuses on personal success without fully considering the social consequences of knowledge and technology. Every human action takes place in a network of relationships with others. Knowledge not only creates capacity but also power. Education must simultaneously develop the ability to use that power responsibly. Technology is seen as a means of expanding human capacity, not an end goal. The success of education is not measured by the amount of technical skills imparted but by the degree to which people can take ownership of their lives, participate responsibly in the community, and contribute to the sustainable development of society. Knowledge is only truly meaningful when it is used to serve the common good and promote humanity's development. That requires learners to be aware of the connection between individual actions and broader social consequences. As AI becomes increasingly involved in the decision-making process, the responsibility for using technology has become an important ethical imperative. This requires rules that place responsibility on AI users to engage with systems in ways that reduce harmful bias (Ferrara, 2024; Floridi, 2023).

This view shows that education needs not only to train the ability to use technology, but also to develop the ability to identify and control its undesirable consequences. This is a condition to ensure that AI serves people instead of degrading human values. Overcoming the technocratic education model does not mean denying the role of science and technology. It is the process of repositioning technology in a human-centered value system. Education in the age of artificial intelligence needs to simultaneously develop knowledge, skills, moral qualities, and the capacity for reflection. Only then will

technology truly become a tool for human development instead of turning people into tools of technological systems. The central task of twenty-first-century education is not to train individuals who can adapt passively to technological changes, but to form subjects capable of orienting themselves to, renovating, and using technology for the benefit of people. This requires education that bridges professional competence and civic responsibility, linking technological understanding to ethical thinking. At the same time, the school needs to become an environment that nurtures learners' capacity for dialogue, cooperation, and criticism. These competencies help people actively participate in solving complex social problems amid digital transformation and globalization. A person-centered education must go beyond pure effective logic to move towards the holistic development of the individual and the community. Education not only prepares people to participate in the labor market but also helps them become responsible citizens, capable of thinking independently and acting for the common good. Technological development should therefore always be placed within a framework of social and moral values (Floridi, 2023). This is the foundation for building a comprehensive, humane, and sustainable education in the era of artificial intelligence.

4.2. Capacity for reflection and the formation of subjects in the algorithmic society

One of the most profound transformations of the artificial intelligence era lies not only in technological development but also in changes in how people perceive the world and themselves. If, in traditional industrial societies, institutions such as the family, schools, religion, and the state played a central role in personality formation, then, in a data society, more processes of cognition, communication, and decision-making are mediated by algorithmic systems. This raises a fundamental problem for education: How can people maintain their subjectivity in an environment where invisible technological mechanisms constantly influence their behavior, preferences, and choices? The development of social networks, search engines, online learning platforms, and artificial intelligence has created an information environment unprecedented in history. Humans can access huge amounts of knowledge in just a few seconds. The paradox of the digital age is that access to information is increasing, but the capacity to understand is not necessarily increasing. In many cases, information overload leads to cognitive fragmentation, impaired concentration, and reliance on automatic selection mechanisms (Selwyn, 2022).

Modern algorithms not only reflect human behavior but also actively shape it. Through data analysis, the system can predict users' preferences, consumer trends, political views, and even emotional states. When personalized content constantly appears in front of each individual's eyes, it is easy for people to fall into a "cognitive bubble" where they are exposed only to information that matches their existing beliefs. As a result, the ability to dialogue with differences, self-criticism, and the capacity for objective judgment are at

risk of decline (Beer, 2017; Selwyn, 2022). The central issue of education is no longer merely the impartation of knowledge but the development of the capacity for reflection. Reflective capacity can be understood as the ability to examine one's own thought processes, identify the conditions shaping perception and behavior, and adjust action accordingly. It enables people to maintain autonomy rather than being absorbed into social or technological mechanisms. The subject is not an entity that exists invariably and immutably. The subject is formed through continuous interaction between the individual and the objective conditions of life. People only truly become subjects when they are aware of the conditions affecting them and actively participate in shaping their own lives. Such education should help learners remain intellectually open and capable of orienting themselves within changing conditions (Gonzalez & Sarria, 2025). The capacity for reflection is an important condition for people to overcome their dependence on existing cognitive patterns.

Education not only has the task of providing knowledge but also must create conditions for learners to identify the power mechanisms operating in society. In an algorithmic society, power is increasingly decentralized and more difficult to recognize. While traditional forms of power typically manifest through laws, institutions, or tangible regulatory bodies, algorithmic power operates through data processing processes, content suggestion mechanisms, and behavioral forecasting models. People may feel free to make choices when, in fact, their choices are already guided by computational systems they are not fully aware of. The ability to reflect is a necessary condition for protecting human freedom in the digital age. Freedom can no longer be understood simply as the ability to choose between many different options. A choice is only truly free when the individual understands the factors influencing the selection process (Beer, 2017; Floridi, 2023). If the behavior is guided by algorithms that the subject is not aware of, then that freedom is only a formality. Reflective education helps learners understand that technology is not an absolutely neutral entity. Every technology is designed in certain economic, political, and cultural contexts. Algorithms reflect the assumptions, values, and goals of the people who create them. When aware of this, learners can approach technology with an active stance rather than passively receiving it. Another important aspect of the capacity for reflection is the ability to assess the moral consequences of an action. Artificial intelligence is dramatically expanding human power in many fields. The greater the power, the greater the responsibility. An AI-powered decision can affect thousands or millions of people. Responsible AI development must address technical capability, ethical deployment, and fair access simultaneously (Ferrara, 2024; Floridi, 2023).

Education not only teaches how to use technology but also helps learners understand the social, ethical, and humane consequences of its use. In many training programs today, technology skills are often prioritized over ethical skills. Students learn how to build artificial intelligence systems but are less equipped with the tools to assess their social impact, creating the risk of developing technologies that are technically effective

yet lack a humanistic orientation. A well-rounded education needs to address this gap by integrating ethics, social responsibility, and critical thinking throughout the training process. Technology training should not be separate from training on social awareness and civic responsibility. Learners should be encouraged to think about the long-term impacts of technology decisions on communities and future generations. Only then will technological development be truly tied to the goal of sustainable human and social development (Floridi, 2023). Learners with the ability to reflect will be better able to adapt to societal fluctuations because they know how to learn from experience and adjust their approach to new situations. Another dimension that is often overlooked in modern education is self-reflection. Many education systems focus on helping learners understand the outside world but pay insufficient attention to helping them understand themselves. Meanwhile, human maturity depends not only on knowledge of the world, but also on the ability to identify one's own motivations, values, and limits. In the absence of this understanding, people are susceptible to social pressures, transient trends, or media manipulation mechanisms (Archer, 2012).

Education needs to create space for learners to reflect on the meaning of life, their responsibilities to the community, and their roles in society. Performance indicators or standardized tests cannot replace these questions. They require a process of dialogue, reflection, and practical experience. The formation of subjects in an algorithmic society is not a process of resisting technology but of consciously learning to live with it. Technology can expand people's cognitive, creative, and collaborative abilities. That only happens when people retain the capacity for independent evaluation and the ability to orient values for their activities. Reflective capacity must become the central goal of education in the twenty-first century, without downplaying knowledge or technical skills. Knowledge and skills are only fully valued when placed in a subject capable of reflection and responsibility. Contemporary society must understand and critically evaluate AI-based creativity rather than accept it uncritically (Floridi, 2023; Selwyn, 2022). A society can possess advanced technology but still face a crisis if people lack self-awareness and self-direction. The formation of subjects in the data society must be considered as a strategic task of education. Through the development of the capacity for reflection, education helps people identify invisible mechanisms of power, protect their freedom from technological pressures, and participate responsibly in creating the future. This is the condition to ensure that the development of artificial intelligence will serve human development rather than degrade humanity in modern life.

4.3. Restructuring the relationship between knowledge, technology, and social responsibility

Throughout human history, knowledge has been considered one of the most important resources shaping human beings' ability to survive and develop. From early inventions that helped humans adapt to the natural environment to modern scientific and

technological revolutions, knowledge has continuously expanded human power over the world. The development of artificial intelligence, big data, and algorithmic systems is profoundly changing the nature of knowledge and the relationships among knowledge, power, and social responsibility. Education cannot continue to approach knowledge as a neutral set of information that needs to be communicated, but must see knowledge as a factor that directly participates in shaping social life. One of the prominent features of the data society is that the speed at which knowledge production far exceeds that of humans. Every day, the amount of data generated globally is far greater than the total humanity has ever generated in any previous period. AI technology can process, analyze, and generate information at an unprecedented rate, creating a new paradox: knowledge is becoming increasingly abundant, but the ability to orient it is becoming more difficult. In many cases, the problem is no longer a lack of information but an excess of it, not a lack of data but a lack of ability to assess its meaning. This change poses a major challenge to education.

In the traditional education model, learners primarily acquire knowledge from teachers, textbooks, and official learning resources. Today, learners can access a multitude of information sources from the Internet, social media, and artificial intelligence systems. The role of education is no longer to monopolize the provision of knowledge, but to shift to helping learners develop the ability to identify, evaluate, and use knowledge responsibly. A major danger of the digital age is the confusion between information and knowledge. Access to a large amount of data does not mean understanding the nature of phenomena. An individual may possess a great deal of information but still be unable to analyze, synthesize, and evaluate its social consequences. People must remain vigilant and proactive in safeguarding against biases that could shape society in unintended and harmful ways (Ferrara, 2024). Knowledge is only really valuable when it is associated with critical capacity and social responsibility. When education focuses solely on accumulating knowledge without cultivating the ability to reflect, knowledge easily becomes a tool for short-term goals rather than contributing to society's sustainable development. The development of artificial intelligence has made this problem more complicated. Today's AI systems can support scientific research, content creation, data analysis, and decision-making in a variety of fields. These abilities greatly expand human cognitive capacities. At the same time, they also increase the risk of reliance on automated systems. As important decisions are increasingly supported or replaced by algorithms, the question arises as to who is responsible for the consequences of those decisions. In many cases, society tends to view technology as an objective and neutral entity. In fact, every technology is designed by humans and reflects certain goals, values, and benefits. Algorithms do not exist outside of society but are built in specific social contexts.

The data chosen, the criteria set, and the optimized goals are all marked by human decisions. The use of technology has always come with ethical and social responsibility.

Education needs to help learners understand that knowledge not only creates capacity but also creates power. A person who possesses knowledge can influence others' behavior, shape social decisions, and shape a community's future. In a data society, power lies not only in traditional political or economic institutions, but also in the ability to control information and data. Individuals or organizations that hold large amounts of data can have a powerful impact on society's perceptions and behaviors (Beer, 2017; Floridi, 2023). That makes social responsibility an inseparable component of education. If education provides only knowledge without developing a sense of responsibility, society can produce individuals with high professional qualifications who lack moral orientation. History shows that many scientific advances have been used for purposes that harm people when knowledge is separated from responsibility. In the age of AI, this risk has become even greater due to the increasing scale and speed of technology's impact. A well-rounded education must help learners understand the connection between individual actions and social consequences. Every decision to use technology can have an impact far beyond the individual. A recruitment algorithm can affect the career opportunities of thousands of people. A credit scoring system can determine the ability of many social groups to access economic resources. Systemic technological decisions therefore require inclusive and deliberative processes capable of anticipating future risks (Floridi, 2023).

A media platform can shape public opinion and influence democratic processes. Technology skills training should be accompanied by capacity training to assess the social consequences of technology. Responsibility is not an abstract moral imperative but is the result of an awareness of the connection between the individual and the community. Humans can act responsibly only when they are aware that all their actions occur within a vast network of social relations. Education must help learners understand that personal success is inseparable from community development and societal sustainability. Another important aspect is responsibility for the future. Many of today's technological decisions will have a lasting impact on generations to come. Choices related to data, artificial intelligence, the digital environment, and technology governance affect not only present living conditions but also future ones. Education needs to develop the capacity to think long-term rather than focusing solely on short-term benefits (Floridi, 2023). The role of the school also needs to be redefined. The school is not only a place to impart knowledge but also a space to practice social responsibility. Learning activities should be organized to create conditions for learners to participate in solving practical community problems, thereby recognizing the relationship between knowledge and action. Learning is not only about knowing, but also about acting responsibly. The restructuring of the relationship among knowledge, technology, and social responsibility also requires a change in how education is evaluated. Traditional assessment indicators often focus on academic performance, exam performance, or professional competence. While these factors are still important, they do not fully reflect the value of education in the age of AI. A person-centered education system needs to pay more attention to

learners' ability to collaborate, sense of community, reflective capacity, and social responsibility. Community engagement should be considered holistically, emphasizing the role of education in connecting knowledge with social practice (See et al., 2026).

Knowledge, technology, and responsibility must be considered three organically connected elements. Knowledge enables the perception of the world. Technology expands human capacity. Social responsibility guides the use of knowledge and technology for the common good. When one of these three factors is separated from the other two, development becomes unbalanced. If knowledge and technology are not accompanied by responsibility, society may achieve major technical advances while also increasing inequality, manipulation, and crises of trust. If there is only responsibility without knowledge and technology, society is unlikely to solve the complex problems of the times. The task of education is to create a dynamic balance among these three factors. Education in the era of artificial intelligence must be reoriented from a model of knowledge transfer to one that develops the capacity to use knowledge and technology responsibly. This is not only a requirement of education but also a condition for ensuring that the development of science and technology serves the sustainable development of people and society. It is on this basis that education can fully fulfill its historical mission in the twenty-first century: to train people who are not only capable of action, but also capable of taking responsibility for the consequences of that action. It is necessary to develop mechanisms to compel AI users to minimize the negative impact of algorithmic bias, thereby ensuring that technology is operated for the benefit of people and society.

4.4. Comprehensive human education as the foundation for sustainable development in the data society and artificial intelligence

One of the biggest questions of the twenty-first century is not whether artificial intelligence will continue to evolve, but where that development will lead humanity. Over the past decades, advances in science and technology have led to significant gains in labor productivity, quality of life, and the expansion of human knowledge. Along with those achievements are a series of crises related to the environment, social inequality, declining public trust, mental health, and ethical challenges posed by technology. These phenomena show that technical development is not synonymous with human development. A society that may be highly technologically advanced still struggles to maintain social cohesion, protect human dignity, and ensure sustainable development. Comprehensive human education has become a strategic requirement. If education focuses only on training human resources for economic growth, the successes achieved may be short-term. If education is geared towards the holistic development of the human being, society will be able to create more sustainable endogenous resources to face long-term challenges, thereby requiring a redefinition of the goals of education in the age of artificial intelligence (Biesta, 2022; Floridi, 2023).

The concept of sustainable development is often understood through three basic pillars: economy, society, and environment. On a deeper level, the sustainability of any society depends on the quality of the people who make up that society. Political institutions, economic systems, and advanced technologies are all built, operated, and regulated by humans. If people lack the capacity for reflection, lack accountability, or lose the ability to cooperate, then even the most modern systems can operate in ways that harm the community. Holistic human education comes from the realization that the human being is not only an economic or biological entity but also a cultural, moral, and social subject. Each individual exists in a complex web of relationships with family, community, the natural environment, and future generations. Income, qualifications, or professional competencies alone cannot measure human development. A well-rounded person is someone who can accurately perceive reality, master oneself, cooperate with others, and act in a socially responsible way. In the data society, this requirement becomes more important than ever. New technologies are not only changing the way people work but also the way they think, feel, and build social relationships. Many studies show that the rise of the digital environment comes with the risk of social isolation, cognitive polarization, and impaired ability to communicate face-to-face. As technological platforms increasingly mediate human interaction, education needs to serve as a mechanism to protect and develop core human qualities. People need to cultivate curiosity, openness, and the courage to engage with unfamiliar realities, emphasizing the role of education in maintaining the qualities that define humanity amid rapid technological development (Gonzalez & Sarria, 2025).

One of the most important tasks of well-rounded education is to cultivate the capacity for empathy. Empathy is not only the ability to feel the emotions of others, but also the foundation for social cooperation. AI systems can process data at very high speeds, but they cannot fully replace the human ability to understand, share, and build trust. In many fields, such as education, health, social work, and community governance, these qualities are decisive for the quality of life. Future education can not only train technological skills but also develop humanistic competencies. Another element of well-rounded education is the ability to connect knowledge with action. In many cases, learners may have a good understanding of social problems but lack the motivation or capacity to participate in solving them, creating a gap between understanding and responsibility. Holistic education needs to bridge this gap by creating learning experiences that are aligned with social realities. When learners are directly involved in community activities, they not only acquire knowledge but also form a sense of citizenship and responsibility towards others (Dewey, 1916/2007; Freire, 1970).

Sustainable development is not only a matter of conserving natural resources but also of preserving and developing the conditions that constitute human nature. A society can maintain a high rate of economic growth. However, if people increasingly lose the ability to think independently, decline their capacity to cooperate, or lose the meaning of life, then it can

hardly be considered sustainable development. Education must be seen as a long-term investment in human survival and development, especially for the younger generation. Today's young people will grow up in a world where AI is present in almost every area of life. They will face careers that never existed before, new ethical challenges, and social upheavals that are difficult to predict. Specific skills may quickly become obsolete, but lifelong learning, reflection, and social responsibility will continue to play a fundamental role. Holistic education must prepare learners to adapt to change without losing their identity and dignity. Another dimension of sustainable development is the ability to build social trust.

Sociological studies show that communities with high levels of trust are often better able to collaborate and solve collective problems. In the age of digital media, social trust is facing many challenges from fake news, information manipulation, and cognitive polarization. Education plays an important role in shaping a culture of dialogue, critical thinking, and respect for differences, which are necessary conditions for maintaining the stability and long-term development of society. Education should support the simultaneous development of four basic capacities: cognitive, reflective, creative, and responsibility capacities. Cognitive capacity helps people understand the world. The capacity for reflection helps people understand themselves and identify the conditions that govern their actions. Creative capacity allows people to create new solutions to new challenges. Accountability ensures that such solutions are geared towards the community's common good. These four capacities do not exist separately but form a unified system. Awareness without responsibility can lead to the abuse of knowledge. Responsibility that does not go hand in hand with awareness can lead to goodwill but also to ineffectiveness. Creativity without reflection can produce innovations with negative consequences. Only when these capacities develop simultaneously can people become free and responsible subjects in modern society.

From a policy perspective, this requires a change in the way the education system is designed. Training programs need to be built toward integration rather than fragmentation across knowledge domains. The teaching of science, technology, humanities, and ethics needs to be interconnected in a shared vision of human development. Schools need to become environments where learners not only acquire knowledge but also learn how to live, cooperate, and take responsibility for their decisions. In the context of globalization and digital transformation, comprehensive human education is not an ideal option but a practical requirement for sustainable development. Societies capable of long-term development will not be those that possess the most powerful technology, but those that use technology to advance human development (Biesta, 2022; Floridi, 2023). Education is the basic way to form that capacity. The central task of education in the age of artificial intelligence is not to compete with machines at tasks they do better, but to develop the qualities that constitute the unique value of human beings. When education helps people understand reality, master technology, act responsibly, and build humanistic social relationships,

education will become a solid foundation for the sustainable development of the data society in the twenty-first century.

5. Conclusion, Limitations, and Future Research

The development of artificial intelligence is necessitating a redefinition of the goals and nature of education in the twenty-first century. The conceptual analysis suggests that education should not only equip people with knowledge and technical skills to meet labor-market needs, but also support the holistic development of people as free, creative, and responsible subjects. Based on a synthesis of approaches to educational philosophy, the data society, and technological ethics, the study proposes the Realistic Humanism Framework, comprising four core capacities: cognitive, reflective, creative, and responsibility capacities. The study contributes an integrated conceptual approach to human development, education, and technology in the context of AI. In practical terms, the framework may inform the development of training programs, education policies, and person-centered learning models. The framework is conceptual and has not been empirically validated. The literature selection was purposive rather than exhaustive, and the transferability of the four-capacity structure across educational and cultural contexts remains to be tested. Future empirical research should verify and refine the framework across diverse educational contexts, thereby contributing to the development of a humanistic, sustainable, and adaptable education for an artificial-intelligence society.

Declaration of Conflicting Interests and Ethics

The author declares no conflict of interest. This conceptual study involved no human participants or personal data; therefore, ethics approval was not required.

AI Use Statement

The authors maintain full responsibility for the intellectual content and originality of the manuscript. AI was used to improve language and readability of the manuscript with caution.

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