Human-technology Game and Nash Equilibrium Solution Under Digital Transformation of Education

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Abstract

With the in-depth application of intelligent educational technology, the increasing expansion of technological autonomy poses a threat to the development of human subjectivity, prompting people to rethink the game relationship between human and technology. The article reveals the ideological interpretation and internal and external difficulties of the human-technology relationship, analyzes the three game forms of human and technology in education from the perspective of game theory: opposition and imbalance, adaptation and balance, integration and symbiosis, tries to seek the Nash equilibrium solution of the human-technology relationship, then proposes the optimal solution of the human-technology relationship for the purpose of cooperation and common good, and constructs a practical path of the human-technology game from the three levels of the construction of the human-technology ethic, return of the human nature subject, and cultivation of human-technology literacy, so as to contribute to the road of human and technology to the good. It also constructs a practical path of human-technology game from three levels: the construction of human-technology ethics, the return of human nature subject and the cultivation of human-technology quality, in order to promote the path of goodness between human and technology.

Keywords

1. Introduction

Heidegger once said, "the domination of technology over us is so deeply rooted that we almost no longer find them there". Nowadays, the iteration of intelligent technology education applications, education digital transformation drive change, technology-enabled education and teaching has long been commonplace, and this has also sprouted a new syndrome, the blurring of the boundaries of human-technology relations, the subject of human nature suffered a weakening. The ensuing "Cyberman", "digital labor" and other new concepts once again show that technology is no longer an auxiliary tool and extension of human beings, but has become an indispensable part of the human subject, a phenomenon that makes the "technological man" hypothesis more and more true. This phenomenon makes the authenticity of the hypothesis of the "technological man" more and more intense. In this situation, we cannot help but think deeply: what is technology? What is the solution for human beings?

In the field of education, how can a harmonious coexistence between human beings and technology be realized? Undoubtedly, the progress of education and the application of information technology have produced intertwined benefits and harms, and while technological advances have contributed to the prosperity of education, they have also had a non-negligible impact on the relationship between human beings and technology in education. It is important to be aware of the possible adverse effects of over-reliance on technology. Therefore, there is an urgent need to re-examine the contradictions and conflicts between the subject of education and teaching technology, and how to build a new type of "human-

technology" relationship has become an important issue that must be resolved in the current education in the digitalized perspective. Harmonious coexistence of the balance of the relationship will be the ultimate solution to the relationship between people and technology, the effective establishment of which directly affects the efficiency of the information technology teaching system and the realization of the goal. Based on this, this paper investigates the possible risks and dilemmas of human-technology relationship, analyzes the optimal solution of human-technology relationship with the help of game theory, and puts forward the development path of cooperation and common good, in order to enhance the understanding and deepen the thinking, to build the norms of human-technology balance in education, and to contribute to the road of goodness between human beings and technology.

2. The Relationship Between Human Skills: Ideological Interpretation and Internal and External Dilemmas.

2.1. Explanation of Ideas

Clarifying the historical origins of human beings and technology is the entry point for solving the problem of the technological nature of human beings. The Encyclopedia of Natural Dialectics defines technology as "the means and methods by which human beings rely on the laws of nature and the material, energy, and information of nature to create, control, apply, and improve artificial natural systems in order to satisfy the needs of society"[1] . Throughout history, technology has always played an intermediary role in the relationship between man and nature, man and society. How to realize the meta-value of education through the intermediary role of technology is a question that deserves our deepest consideration. 21st century education aims to better prepare people for the future, to become masters of the society of the future and to have the ability to actively transform it. People with creative thinking and action are what the future needs.

Marx believed that the nature of technology and the nature of man have inherent consistency, and "the nature of man is not an abstraction inherent in a single person, but in fact it is the sum of all social relations" [2] . Marx emphasized the integration of technology with the overall development of society, so as to realize the common progress and development of man, technology and society. Therefore, he advocated the combination of technology and human values to realize the progress and development of society, and people should hold the correct human values and development direction to guide and control the application and development of technology, so as to prevent technology from becoming the tool of interest groups, which will have a negative impact on the society and the health of human beings. Education, as a specialized "technology of human education", is a kind of conscious activity with purposeful intervention, so human development under the action of education is a creation of human purposeful activity, which can be said to be a kind of man-made artificial object [3] . To a certain extent, education and technology have an internal consistency, and it is precisely this consistency of interaction and back-and-forth movement that makes it possible for them to develop together to build, perfect and develop human beings.

2.2. Revised sentence: Challenges both within and outside the organization.

From the perspective of historical materialism, the contradictory movement between the productive forces and the relations of production indicates that the relationship between human beings and technology is in a state of dynamic development under the influence of multiple factors that are constantly changing. This feature determines that even though intelligent technologies, especially generative AI technologies (such as Chat GPT), have made great improvements in form, in actual use, human beings still face a variety of specific dilemmas,

and behind these dilemmas is actually the reality of the relationship between human beings and technology.

When exploring the relationship between people and technology, the dilemma of the loss of subjectivity is particularly prominent. Under the wave of digital transformation of education, the rapid development of technology has profoundly changed the traditional pattern of "human-technology-world" relationship. The rapid iteration of technology has led to its continuous "humanization", resulting in the "intervention" and "adjustment" of people's perceptions by technological objects when interacting with technology, thus affecting people's understanding and cognition of things. and cognition, the form of human cognition has undergone fundamental changes, technology and human re-education in the field of increasing inter-constructive relationship between the machine perception gradually replace the body perception, originally only as a teaching aid, technology, gradually towards the field of education in the transformation and upgrading of the actors, the transformation of the subjectivity of people constitute an unprecedented threat, gradually weakening the subjectivity of people. Therefore, in the process of digital transformation of education, we must be highly alert to the dilemma of the loss of subjectivity, re-examine the relationship between human and technology, ensure that technology does not harm the subjectivity and autonomy of human beings while improving the quality of education, realize the harmonious symbiosis of human-technology relationship, and promote the healthy development of education.

In addition to the fact that the subjectivity of human beings in the relationship between human beings and technology has been eaten up by technology, the infinite expansion of technical rationality and instrumental rationality originating from technology is marginalizing value rationality and humanism. It makes "those who lose themselves to things and their nature to the common people are called inverted people" gradually develop into reality, and the subject is alienated to the object[4] . The so-called alienation refers to the fact that the creation of human beings as the subject has in turn become an alien force that enslaves and controls human beings. The original subject instead becomes passive, subject to the object and loses its subjective nature. Man becomes a slave of technology, and man is subjected to technology, which makes him lose himself, deviate from the essence of man, and forget the spiritual value of the meaning of life[5] . Alienation is manifested in the excessive trust in the power of technology, relatively ignoring the role of human beings, when people are overly dependent on technology, human subjective initiative is submerged, will lose the knowledge of their own nature, reduced to the subordination of technology. The anti-client and instrumentality overpowering purposefulness become the common characteristics of all alienation phenomena. As the externalized product of human intelligence in the field of education, making the educational environment, educational methods of diversification, and thus enhance people's confidence in the "supremacy of technology", "technological determinism", "technocracy", and raise the level of confidence in the "supremacy of technology", "technological determinism", and raise the level of confidence in the "supremacy of technology". "confidence, raise the status of technology in education, that the higher the content of technology, the better the teaching effect. This distorted conception of human beings and technology is a blind worship of the role of technology and a neglect of the value of human beings.

In the age of intelligence, the degree of digitalization of education is increasing day by day, and the ways for learners to capture information are becoming more and more simple and diversified. Big data and user profiles and other technologies through the Internet search engine to collect the interests and preferences of learners, resulting in more and more accurate user profiles, learners receive the push of resources more and more homogenized, personalized. In the long run, learners are forced by technology to passively lose the opportunity to collide with diversified ideas, and are thus trapped in the "information cocoon"[6] of information narrowing, where their innovative ability encounters shackles and their higher-order thinking

loses its vitality, which is not conducive to the cultivation of the spirit of the times of innovation and creativity. At the same time, the mixed quality of data sources and the value bias of manual review can also induce algorithmic discrimination, information cocoon, and other phenomena, and students are overly dependent on technology, lose interest and desire to explore, and become slaves to technology.

3. Human Skill Games: Analysis Models and Nash Equilibrium Solutions

3.1. Game Model Analysis Framework

3.1.1. Game Theory and Nash Equilibrium Solutions

References are cited in the text just by square brackets

Game theory originated from Sun Tzu's The Art of War, and was initially used mainly in chess and bridge tournaments, but later extended to different disciplines and gained wide application. Game theory is the study of decision making and equilibrium of decision making when subjects' behaviors are in direct interaction[7] . There are many educational applications of game theory. For example, Chen Cuirong et al. analyzed the dilemma and solution strategy of sharing educational resources in western region universities from the perspective of game theory[8] , Zhao Yupeng et al. used the evolutionary game theory and its dynamic model to reveal the dynamic evolution strategy of graduate student supervisors and tutors in the process of educating human beings, analyzed the triple factors influencing the evolutionary game, and put forward the optimization path[9] .

In the 1950s, John Nash, a famous mathematician and Nobel Prize winner in economics, proposed the Nash equilibrium solution. Nash equilibrium is a concept in game theory that refers to a solution in a non-cooperative game containing two or more participants, assuming that each participant knows the equilibrium strategy of the other participants, and that no participant can benefit from changing his or her own strategy. In short, it is a stable state reached by all parties without mutual sacrifice, i.e., the optimal solution of the game. This has also been a continuing concern in the educational community. For example, Yinjie Jiang et al. applied the idea of game to big data intelligence, through Monte Carlo tree search and reinforcement learning and other methods, the game can be combined with artificial intelligence to seek the equilibrium solution of the game confrontation model[10] . Li Baobin based on game theory to think and strengthen the Nash equilibrium pivot point of education discipline game of Lidu Shujin, in order to better implement the rules of education discipline .[11]

3.1.2. The "human-technology" game model

The "human-technology" game model considers human and technology as participants in a mutual game, and provides a theoretical basis by modeling and analyzing the game relationship between them. The design of this model and framework is based on the idea of game theory, constructing appropriate evaluation indexes, assessing the benefits and risks of different strategies, and helping decision makers make the optimal choice. In this context, "human" refers to human beings, including users, decision makers, managers, etc., who utilize various technological means to interact with computers, robots and other electronic devices. Technology" is broadly defined to include advanced computer technology, artificial intelligence, big data, cloud computing, and many other technological means. This game model views people and technology as interacting participants, in which each participant has its own goals, resources and constraints, and develops strategies and executes actions in the game to achieve the ultimate goal.

In this regard, the following three game forms have been established: opposition and imbalance, adaptation and equilibrium, and integration and symbiosis. Generally speaking, the integration

and symbiosis of human and technology can get the Nash equilibrium solution between the two and maximize the benefit of both sides. Therefore, the path of cooperation and common good is proposed to build a balanced relationship between human and technology. Verbeke's moral objectification theory suggests that in the application of AI education, people can give full play to the regulating role of technology to form a two-way promotion and synergistic development of the "human-technology" relationship[12] . It is true that we should give full play to the advantages of technology in education, but we should also avoid the crisis and challenge of technological alienation and subject limitation, and form the transformation from gaming to common good.

3.2. Oppositions and Imbalances

"Everything that is antagonistic potentially contains a contradiction", which indicates that antagonism is an inherently contradictory state. In the two-party game, opposites are often in a state of mutual conflict and fierce competition, which leads to difficulty in balancing and lack of cooperation between the two sides, and is prone to imbalance. Therefore, in the game of antagonism and imbalance, both sides should seek common ground and establish cooperative relationships to achieve balance and development. The imbalance between human and technology in education refers to the imbalance in the use and application of educational technology in the educational process, i.e., over-reliance on technology and neglect of human subjectivity and individualized needs. The reasons for this imbalance can be summarized as follows: First, the technology itself pays too much attention to the cultivation of certain basic skills, so as to meet the knowledge acquisition needs of students in a mechanized way, while ignoring the development of students' innovation and critical thinking ability. The second is that technology pays too much attention to the role of technology in managing and monitoring students, while ignoring the individual differences and diversity of students and lacking differentiated education for different students. The evolution of certain educational technologies has certainly promoted the innovation of many teaching programs, but there are often problems of uneven quality in the actual application, such as the weakening of students' subjective initiative and the reduction of learning efficiency, which induces scholars in the field to question the reliability and effectiveness of the technology. In addition, in the process of education, people should not only focus on the inculcation of knowledge, but also return to the "people-centered" concept of education, to play the role of the teacher to teach and solve the problems, emphasizing the subjective position of the learner, guiding the students to think deeply, and teaching the way of learning. Committed to the overall development and quality improvement of students, give full play to human initiative, realize the deep integration of innovation and technology, and achieve the organic integration of technology and education.

3.3. Adaptation and Balance

"The essence of resilience lies in the construction of a harmonious and positive interaction between mental energy, personal capabilities and the difficulty of events." This statement deeply reveals the intrinsic connection between adaptation and balance. In the complex game arena, adaptive ability is like an individual's "impenetrable defense", its stability is directly related to the survival and development of the individual in the game. We must ensure the formation of a solid and benign cycle between psychological energy, personal ability and event difficulty, in order to maintain dynamic balance, so as to seize more advantages and benefits in the flood of the game.

The process of human-technology adaptation spans several stages in the ongoing evolution of educational dynamics. The initial stage is the period of instrumentalism, when technology is mainly used as a tool to assist teaching and learning, and to help teachers to deliver knowledge more effectively; then it enters the period of mediationalism, which emphasizes the far-reaching impact of new media technologies on teaching and learning, and regards technology

as a key driving force of educational reform; then it is the period of constructivism, in which technology is regarded as a sub-system of a complex learning system, and emphasis is placed on the application of technological sub-systems to create learning contexts, guide learners to actively participate in the learning process, and forge their independent learning abilities; the integration stage is the period of learning technologism, in which technology is considered as an important factor in promoting students' learning. Then comes the period of constructivism, in which technology is regarded as a subsystem of a complex learning system, emphasizing the use of technological subsystems to create learning contexts, guide learners to actively participate in the learning process, and forge their independent learning abilities. Throughout this journey, the relationship between humans and technology has become increasingly close, evolving into a symbiotic relationship of mutual concern and complementarity. Human beings continue to create and optimize technology, while technology continues to expand the realm of people's lives, resulting in a gradual balancing of the relationship between "human-technology-world". In order to realize the common educational goals, the opposition between the educational subject and the teaching technology gradually dissolves, forming an internally consistent, harmonious and symbiotic relationship structure. As technology is integrated into the educational process, it is also becoming more and more humanized, injecting new vitality and possibilities into the future development of education.

3.4. Integration and symbiosis

"Integration and Symbiosis: Japanese Philosophy in an East Asian Perspective", the Japanese philosophy of "Wo" is a way of integrating different consciousnesses, cultures, and values[13] . In the arena of gaming, integration and symbiosis require both parties to abandon the constraints of narrow individualism, respect each other, build trust, and work together for harmony in order to achieve a win-win situation. This concept is also fully realized in education technology. It has become a forward-looking educational concept and practice to integrate cutting-edge artificial intelligence technology into teaching and learning, and to optimize the effect of education through mutual collaboration and support. With the rapid changes in modern technology, the content and ideas of education can be continuously expanded and deepened, giving education more possibilities. At the same time, with the development and change of students, the educational environment also needs to keep pace with the times and make corresponding adjustments. Traditional, single knowledge "indoctrination" education can no longer meet the diverse needs of contemporary learners, the need for more use of modern technology for personalized, customized education. Through technological mediation, teachers rely on the use of teaching technology to display ideas, concepts and methods, while accurately planning students' learning paths, not to give up the use of technology, but to reconfigure human beings and technology into a coherent unity, artificial intelligence and human intelligence should learn from each other, complement each other's strengths and weaknesses, constituting a community of action, so as to maximize the benefits of education. In this process, we deeply realize that the integration and symbiosis of human and technology is not only an inevitable trend of educational development, but also an important way to pursue educational excellence and achieve educational goals.

4. Cooperation for Good: The Optimal Solution for Human-Technology Symbiosis

So far, people have been exploring the optimal solution of human-technology relationship. Yu Minhong believes that the relationship between technology and education is 1+1>2. This paper stands in the perspective of game theory, deeply analyzes how to realize the human-technology cooperation and win-win human-technology game dissolution path under the background of

digital transformation of education, mainly covering the construction of human-technology ethics, the return of human nature subject and the cultivation of human-technology literacy.

4.1. Construction of ethic of human skills

Human-technology ethics in educational technology refers to the moral and ethical principles and norms to be observed when applying artificial intelligence and other related technologies. It encompasses, but is not limited to, respect for the personality and privacy of students and teachers, fairness and equality in the process of technology application, and strict protection of students' information security and network security. The establishment of a sound ethical code system for human technology can promote educational institutions and students to establish correct ethical awareness and values, create a good learning environment, and promote the benign development of technology.

This requires the cooperation and joint efforts of the government, educational institutions, industry and individuals to create an ecosystem for the healthy development and effective application of educational technology. Macro perspective: policy and legal level. To regulate the use of educational technology in accordance with relevant laws and regulations, to ensure the transparency, fairness and legality of the technology, to formulate corresponding management methods and policies, to supervise the development and application of educational technology, and to penalize and sanction non-compliant behaviors. Meso perspective: Educational institutions and industry. Work together to develop moral codes and ethical norms to regulate the use and development of technology. Educational institutions should actively establish mechanisms for technology development and evaluation, and strengthen the research, evaluation and use of educational technology. Designers of technological products need to pay attention to and enhance antecedent ethical sensitivity[14] . Dialogue and communication between designers and users of technology products should be strengthened in order to promote the effective use of technology. At the same time, it is necessary to clarify the responsible parties for the negative impacts of the application of technology in education, and formulate the necessary accountability system, so as to continue to promote the in-depth integration of intelligent technology and education, and to create a new situation for education in the age of intelligence. Micro perspective: practice level. Educators and knowledge acquirers need to establish a correct sense of ethics and morality, and improve their understanding and application of educational technology. Educators should pay attention to the effectiveness and applicability of technology, and avoid the misuse of educational technology that leads to excessive dependence on learners, which in turn affects the development of their ability to think and innovate. Learners should pay attention to improving their own quality and developing good habits of use, so as to use educational technology reasonably and avoid becoming addicted to it. Through the construction of human-technology ethics, it is expected to realize the ideal state of human-technology harmonious coexistence, and drive educational technology to play a greater role in promoting educational progress and the comprehensive development of learners.

4.2. The Return of the Human Subject

As Karl Jaspers said, "It is the human being who gives meaning to technology", and the so-called subjectivity is one of the universal attributes of human beings, which is the fundamental characteristic of human beings that distinguishes them from animals. The position of human being as the subject of education is unshakeable by technology. In the process of cultivating human education, in the face of the general trend of the increasing development of educational technology, how to make its subjective role can continue to manifest and play is a subject worthy of in-depth exploration[15] . In other words, in order to eliminate the alienation phenomenon of technology in education, to make the technical power in the field of education return to the human nature, and to realize the real value of education, philosophical reflection

on the application of technology in education should not only not blindly exclude the power of technology in the field of education, and should not simply use the instrumental rationality to explain the application of technology in education, but also should seek for the correlation between education and technology, and grasp the essence of education to the technology in the field of education, and should also seek the correlation between education and technology, and use the essence of education to understand the role of technology in education. The essence of education to grasp the profound value of the application of technology in the field of education[16] .

Obviously, the core is to adhere to the "people-oriented" concept of education. The first is to advocate diversified teaching. Educational institutions and teachers should realize that educational technology cannot and will not replace traditional teaching methods. They should actively try to combine educational technology with traditional teaching methods to form a diversified teaching program, so as to avoid over-reliance on technology, which will lead to a decline in students' ability to think and innovate. Second, focus on the quality of education. The application of educational technology needs to be verified by its effectiveness. Educational institutions should set up a perfect evaluation mechanism to examine the actual effectiveness of educational technology, and adjust and improve the application of educational technology according to the results. Third, avoid the dissolution of the teacher-student relationship by technology. Let technology reconfigure the field of education, teachers' ability to empathize with their students remains the same. Educational technology should be used as a supplement to teachers' teaching tools, rather than breaking the teacher-student relationship between teachers and students or weakening its role. Fourth, the advantages of educational technology should be fully utilized. It will lead to improved quality and efficiency of learning, and enable students to complete their learning tasks more attentively and autonomously, such as global resource sharing and interactive experiences.

4.3. Fostering Human Skills

Ethical literacy in science and technology refers to the recognition of ethical norms in science and technology and the ability to fulfill them consciously through a combination of self-awareness and external education[17] . Human-technology literacy in educational technology refers to the ability to have basic technical operation ability, data and information management ability, educational technology application ability, educational teaching design ability, and educational innovation and research ability, which can help education practitioners better cope with the challenges and opportunities brought by educational technology. The cultivation of ethical literacy in science and technology needs to take into account the internal logic of instrumental rationality and value rationality, not only pursuing the advancement and practicality of technology, but also paying attention to the ethical and moral issues behind it. Only by unifying the pursuit of truth in science and the pursuit of goodness in morality can the highest state of "truth, goodness and beauty" be achieved.

For teachers, they have the important mission of imparting knowledge, but also play the role of practitioners and leaders of ethical literacy in science and technology. The cultivation of human-technology literacy requires teachers to: first, continuously update their domain knowledge, actively apply technological tools, and avoid being bound by traditional educational paradigms in order to maintain the vitality and innovation of education. Secondly, they should deepen their professional competence in the digital field, become proficient in the use of digital resources, build highly effective and collaborative digital teaching teams, develop up-to-date and unique digital quality courses, and improve the digital skills and comprehensive literacy of students. Thirdly, we will consciously devote ourselves to relevant training and learning, uphold the concept of lifelong learning, follow the pace of the times, flexibly respond to the

wave of educational innovation, and dedicate ourselves to cultivating new-age talents with scientific and technological ethical literacy.

For students, as the backbone of the future development of science and technology, the cultivation of their ethical literacy in science and technology is not only related to their personal growth, but also promotes the advancement of science and technology and the shaping of morality. The cultivation of technological literacy requires students to: firstly, improve their information screening and discernment ability, be good at accurately extracting the knowledge they need from the vast amount of information, and be able to accurately identify and deeply analyze false and misleading information generated by artificial intelligence. Secondly, they should be proficient in digital technology and possess excellent digital application skills, form efficient habits of utilizing technology, cultivate digital thinking, and broaden the boundaries of their personal skills, so that they can better respond to the development of the future wave of digitalization in society. Thirdly, we should be clear about our responsibilities in the digital realm and abide by ethical and moral standards. While enjoying the convenience of digital technology, we should be wary of the potential problems it may bring to the social, ethical and legal levels, so as to establish positive and healthy values of science and technology.

5. Conclusions and Discussion

In the context of the digital transformation of education, to explore the Nash equilibrium solution of the human-technology game, it is necessary to deeply analyze and accurately grasp the subtle relationship between human beings and technology, and to find the balance point between human beings and technology that is complementary to each other, in order to build a solid symbiotic bridge between the two. Peter Drucker once said, "The biggest risk in turbulent times is not the turbulence itself, but the attempt to cope with turbulence with yesterday's logic." Standing on the cusp of digital transformation and facing the reality of increasing technological autonomy, one must draw back from the inherent mode of thinking and examine the profound changes that technological innovation has brought to the field of education. With an open mind and innovative thinking to cope with the human-technology game, seek the Nash equilibrium solution of the human-technology relationship, and promote the realization of a truly harmonious symbiosis between human beings and technology in education. In other words, we strive to realize the transformation from game to common good, in order to provide more useful inspiration and reference for educational practice.

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