| **RESEARCH ARTICLE**

Analysis of the Challenges and Opportunities of AIGC for Youth Education

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| **ABSTRACT**

The rapid growth of artificial intelligence (AI) technologies has permeated various industries, notably transforming the education of young children. On the one hand, content creators can use Artificial Intelligence Generated Content (AIGC) to convert mundane educational material into engaging animations, leveraging AI to tailor interactive content based on individual performance, thus enhancing the learning experience. However, as adolescents increasingly own smart devices, streaming platforms often customize content based on browsing history, potentially trapping youth in echo chambers. Moreover, advancements in AI can facilitate the spread of fake videos and news on these platforms, potentially altering adolescents' worldviews and posing challenges to their personal development and societal integration. This paper explores these challenges and opportunities, offering insights and recommendations for regulatory bodies and family education strategies.

1. Introduction

The rapid growth of Artificial Intelligence Generated Content (AIGC) is transforming various industries, with education being one of the most significantly impacted sectors. As AI technologies continue to evolve, AIGC is increasingly used to create personalized, interactive, and engaging educational content for young learners. This technological advancement has the potential to revolutionize the way education is delivered, offering new opportunities to enhance learning experiences. However, the integration of AIGC into youth education also presents several challenges, such as the risk of misinformation, algorithmic bias, and the potential overreliance on AI-driven tools, which may affect students' critical thinking and self-directed learning.

Given these developments, it is crucial to examine the dual nature of AIGC in youth education—both its opportunities and its challenges. This study aims to explore how AIGC is reshaping educational content and learning experiences for young people while also addressing the associated risks. By analyzing these aspects, this paper seeks to provide insights and recommendations for educators, policymakers, and parents on how to effectively integrate AIGC into the education system in a way that maximizes its benefits while minimizing potential drawbacks.

2. The Role of AIGC in Transforming Educational Content
2.1 Definition and Overview of AIGC
AIGC, or AI-generated content, refers to the use of artificial intelligence algorithms to generate and modify diverse content, including text, images, videos, and so on. AIGC leverages natural language processing, computer vision, and machine learning

algorithms to generate content that mimics human creativity. It can possibly assist or replace manual content generation by generating content based on users' inputs in two major steps: First, extracting intent information from the user's instructions and then generating content according to the extracted intentions.

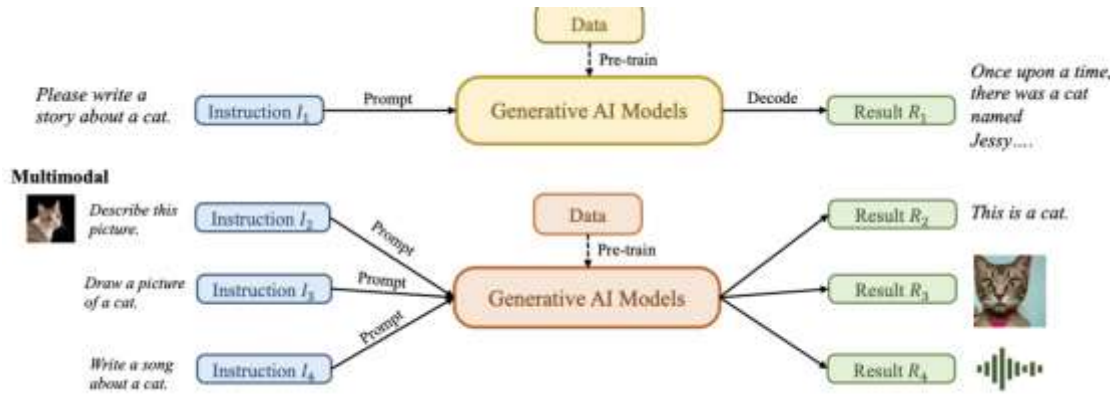### 2.2 Explanation of AIGC and Its Applications

Figure 1 How generative AI work
Source: (Bastola, 2024).

AIGC also utilizes large-model algorithms. For instance, ChatGPT utilizes reinforcement learning from human feedback (Ouyang et al., 2022) to determine the most appropriate response for a given instruction, thus improving the model's accuracy over time as well as reliability. This approach allows ChatGPT to better understand human preferences in long dialogues.

2.3 Case Examples

Today, some specific AI tools have already been employed by industries and applied in children's enlightenment education fields. In August 2024, Heeyo, an AI chatbot software, was published and received a $3.5 million investment from OpenAI. As an education-oriented AI, Heeyo is supposed to play the same role as teachers at primary school—guiding children to pass on knowledge and fostering children's critical thinking skills.

Figure 2. Heeyo AI advertising page

Due to that end, Heeyo AI was born with one learning game generator, built on decades of research from educators, psychologists, and neuroscientists. Using generative AI, it creates new learning games for kids. In fact, it interacts with children by helping them design their own questions and propose trivia games. Then, Heeyo guides young learners into different subject fields and excavates children's interest in learning. According to the founder of Heeyo, Xiaoyin Qu acknowledges that within the tests of 100 children who use Heeyo, the majority of the children see Heeyo as their friend, and they are very willing to interact with it.

3. Opportunities AIGC Brough to Youth Education
3.1 Appearances of AI Algorithms in Education and Its Unique Education Methods
3.1.1 AIGC in Fields of Education Sector
The field of education is one of the forefronts where AIGC can apply its uses. Unlike traditional human educators and teachers, AIGC can provide learners with personalized learning materials. For instance, it can generate exercises and lecture texts based on student's abilities and learning habits. Moreover, AIGC is able to interact with learners in a unique way. Specifically, users might learn through online classes by watching videos like AIGC-generated animations.

3.1.2 AI Enhances Interactive Learning as a Teacher
AIGC might pause the video and throw questions about the content lectured through the video. Those questions are often accompanied by different options. Once users have given their responses through algorithms and deep data analysis, AIGC will quickly get the learning feedback from each student. In return, AIGC will generate different content and videos for users at different paces. If Lerner knows the knowledge well, AIGC will move on and teach him the next chapter. On the other hand, if Lerner gets stuck on some parts of the course, AIGC will generate some review videos automatically for learners. As an educator, AIGC makes sure that no students in its class are left behind while interacting with learners.

3.2 Applying AIGC in Education Fields Tends to be Cost-effective
3.2.1. Cost-effectiveness in Content Creation
Previously, when generating content like news articles, photographs, music, and 2D/3D drawings, those pieces of work were all generated by humans. In order to create those works, it is required to precisely catch the thoughts in one's mind, express them effectively, and at the same time, express a bit of creativity.
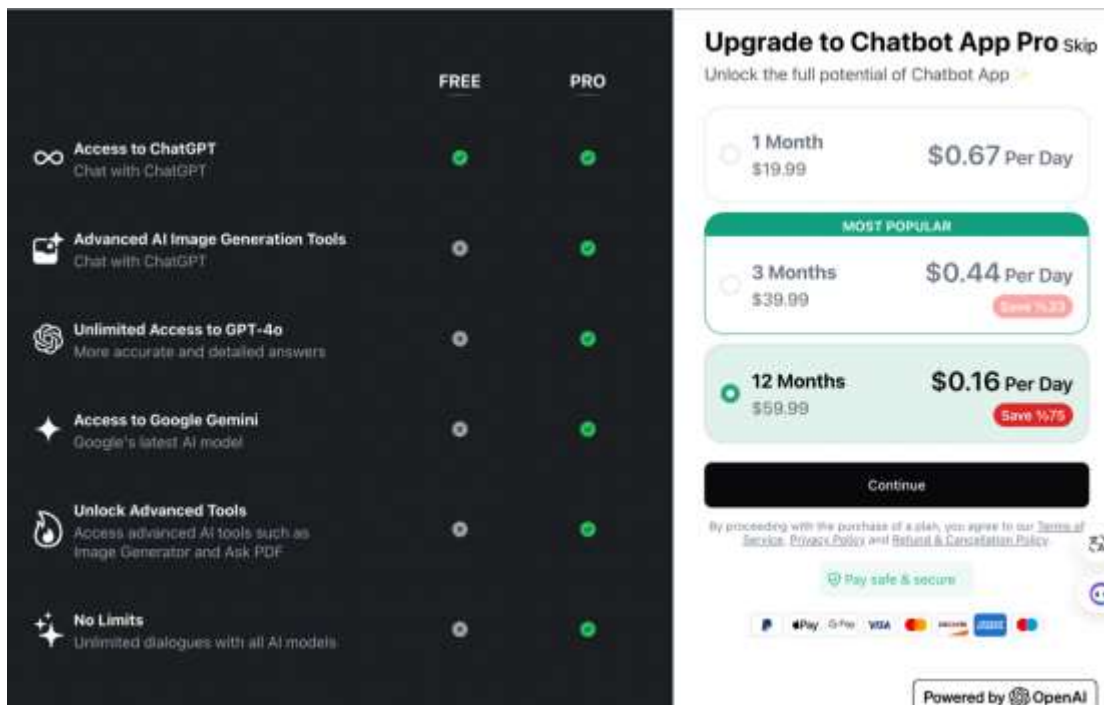

Figure 3. Pages showing the costs of purchasing Midjourney

Nowadays, AIGC tools like Midjourney are able to catch the thoughts of humans within a few lines of text. By just typing what people want to draw, image-drawing tools like Midjourney can quickly give a few possible images to meet the request. By contrast, a human artist might take more time and effort to create the same quality picture. Additionally, it takes more than 50 thousand dollars to hire a 2D artist to help create images for you. For AI tools like Midjourney, it only takes 59.99 dollars. Although AIGC tools might not generate pictures as well as 2D artists, such a situation seems unlikely to continue for too long.

AIGC tools are very costly and time-efficient in terms of AI image generation. For cases other than image creation, like text and animation generation, AIGC will definitely do the same job as shown in image generation. Returning to fields of education, if lectures, videos, and assignments used for educational purposes can be generated by AIGC, the cost of education will be reduced dramatically.

3.2.2 Costs-effectiveness in Knowledge Acquisition
AIGC tools have the ability to gather the input data and output the intended results. Imagine the situation without AI's help. If a student has an unsolved question about the subject of biology, she might need to grab a book, direct herself to the right place, and examine the information. This process might take more than ten minutes. Even worse, it is not guaranteed that the girl can answer her question with an accurate response. On the contrary, an AIGC tool can catch the exact information from the question and direct her to the exact right answer. At the same time, she will also be able to know the knowledge points behind it within less than one minute. In this case, it takes less time and simplifies the process of solving questions when acquiring knowledge.

3.3 Enhancement of Personalized Learning Experiences
Today, on some online video sharing platforms like YouTube, some bloggers interact with AI avatars in live streams, which attract substantial attention. Once AI avatars are applied to young people's education, teenagers will be excited about such AI avatars. Take an online class, for example. AIGC can present its form to learners through creating AI avatars. Young people are very likely to view AI avatars as friends and will be willing to interact with them. As a digitally generated representation of a person, AI avatars can be designed in creative forms. For instance, in an online history class, AI avatars can be designed for historical figures or anime characters related to such topics.

Besides arranging a vivid character, AIGC can also create a more interactive learning environment. The application of AIGC to create a more interactive, personalized learning environment is significant for enhancing the quality and effectiveness of young people's education. With the aid of augmented reality (AR) and virtual reality (VR) technologies, AIGC can provide immersive learning experiences for learners. Specifically, students can get in touch almost directly with the things they need to learn. In such an environment, the students have chances to engage in more practical learning by simulating the use of knowledge in real life. Additionally, class activities and assignments can be used in creative ways. For instance, groups of students can design experiments in the 3D-demo environment generated by AIGC. Regarding where students are on the planet, once they wear the AR helmet and get into the environment, opportunities to get into practical learning are provided to them.
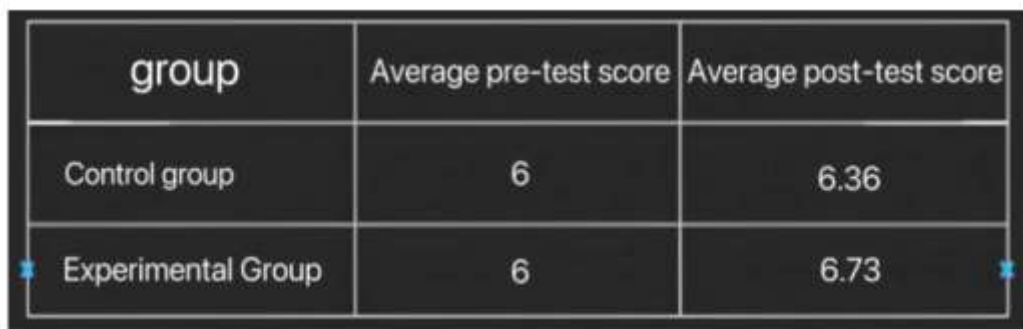
3.4 Case studies
3.4.1 Contexts
In the previous sections, we noticed that AI personalizes educational content based on individual performance. Such a unique approach offers benefits for students at different learning paces and styles. This is especially evident in terms of language learning. If a student takes a mock TOEFL test on an educational website where AIGC is employed, AIGC will provide other things besides score results. Specifically, it provides personalized customization, where it customizes teaching content according to individual circumstances. By analyzing the results of student's scores, AIGC provides each individual with a suitable, targeted, and specific study plan to help them better prepare for the TOEFL test.

3.4.2 Research Objects, Procedures, and Data Collections.
A research project was conducted by a university in Guangdong (He et al., 2024). A total of 80 second-year foreign language students were selected, including 27 English majors, 27 translation majors, and 26 business English majors. They were divided into two groups: the experimental group, which uses AIGC tools, and the control group, which applies traditional teaching methods for 11 weeks of IELTS reading and writing training twice per week.

After the experiment, 80 students were collected from the practice records and post-practice feedback in 11 weeks. 80 students with reading and writing scores ranging from 6 to 6.5 for the experiment were selected by researchers. Then, students were again arranged to take a summary test.

group	Average pre-test score	Average post-test score
Control group	6	6.36
Experimental Group	6	6.73

Figure 4. IELTS reading scores results before and after comparison
Source: (He et al, 2024)

Figure 5. IELTS reading scores results before and after comparison
Source: (He et al, 2024)

3.4.3 Analysis of Experiment Results
Percentage increase in score calculation:

Reading:
Control group: (6.36-6)/6*100%=6%
Experimental group: (6.73-6)/6*100%=12.17%

Writing:
Control group: (5.8-5.5)/5.5*100%=5.45%
Experimental group: (6.04-5.5)/6.04*100%=9.82%

Based on the calculations, the percentage increase in score for the control group was 6% for the reading section and 5.45% for the writing section, whereas the percentage increase in score for the experimental group was 12.17% for the reading section and 12.17% for the writing section. In comparison, the percentage increase in score for the experimental group is larger than that for the control group. Such results suggest that the use of an AI-assisted approach can help students improve their writing and reading results more than traditional methods do.

3.4.4 Conclusion
By analyzing the data collected, it can be inferred that AIGC-associated help increases the scores more than the traditional approach. Additionally, the use of AIGC has the potential to improve the performance of some students in a short period of time. The results support my previous assertion that AIGC customized teaching content according to individual circumstances by offering a unique review plan. By offering forward suggestions and targeting modifications, AIGC-tools are very likely to help students resolve their difficulties during fields of learning. Through customized teaching content according to individual circumstances, introducing AIGC in young people's education will be beneficial in terms of test- preparation.

4. Challenges of AI-Driven Streaming Platforms
4.1 Impact Inside Classroom
4.1.1 Overreliance on Artificial Intelligence Hinders Teacher-Student Communication
In the practice of AI-assisted education, an increasingly concerning issue is that students may reduce face-to-face communication with teachers due to an overreliance on AI tools, especially in traditional settings such as office hours. This trend could have profound implications for the teacher-student relationship and the learning experience of students. In a recently published survey, 67% of students indicated that they use artificial intelligence to solve problems in order to reduce communication with teachers. However, teacher-student interaction is an indispensable part of the educational process, which not only aids in students' knowledge acquisition but also plays a significant role in the development of social skills and emotional growth (Popenici & Kerr, 2017).

Reducing face-to-face communication may limit students' opportunities to express their views and decrease the likelihood of receiving personalized guidance from teachers. Moreover, teachers play the role of guides and motivators in students' learning process. While the use of AI can improve teaching efficiency, it cannot completely replace the human touch and emotional support provided by teachers. Academic papers have mentioned that teachers should utilize AI technology as an auxiliary tool for teaching, not as a substitute, to ensure that students can receive the necessary interpersonal communication and emotional exchange with the support of technology.

4.1.2 Overreliance on Artificial Intelligence Affects Self-directed Learning.

In today's era, where artificial intelligence technology is extensively integrated into the field of education, students' dependency on AI has gradually become a concern. This reliance may lead students to forgo in-depth thinking when faced with problems, instead directly seeking AI's assistance, which could impact their abilities in critical thinking and proactive learning.

The immediate answers and solutions provided by AI might weaken students' motivation to solve problems independently. As students become accustomed to quickly obtaining answers, they may gradually lose their ability to explore, analyze, and think independently about issues. This dependency could hinder the development of critical thinking skills, as these require the formation through questioning, analyzing, and evaluating different viewpoints and arguments.

Academic papers have mentioned that one of the goals of education is to cultivate students' abilities to learn proactively. Proactive learning involves self-driven exploration, questioning, and research by students. However, when AI becomes the primary source students turn to for help, they may become passive, merely satisfied with accepting the information provided by AI, rather than actively seeking out and verifying the sources and accuracy of this information. Finally, the dependency of students on AI could also affect their innovative capabilities. Innovation often stems from questioning existing knowledge and exploring new possibilities. If students are accustomed to accepting AI's answers without their own contemplation, they might miss the opportunity to develop innovative thinking.

4.2 Impact Outside Classroom
4.2.1. Dissemination of Erroneous Information

In contemporary society, the rapid development and widespread application of Artificial Intelligence (AI) have undoubtedly brought many conveniences to human life, but they have also introduced some non-negligible issues. One such issue is the authenticity of knowledge. Knowledge derived from genuine and reliable information must be based on objective facts and sound reasoning, thus possessing credibility and verifiability. However, in educational research on AI-generated content (AIGC), the "black box" knowledge generation process has continuously faced skepticism. The most critical viewpoint is that the content from extremely large-scale corpora is complex in origin and lacks classification standards; hence, its output might be a horizontal integration similar to the low-quality discussions found on platforms, with potential biases in accuracy (Jing & Yang, 2024).

Especially in terms of information generation and dissemination, the involvement of AI can sometimes lead to the creation of erroneous information, affecting the judgment and decision-making abilities of young people. An illustrative example is the incident with the well-known American technology news site CNET in January 2023. Over the course of a month, CNET quietly published 77 articles generated by AI without any labels, which were directly presented to the public without human review, causing widespread concern and criticism. This action by CNET not only violated the transparency principles of the news industry but also exposed the limitations of AI in information processing. Particularly, an article about "What is compound interest?" even contained computational errors. Adolescents are at a critical period in forming their worldviews and values; obviously, erroneous information published on such official media websites can mislead their way of thinking and decision-making process. Although CNET corrected 41 articles in a timely manner, the impact already made is hard to completely undo. This incident reminds us that while enjoying the convenience brought by AI, we must remain vigilant about the potential errors it may generate. Especially in the fields of education and information dissemination, ensuring the accuracy and reliability of information is crucial for cultivating correct judgment in young people. Therefore, for content generated by AI, relevant organizations and individuals should adopt a more cautious attitude and ensure the authenticity and accuracy of information through human review and proofreading to prevent the adverse effects of erroneous information on young people and the entire society.

4.2.2 Algorithmic Bias and the Echo Chamber Effect

Since the early days of the internet era, the negative impact of the echo chamber effect on adolescents caused by internet platforms has been a hot topic in the field of communication studies. After entering the era of artificial intelligence, personalized content delivery based on algorithms and big data by internet platforms will undoubtedly make the phenomenon of the echo chamber more common.

In 2012, Ted Striphas proposed the term "algorithmic culture," defining it as "the sorting, classifying, and grading of people, places, things, and ideas through computational processes." He believes that algorithmic culture actually follows the principles of cultural organization. The elites behind the platforms are responsible for propaganda, promoting the "best ideas and discourses." Striphas argues that algorithms are used to "arrange" culture. Powerful platforms plan public culture but never disclose the "behind-the-scenes" decision-making process; the public never knows how these decisions are made. In other words, when we use artificial intelligence and new media platforms, it is almost impossible to avoid the elite class behind the platforms instilling what they want us to see. Adolescents lack independent cognition and thinking abilities, and compared with traditional education models, when adolescents access information online with the help of artificial intelligence, the information they receive is difficult to filter and

regulate. It is hard to prevent adolescents from being exposed to inappropriate content such as pornography, violence, and flaunting wealth (Carah, 2023).

Moreover, in the process of knowledge dissemination, people tend to select and be exposed to information that aligns with their own views, thus forming an information loop that limits their horizons and breadth of thought. On short video and other social media platforms, the algorithmic recommendation system pushes personalized content through precise user profiling, which may cause adolescents to fall into an echo chamber, making it difficult for them to be exposed to diverse and opposing views. Being in an echo chamber for a long time may lead adolescents to develop a rigid thinking pattern and lack critical thinking, and it may affect their ability to make rational judgments and think independently.

Due to the imbalance of datasets, the subjective consciousness of the designers, or inherent societal biases, the results of algorithmic outputs may contain unfair or discriminatory issues. It is generally believed that algorithmic bias is a product of social processes and an extension of social prejudice. For example, in the field of education, algorithmic bias may lead to unfair distribution of educational resources or discrimination in student evaluation in terms of gender, race, and other aspects. Such bias not only violates the principle of educational equity but may also have a negative impact on the adolescents' self-identity and development.

4.2.3 The Knowledge Gap Triggered by Technological Change
With the rapid development of artificial intelligence technology, the field of education is undergoing an unprecedented transformation. However, this transformation is not without challenges, one of which is the potential to exacerbate the knowledge gap. Firstly, the application of artificial intelligence technology in education, especially in the distribution of high-quality digital educational resources, may lead to inequality due to differences in regions, economic conditions, and school facilities. As stated in the "People's Daily," although China has a solid foundation and unique advantages in the development of "AI + Education," the "digital divide" may exclude some students from smart education. This indicates that without proper policy support and resource allocation, some students may not be able to enjoy the educational benefits brought by artificial intelligence. Secondly, the reality of the knowledge gap is multidimensional, including the access gap, usage gap, and quality of use gap. This means that in addition to the issue of whether students of different economic levels can use artificial intelligence to assist learning equally, the skill differences among different groups when using the Internet for educational learning, as well as the differences in the quality of information obtained, can affect educational equity. For example, there is a significant difference in the understanding of artificial intelligence itself between urban and rural areas, which may lead to different judgments and decisions for urban and rural students in terms of how to search for information more effectively and how to distinguish higher-quality information when using artificial intelligence (Wu, 2022).

5. Possible Solutions for Problems Brought by AIGC
The following measurements are listed in order to provide possible solutions that minimize the drawbacks and risks mentioned above.

5.1 Inside the Classroom
In order to avoid decreasing in teacher-student interaction, efforts should be made by educational systems to train teachers to be capable of offering courses aligned with AI teaching and to mandate courses that provide education on the proper use of AI. It has been shown from research that, while applying AIGC to studying, the sense of interaction is comparatively low and tends to cause a sense of alienation between the students and teachers in those online text communications. However, introducing the use of multimodal communication methods, such as video, audio, and images, can effectively enhance students' sense of engagement, which indicates the significance of teachers mastering the skills used to create more efficient and effective courses with the assistance of AIGC (Wang et al., 2022; Woolf et al., 2013).

To protect the self-motivation to study among youths, both the emphasis on AI challenges and the preparation for an AI-ready world should be a mandatory part of education and preschool education. Addressing ethical issues associated with AI use in education, such as AI bias and the potential for misinformation. Developing a module-based approach that optimizes learning outcomes, which involves creating AI education modules that are engaging and relevant to students' lives, thereby reducing the sense of authority of AI and promoting students to stay curious, is another approach that should be put into practice (Greenwald et al., 2021).

5.2 Outside the Classroom
5.2.1 Government Involvement
In order to offset the negative effects of prolonged use of electronic devices on young people's visual health and mental health, governments should introduce relevant policies to ensure that young people's time for outdoor activities is sufficient.

At the same time, in order to avoid the use of electronic products for learning, which will infringe on the right of youth from underdeveloped regions to have equal access to education, electronic products used in schools, as well as a range of by-products that may be used, including stylus pens, apps, etc., should be provided by the government with nationally recognized and standardized products.

5.2.2 De-commercialized Education
Education should be de-commercialized. Education as a public resource should not be left to the market; thus, suppliers of electronic products used for youth education should, under the supervision of the government, develop versions more suitable for use in education, in which algorithmic pushing based on user preferences should be banned.

The creation of echo chambers could be inhibited by the ways above, but considering the inevitability of the creation of echo chambers, it is also possible to dismantle the existing ones by enhancing individual media literacy, which includes critical thinking skills and the ability to filter information. It requires individuals to be able to actively seek and accept information that differs from their own viewpoints rather than passively accepting information from a single source. This can be achieved through the following:

(1) Encouraging students to question the existing information and to stay open to diverse sources of information, including materials from different viewpoints and backgrounds.
(2) Helping youths to learn to analysis and evaluate the received information and identify possible biases and errors within it.
(3) Teaching students to question themselves and adjust one's own views, so that when encountering information that is inconsistent with their own views, students could consider the possibilities of how inconsistent one can be true, which can expose them to new views.
(4) Utilizing electronic products to create platforms which foster the interaction and discussion between students with different background to promotes dialectical thinking among youths.

5.2.3 Reduce Spreading Information
Several approaches can be taken to reduce the spread of misinformation.

(1) Use the COSMOS method to facilitate self-supervised learning for detecting misinformation in adolescents' education with AI. The COSMOS method utilizes image and text anchoring to distinguish scenarios that cannot be distinguished by language alone. In the COSMOS method, the key process is the grounding of images with corresponding textual claims. While training, the system learns to selectively align individual objects within an image with specific textual claims. This allows the model to compare the visual content and textual descriptions, which helps in making accurate predictions about whether the information is being presented out of context. If the captions refer to different versions of the same image, it suggests that the information might be misleading (Aneja et al., 2021; Devlin et al., 2018).
(2) By engaging in a dialog with the user and explaining the algorithmic predictions using class-comparison counterfactual statements, the user can understand the process of automated decision-making and identify biases and errors in the model. This is known as the glass box approach. For example, if a loan application is denied, the system can provide one or more counterfactual scenarios that show what the prediction would have been if certain conditions were different. This approach does not require any technical knowledge and is suitable and practical for students (Sokol & Flach, 2018).

5.2.4 Remove Knowledge Gap Caused by Technological Development Brought by AIGC
Knowledge graphs can be adopted to identify the knowledge gap triggered by technological development and the uneven distribution of knowledge. By analyzing the semantic search, graph analytics, and polystore query optimization, organizations can identify areas where they lack critical knowledge and take steps to fill these gaps (Gupta et al., 2021).

To reduce the knowledge gap triggered by technological development and the uneven distribution of it, the vital step should be to ensure equitable access to technology through government forces. This includes not only expanding the physical infrastructure necessary for the use of electronic devices but also ensuring that the technology itself is affordable and relevant to the needs of all local populations through economic policies.

There is a growing need for students to be equipped with the skills necessary to utilize AIGC technology. Educational programs that focus on digital literacy, including basic computer skills, internet safety, and understanding of emerging technologies, are crucial for reducing the gap. These programs should be tailored to different age groups and educational levels to ensure broad coverage of the current situation and make sure underprivileged groups can also benefit (Yu & Luo, 2020).

6. Conclusion

This study has highlighted both the opportunities and challenges presented by AIGC in youth education. AIGC has the potential to transform educational content delivery, making learning more personalized and engaging. However, the risks associated with misinformation, algorithmic bias, and the overreliance on AI cannot be ignored. It is crucial for educators, policymakers, and parents to work together to harness the benefits of AIGC while mitigating its risks. Future research should explore more comprehensive strategies for integrating AIGC into education in a way that promotes equity, critical thinking, and holistic development among youth.

Conflicts of Interest: The authors declare no conflict of interest.

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