Article

The Realistic Dilemma and Parenting Path of Family Education in the Context of Mathematical Intelligence

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Abstract: The era of digitalization has brought new dilemmas to family education, and digital technology has brought potential threats while changing minors' entertainment and learning styles. In view of this, based on the perspective of family education, the article analyzes three problems: the "information cocoon" brought by big data analysis technology. The distorted "fan culture" caused by the metaverse, and the threat of data security, and proposes to build a path of family education from the cultivation of minors in the three dimensions of dialectical thinking, independent thinking, and precautionary awareness. This will help parents to adapt to the digital transformation of society, correctly view digital technology, and promote the coordinated development of minors and digital intelligence.

Keywords: Numerical intelligence; Family education; Dilemma; Parenting paths

1. Introduction

In recent years, with the wide application of new generation technologies such as big data analysis, artificial intelligence, cloud computing, etc., the whole society is experiencing a digital-intelligent transformation, and "Digital Intelligence" as a strategic resource and a production factor is profoundly affecting the development of the country and reshaping the behavioral patterns of organizations and individuals [1]. At the same time, due to the immersive, precise, and agile response characteristics of digital intelligence products [2], they exude a strong attraction to minors, and become an increasingly important part of their growth. According to the 5th National Survey Report on Internet Usage by Minors (hereinafter referred to as the Survey Report on Internet Usage by Minors) jointly released by the Department of Youth Rights and Interests of the Central Committee of the Communist Youth League and the China Internet Network Information Center (CNNIC) in December 2023, the scale of China's underage Internet users in 2022 was 193 million, and the

penetration rate of the Internet among minors was 97.2%, in which AI as a typical representative of the emerging technology of the Internet is widely concerned by minors [3].2021 In October 2021, the Law of the People's Republic of China on the Promotion of Family Education (hereinafter referred to as the Law on the Promotion of Family Education) was formally enacted in order to adapt to the new needs of digitalized family education. The requirements of the law for minors include "healthy Internet access and preventing minors from becoming addicted to the Internet", and the requirements for the government include "preparing for the construction of an informatization and shared service platform for family education, and setting up public welfare online parenting schools and online courses" [4].]. Therefore, under the development trend of minors contacting the Internet at an increasingly younger age, more and more scholars believe that digital intelligence is an important path to cultivate new quality talents [5], and in the context of the urgent need to change the family's parenting management, explore the current dilemmas and crises of family education, and clarify the effective path of family parenting, which may be able to help crack the parental anxiety of education.

To explore what kind of thinking and quality students should have to cope with the opportunities and challenges in the digital era is a topic of great concern in the academic world, and the existing research on the cultivation of minors in the context of digital intelligence is mainly based on two types of perspectives: on the one hand, it focuses on the negative consequences, such as the potential crises of minors' information leakage, indulgence in the virtual world, and being caught in the "information cocoon" [6-8]; on the other hand, it focuses on the positive effects, providing digital financial inclusion, the application of multiple cross-scenarios for minors' prosecution, and the establishment of "6+X" prosecution and social protection for special minors. On the one hand, it focuses on the negative consequences, such as information leakage, indulgence in the virtual world, and falling into the "information cocoon" in the digital context [6-8]; on the other hand, it focuses on the positive effects, and provides educational resources, such as digital financial inclusion, multi-scenario application of minors' prosecution, and establishment of the special minors' protection "6+X" prosecution-society fusion of digital intelligence system [9-11]. The family is one of the most important environments for students to grow up, and it is a key factor affecting students' physical and mental development [12], so how can the family, as the first school for minors, overcome the existing difficulties and help children to cope with the wave of digital intelligence?

2. The reality of the dilemma of family education in the context of digital intelligence

In the era of rapid changes in science and technology, digital intelligence has become an indispensable part of the growth process of minors, living in the rapid iteration and upgrading of minors' life and learning styles have also undergone great changes, which in turn bring new challenges to parent-child relationships and family parenting styles.

2.1 Cognitive Development Perspective: Synergistic Effects of Filter Bubbles and Digital Overengagement

Under the rapid development of digital and intelligent technologies, information cocoons and virtual addiction have emerged as two core issues affecting minors' cognitive development. These phenomena do not exist in isolation; rather, they interact through complex mechanisms to create a compounding effect, further exacerbating cognitive narrowing and disconnection from reality among minors. This synergistic impact manifests not only in the mutual reinforcement between algorithm-driven recommendations and immersive technological experiences at the technical level, but also in psychological dependencies and cognitive rigidity at the mental level.

(1). The Current State of Big Data: Trapped in "Information Cocoons".

In the era of intelligent media, minors no longer rely solely on traditional media (radio, newspapers, magazines, etc.) to access information. They navigate the "information deluge" through the internet, enhancing the efficiency of information acquisition. However, big data employs recommendation algorithms to deliver massive amounts of precisely targeted content. Under these circumstances, the phenomenon of "information cocoons" has emerged in intelligent media-era information dissemination [13]. Cass Sunstein was the first to propose the concept of "information cocoons," noting that the public tends to accept information aligned with their preferences, interests, and values. Within this imperceptibly constrained informational scope, individuals become ensnared like silkworms in a cocoon. Sunstein argued that people selectively consume "communications that reflect and reinforce their existing views," and the term "cocoon" aptly describes how users are confined to algorithmically curated and closed information sources [14].

As the most proactive group in learning and absorbing knowledge, minors possess strong curiosity and rapid comprehension. However, their underdeveloped critical thinking makes them vulnerable to being unknowingly trapped in "information cocoons." According to the Report on Internet Usage Among Minors, short-video platforms have rapidly penetrated this demographic, with over half of minor internet users regularly engaging with such platforms for entertainment. Platforms like Douyin, Kuaishou, and TikTok utilize collaborative filtering algorithms to continuously push content tailored to minors' preferences, exposing them only to like-minded individuals [15]. Over time, this results in minors being inundated with homogenized information. Consequently, those long confined to information cocoons tend to develop rigid thinking patterns and value systems, struggling to accept diverse perspectives. This entrenches them in "cognitive cocoons" and even traps them in "social cocoons" in real-world interactions, ultimately limiting the breadth and depth of their cognitive development.

2.2 The Current State of the Metaverse: Trapped in "Fan Culture Cocoons"

The metaverse, as an advanced manifestation of virtual worlds, is built upon extended reality (XR) technologies that integrate virtual reality (VR) and augmented reality (AR). Functioning as a virtual space that mirrors and interacts with the real world, it transcends traditional audiovisual experiences by offering fully immersive sensory engagement [16-17]. Minors, primarily composed of "Gen Z" (born between 1995 and 2010) and "Gen Alpha"

(born after 2010)—often termed "digital natives"—not only benefit from the conveniences of intelligent technologies but also enjoy abundant material resources. According to Maslow's hierarchy of needs, as material foundations are increasingly met, individuals shift toward higher-level spiritual pursuits. Many minors, raised in material abundance, turn to celebrities as emotional anchors. A 2021 report jointly released by Tencent's Sustainable Social Value Division and the China National Children's Center, Insights into Minors' Internet Interests, reveals that 6- to 16-year-olds primarily use the internet for social activities like chatting and idol fandom to fulfill emotional needs, with middle school students exhibiting the strongest idol worship tendencies.

Within the metaverse, leveraging advancements in digital twin technology, human-computer interaction, and artificial intelligence [18], underage fans can engage in cross-dimensional interactions with idols in virtual spaces. However, due to minors' limited self-control and susceptibility to temptation, these interactions often devolve into fleeting pleasures or even foster distorted "fan culture cocoons" [19]. Research indicates that in the visually driven new media era, idol selection has become increasingly superficial, prioritizing homogeneity and virality. Adolescents, influenced by capital-driven narratives, often commodify their emotional attachments to idols. For instance, China's fan-driven consumption reached approximately 140 billion yuan in 2022, with top contestants on Chuang 2021 (a reality show) amassing over 100 million yuan in fan-funded support [20]. Case studies demonstrate that while the metaverse offers immersive experiences and cross-dimensional interactions for minors, it also risks trapping them in irrational consumption behaviors.

(2) Security Risk Dimension: Dynamically Evolving Data Threat

At this stage, intelligent tools and big data have been extended to all aspects of minors' life and learning, and Internet technology has shown a trend of rapid iteration and leaping breakthroughs, so that under the background of digital intelligence, the information security threats faced by minors have also become diversified. Mainly manifested in the following aspects: First, the phenomenon of network violence emerges endlessly. According to the "2022 Survey on Internet Users' Satisfaction with Network Security" issued by 135 national network social joint organizations, more than 30% of minors have participated in activities related to network violence . This shows that as the material cost of Internet access becomes lower, there are more and more low-quality and low-morality Internet users lurking on the Internet, and these Internet users are readily accessible to minors, and their comments will have an adverse impact on minors, which will lead to a large number of minors being involved in cyber-violence incidents. Secondly, online fraud is difficult to prevent. In the AI technology has not yet appeared, network fraud is mainly concentrated in red packet rebate, free game equipment, extraction of blind boxes, false sale of concert tickets and other ways, but in the AI "deep forgery" technology, image fraud can not be prevented, according to the "minors Internet use survey report" shows that less than half of the According to the Survey Report on Internet Use by Minors, less than half of the minors have heard of lawless elements using artificial intelligence to synthesize false video and audio for fraud. This shows that the concept of fraud prevention of minors needs to be updated. Third, the risk of information leakage increases. With the development of technology, more and more intelligent tools are

available to minors, such as online learning platforms, smart wearable devices, etc., and minors leave a large number of traces when using these tools, which increases the risk of data leakage, but the leakage of information will not have a direct impact on minors, but will be used for enrollment consulting, big data killing, or precision fraud on parents of minors, so that they suffer property losses [21].

As minors lack social experience and judgment, it is often difficult for them to recognize these security risks when they encounter them.Therefore, parents, as the first person responsible for their children, in addition to their own awareness of preventing cybersecurity risks, it is even more important to cultivate their children to build risk prevention awareness.

4. Parenting paths in family education in the context of digital intelligence

Contemporary minors and digital technology go hand in hand, and with the popularization of new smart terminals, minors' access to the Internet is also showing a trend of underage. Digital technology not only provides minors with new learning platforms, entertainment and other new opportunities, but also brings new challenges to parent-child relationships and family education. In order to help minors cope with the crises brought about by the digital transformation, parents are urgently required to improve their digital literacy and update their concepts of parenting.

(1)   Fostering dialectical thinking: clearing the fog of information

In the age of digital intelligence, digital technology is changing our way of life all the time. As far as big data analysis is concerned, as long as a minor has been exposed to relevant information he is interested in once, big data will be pushed continuously, which greatly improves the efficiency of minors' understanding of the world, but also increases the risk of minors' exposure to undesirable information. According to the Survey Report on Internet Use by Minors, online entertainment activities represented by playing games and watching short videos have become an important way of leisure and relaxation for minors, and the proportion of minors who often watch short videos online has reached 54.1%. Short video through the algorithm according to the minor's point of interest for accurate push, parents in this case, should cultivate the minor's ability to verify the authenticity of the information, so that minors in the flood of information can also go in the right direction.

In the vastness of information on the Internet, the possession of critical thinking ability by minors is like having the seven stars of the Big Dipper, which helps minors to clear the fog of information and explore the direction of growth. Psychologist Kohlberg put forward the "moral dilemma story method" can be used as a method to cultivate the minors discursive thinking, and the family is often the best place to produce "moral dilemma" events, in the family often encounter some difficult to distinguish between the right and wrong trivialities, these trivialities Try to let the children to participate in, let them speak freely, express their views in order to cultivate their discursive thinking, in the practice of exercise in the dialectical thinking of the minors in the number of wisdom in the flood naturally also have the ability to settle down.

(2) Cultivating Independent Thinking: Reducing Dependency

Minors are independent individuals with their own thinking and mobility, especially for the younger minors, parents should not overindulge and reduce their independence. In the traditional society before the emergence of digital intelligence, minors encountered problems first turn to their parents, teachers, classmates and books, but later the first help browser, the development of the current help AI, which is a constantly updating the development of technology, enhance people's work and learning efficiency, but if over-reliance on AI? Inevitably, the independence of minors will also be reduced, so how should parents cultivate the independence of minors?

First, regarding age, psychologist Erik Erikson highlighted that the primary developmental conflict for minors aged 3 to 6 or 7 lies between initiative and guilt. If parents provide children with space for independent activities during this stage, it fosters confidence and a sense of responsibility. Conversely, excessive interference may lead to feelings of inferiority. Thus, parents should offer appropriate supervision during this phase, focusing on cultivating younger minors' independence rather than overstepping.Second, in terms of behavior, Yan Zhitui, an educational philosopher from China's Wei-Jin and Northern-Southern Dynasties, emphasized that "moral education thrives on role modeling." Parents should lead by example at home, actively engaging children in collaborative problem-solving processes that involve critical thinking, rather than resorting directly to AI tools.Finally, parents must guide minors in the proper use of AI. Researchers Hu Yiling and Zhao Zihong (2024), through a survey of over 8,000 parents and students, found that parental factors are critical variables influencing student development, with parents' AI acceptance showing a significant positive correlation with students' holistic growth [22]. To maximize AI's positive impact on children, parents must enhance their own digital literacy.

（3）Fostering Precautionary Awareness: Defying Security Threats

Through a quantitative analysis of 480 criminal cases, Luo and Zhang's (2021) empirical study revealed that adolescents constituted 35% of the victim sample.[23]In view of the fact that minors have not yet established a mature awareness of Internet safety precautions, and that the family is the first classroom for children's growth, parents play an unignorable role in the formation of minors' awareness of Internet safety precautions and healthy Internet access. First of all, parents themselves should have a certain degree of digital literacy and a certain understanding of digital intelligence products. Parents have the responsibility to help minors choose products that are ethically and morally designed, which plays an important gatekeeper role in reducing security risks. Second, when it comes to authorization of personal information, parents should build awareness of the right to "informed consent", pay more attention to personal data and privacy, stop using a product once they notice a security threat, and provide timely feedback to the product developer and government agencies.

 Finally, parents and minors should strengthen the knowledge of fraud prevention. In recent years, lawless elements in addition to the use of human greed fraud, such as into the group to grab red packets, brush single part-time work, gift game equipment, etc., but also the use of artificial intelligence to synthesize pictures or videos for fraud, this new type of fraud can not be prevented. This kind of fraud not only points to minors, but also points to the parents of the "wallet", so not only minors need to master the knowledge of fraud prevention, parents

also need to update the digital literacy, master the latest knowledge of fraud prevention.Network security relies on the common maintenance of Internet users, and in the case of increasingly younger Internet users, parents can substantially reduce the frequency of minors being violated by network security by timely popularizing network information security education to minors and enhancing their awareness of information security precautions.

4. Conclusions

In the context of digital intelligence, family education faces inevitable dilemmas and challenges. However, we can also explore new paths of parenting to solve these dilemmas and to promote the healthy and comprehensive development of family education, which will emanate a new light of parenting under the new opportunities.

Family education involves the knowledge of many disciplines, such as pedagogy, psychology, jurisprudence, etc., and most parents have not undergone systematic training in these disciplines. Therefore, in today's fast-changing era, many family problems have arisen that have not appeared in the society before, such as the "problem of depression", "anorexia", "addiction to Internet" and so on.", "addiction to the Internet" and so on. This requires parents to communicate more with their children and solve problems in a timely manner, and to update their educational concepts and reshape their parenting path. In addition, government agencies should also provide family education guidance services, so that parents not only have a place to learn, but also learn scientifically. In short, family education in the new era should not only retain the traditional family education that focuses on imparting knowledge and morals, but also adapt to the development of the digital age and effectively solve the education problems of minors.

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