Research on the New Path of Popular Science Education under the Background of Digital Media

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Abstract—The purpose of this paper is to explore new paths and methods of popular science education in the context of digital media. Digital media is a new form developed in the information age. Popular science education has broken the traditional education methods, followed by new ways of creating works, new communication platforms and forms. This paper analyzes the shortcomings of traditional popular science education, and makes a project case of popular science education under the background of digital media, which proves the feasibility of the new path of popular science education. The article proposes a new path for the development of popular science education in the context of digital media, such as making good use of new media platforms, using new virtual reality technologies, focusing on the training of popular science education talents, strengthening popular science education for young people, playing the role of all media, and forming a good social atmosphere for popular science.

Keywords-Digital media; popular science education; augmented reality

1 DIGITAL MEDIA

1.1 Definition of the Digital Media

Digital media belongs to the engineering discipline category, which refers to the information carrier that records, processes, transmits and obtains the process in the form of binary numbers. These carriers include digital sense media such as text, graphics, images, sounds, video images and animations, digital coding that represents these sense media, and physical media that store, transmit and display logical media.[1]

1.2 Classification and Introduction of Digital Media

Digital media provides users with information and services through computer networks, wireless communication networks, satellites and other channels, as well as computers, mobile phones, digital television and other terminals, using digital technology. Digital media, corresponding to traditional media, is supported by digital compression and wireless network technology. With its large capacity, real-time and interactivity, it can cross geographical boundaries and finally achieve globalization.

The digital media platform has the characteristics of high communication efficiency, diverse forms of expression, and strong sense of interactive experience. Popular science education in

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the form of new media can innovate the form of communication and improve the effect of communication. There are many forms and technologies of new media, and the available carriers include WeChat, microblog, short video platform, Web3D technology, virtual reality technology, augmented reality technology, H5 technology, etc.[1]

2 POPULAR SCIENCE EDUCATION

2.1 Concept and Development Status of Science Popularization

Popularization of science and technology (hereinafter referred to as PST) refers to activities to popularize scientific and technological knowledge, promote scientific spirit, disseminate scientific ideas, advocate scientific methods and promote the application of science and technology in a way that is easy for the public to understand, accept and participate in. Science popularization is an important basic work to achieve innovative development. The significance of science popularization lies in publicizing scientific principles and scientific truth, correctly guiding people to overcome cognitive barriers, eliminating panic, and protecting the overall and long-term interests of the people.

The development level of popular science education in China is not high and uneven. Popular science education abroad has a strong social atmosphere, and its development is relatively mature. It promotes the scientific spirit and scientist spirit. Speaking with experimental data, popular science work is more rigorous, and popular science education is integrated into every aspect of daily life. For example, "Ah! Design" in Japan is a TV program designed for popular science. It has a high audience rating on NHK TV. The YouTube popular science channel in the United States has made a series of popular science columns through various forms of two-dimensional animation, three-dimensional animation, freeze frame animation, scene shooting, etc., such as the best biological three-dimensional animation Nucleus Biology. The BBC in Britain has produced many large-scale popular science documentaries, such as The Secret of Everything's Operation, The Factory of Creation, Funny Popular Science, etc. It has formed a social atmosphere with rational thinking and scientific spirit.

2.2 Shortcomings of Traditional Popular Science Education

There are some problems in the current science popularization education, which are manifested in the low overall level of scientific quality, the unbalanced development between urban and rural areas and between regions, the insufficient efforts to promote the scientific spirit and advocate the spirit of scientists, the weak social atmosphere of science popularization, and the lack of high-quality science popularization products, which cannot meet the needs of science popularization.

Teenagers are an important reserve force for national construction, and popular science education for teenagers is more urgent. However, the popular science education for young people is not deep enough, the application of new technology in popular science education is insufficient, the means of popular science education for young people are few, and the supply of high-quality popular science products is insufficient.

The whole society should strengthen the popular science education for young people, put the popular science education for young people in a more prominent position, make young people

full of curiosity and imagination, enhance their interest in science, strengthen their innovation ability and consciousness, vigorously promote the spirit of science, vigorously promote the spirit of scientists, and lead more young people to devote themselves to science and technology.

3 NEW PATH OF POPULAR SCIENCE EDUCATION

3.1 Do Well in Popular Science Education Through New Digital Media Platform

The iteration of new technologies has led to the emergence of new media platforms. The form of popular science education is no longer confined to traditional forms of text, graphics, images, audio, etc. It can achieve multi-dimensional reconstruction of popular science content through new digital media technologies such as animation, short video, augmented reality, virtual reality, etc. Popular science education is no longer a linear transmission of traditional media, but instead emphasizes non-linear transmission. Popular science education strengthens users' emotional interaction and composite experience. The emergence of digital media provides new possibilities and new content for the creation of popular science content. Make full use of digital media paradigm and new digital media platform to do a good job in science popularization education, create a better user experience, and produce science popularization education products that conform to the use habits of modern people. In addition, due to the impact of the "COVID-19" epidemic, offline popular science education places have been limited. In order to meet the spiritual needs of the masses, more new digital media styles have been created and promoted, and more new media forms have emerged to meet the needs of popular science education.[2]

By building a new digital media platform, we will promote the development of science popularization education in virtual depth, create a science popularization communication platform that is jointly built and shared by the whole society, attract social forces to release creative products and provide science popularization services on the platform, and turn science popularization from mainly relying on professionals into a platform that can be participated, interacted and shared by science popularization enthusiasts, free designers and scientific researchers, and integrate science popularization resources on the platform, It uses 3D animation, virtual reality, animation and all media to transfer scientific knowledge and provide the public with a full coverage and interactive science education platform. By means of 3D animation, virtual reality, augmented reality, interactive device design, interactive games, Web3D and other digital media, the digital media art and popular science education are deeply integrated to enhance the artistic effect of popular science education, make popular science more interesting and attractive, and deepen users' scene, experience and immersion feelings.

At present, there are typical cases of using new digital media platforms for popular science education, such as short videos, Bilibili popular science channels, etc.

3.1.1 TikTok Science Number

"KEJI and TEC" TikTok is a public platform that focuses on the use of three-dimensional digital technology to produce popular science content display. Its works include introducing the working principle of piano, GPS positioning principle, key unlocking principle, steam engine working principle, etc. The content of popular science adopts the form of three-dimensional

animation. The complex structure is modeled with three-dimensional digital technology and made into three-dimensional animation. The intuitive and clear characteristics of three-dimensional animation are fully used, so that the audience can see the internal structure of objects that cannot touch the real object at ordinary times, and clearly show the working principle of the research object. As shown in Figure 1, a partial screenshot of the TikTok number "KEJI and TEC". As shown in Figure 2, three-dimensional animation is used to show the working principle of microwave oven.

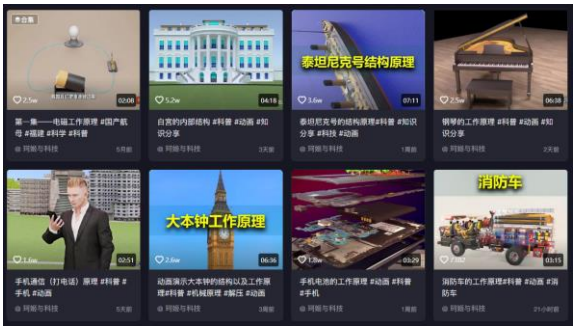

Figure 1. Screenshot of "KEJI and TEC" TikTok.

Figure 2. Use 3D animation to popularize the working principle of microwave oven.

3.1.2 Bilibili Science Channel

Bilibili is a platform where young users occupy the mainstream. The popular science channel on the platform gathers many UP owners who focus on the creation of high-quality popular science content, including high-quality official accounts such as the "anime Institute of Physics of the Chinese Academy of Sciences", the "Planetary Research Institute", and the "Chinese Popular Science Expo of the Chinese Academy of Sciences". "Anime Institute of Physics of the Chinese Academy of Sciences" won the best annual creative organization in 2022, and "Planetary Research Institute" won the best annual popular science recording video.

The "Planet Research Institute" focuses on exploring the ultimate world from the perspective of geography, including satellite science popularization, planet scenery, planet 1min and other sub channels. For example, the work "What will you see when you open the “Da Yan Ta”?"

introduces the structure of the “Da Yan Ta” in the form of three-dimensional animation, and explains the tenon and mortise structure of wooden buildings in detail.

The account of "China Science Popularization Expo of CAS" is the science popularization cloud platform of CAS. The content released is authoritative and the form is lively. For example, the work "5-minute 3D Show You the Whole Process of the Core Cabin of the Space Station" makes full use of the advantages of 3D digital technology, and makes science popularization education for the launch of the core cabin in the form of 3D animation, which is intuitive, clear and interesting. As shown in Figure 3, the 3D animation screenshot of the China Space Station is shown.

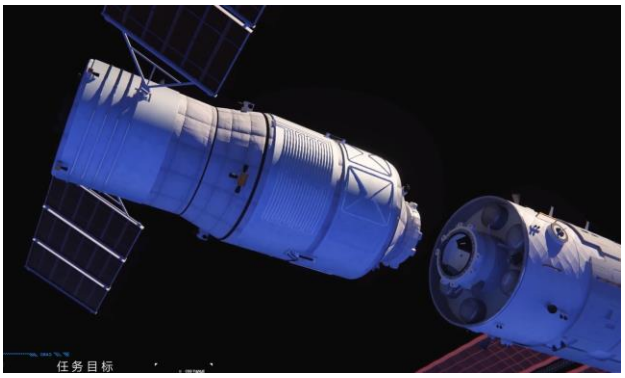

Figure 3. 3D rendering of China Space Station.

3.2 Strengthen Theoretical Research and Attach Importance to the Training of Science Popularization Talents.

The whole society should establish a scientific and diversified cultivation mechanism, strengthen the allocation of educational teachers and the compilation and use of scientific textbooks, cultivate more outstanding talents to use digital media technology to engage in science popularization, focus on cutting-edge science and technology with high public concern, and launch a number of high-quality science popularization works that promote positive energy and have a great impact. Set up science popularization related majors and courses in colleges and universities, establish a development alliance combining "production, learning, research and use", form an industrial development pattern, and strengthen the creative power of digital science popularization works. Carry out research on the theory and practice of popular science education around the problems of science and technology ethics, science and technology security, science rumors and other aspects brought about by the development of science and society. Deeply carry out research on means and methods of science popularization, use new technologies such as big data, 5G, artificial intelligence to enrich the supply of science popularization works, produce science popularization products, provide science popularization services, and develop science popularization education products for young people. Effectively carry out science popularization and education activities on the theme of infectious disease prevention and control, disaster prevention and mitigation, emergency and risk avoidance, and comprehensively promote the popularization of science knowledge into schools, families, enterprises, villages and communities.

3.3 Strengthen the Weight of Popular Science Education for Young People.

General education courses related to science and technology should be set up in youth education to meet the needs of students of different majors and ages, vigorously support youth to carry out innovative practice activities, and make full use of science and technology resources inside and outside the school to strengthen science education.

3.4 Give Full Play to the Role of All Media, Make Good Use of the New Digital Media Platform, and Improve the Science Communication Ability.

With the development of digital media technology, more and more new digital media platforms have emerged, which affect the creation methods and styles of popular science education works. It is imperative to make good use of the new technology and platform of digital media to build an appealing new object of digital experience, and to do a good job in science popularization in a novel and interesting form.

Deeply promote the development of science popularization informatization, vigorously develop online science popularization, and increase the promotion of excellent science popularization works. With the power of new media platforms such as CCTV, TikTok, WeChat video number, and the role of network science popularization, the new space created by new media has become an important position for science popularization. While giving play to the role of new media, we should support and cultivate new forces active on the network to serve science popularization in a more direct and convenient way.

3.5 Form a Good Social Atmosphere, Let Everyone Attach Importance to Science Popularization and Let Everyone Love Science.

Organize the whole society science popularization innovation competition, publicize science popularization in the whole society, form a social atmosphere that supports the development of science popularization, publicize the important role of science popularization in improving the quality of citizens, especially the quality of young people, and enhance the whole society's sense of responsibility for science popularization. Through the science popularization innovation and creativity competition, we will explore the innovation points of the whole society and provide a continuous stream of new ideas for science popularization product development for science popularization education.

4 APPLICATION CASES OF POPULAR SCIENCE EDUCATION IN THE CONTEXT OF DIGITAL MEDIA

4.1 Hippo Popular Science Education Readings Based on Augmented Reality Technology

Hippo children's science popularization project uses augmented reality technology. Augmented reality is a real-time direct or indirect view of the real physical world environment. In this view, some computer-generated sensory information, such as sound, video, image and other data, are input into the real physical world environment, thus adding or enhancing the components of the real environment.

This project has drawn a two-dimensional illustration picture book of hippos. The mobile terminal scans the picture book image to display hippos' morphological characteristics, habitat, living habits, distribution range, breeding methods, protection status and other contents in a real-time interactive manner. By using augmented reality technology, the multi sensory experience of vision, touch and hearing is combined with the popular science education of hippos, which is novel and interesting. As shown in Figure 4, the effect of Hippo children's popular science books in augmented reality is shown.

Figure 4. Hippo children's popular science readings with augmented reality.

Hippo popular science reading project, analyzed and investigated the object of use, content, production form and media of the project. The 3D model of the hippo was created, and the animation of the hippo movement was made. The display was made using augmented reality technology and the new digital media platform.

4.1.1 Real Dynamic Performance

Create a high-precision model of the hippo in Maya, endow the hippo with real materials, bind the bone system for the hippo, make skin, adjust the animation, and make the hippo's common foraging paintings, jumping animation, rich expression change animation, etc. Stimulate users' perception of the reality of hippos, turn the two-dimensional static image of picture books into a three-dimensional dynamic image integrated into the real environment, awaken users' emotional cognition, teach in fun, and achieve a good science popularization effect.

4.1.2 Combination of Virtual Pictures and Real Scenes

When the mobile terminal is used to scan the picture of the picture book, the three-dimensional hippopotamus will appear on the paper and make the action corresponding to the content of the picture book, which is vivid, interesting and attractive. Augmented reality technology integrates the virtual hippo with the real environment, strengthening the audience's experience of augmented reality content.

4.1.3 Convenient Control of Real-time Interaction

In the hippo science popularization project, augmented reality technology is used to complete the interaction between users and content. Through real-time and convenient interactive manipulation, hippos can make interesting actions such as eating, jumping and making faces.

Let users intuitively understand the habits of hippos, which can achieve a better effect of popular science education.

4.1.4 New Media Platform for Augmented Reality

Augmented reality is a new media platform. It is a digital technology that uses virtual information to enhance the perception of reality environment. It uses multimedia, 3D modeling, real-time tracking, intelligent interaction, sensing and other technical means to simulate computer generated virtual information such as text, image, 3D model, music, video, and then apply them to the real world. The two kinds of information complement each other, So as to realize the "enhancement" of the real world.

4.2 Popular Science Project for Digital Restoration of Cultural Relics

The use of digital technology can restore cultural relics, such as the use of high-precision three-dimensional modeling technology, the restoration of damaged bronze masks, the restoration of the surface texture and texture of masks, and the use of digital means to visually express the magnificent cultural relics of the year. By using Web3D technology, the digital 3D model can be embedded into web pages, mobile phone applets, and H5 pages, which can enable users to interact with cultural relics and enhance users' real perception of cultural relics in virtual scenes.

Storing cultural relics in museums cannot really save culture. We should make good use of new digital media platforms and digital means to better deliver traditional culture to the next generation. On the one hand, digitizing the cultural relics in the museum can do a good job of digital protection of cultural relics, and on the other hand, moving cultural relics from offline to online can do a better job of popular science education of cultural relics.

The digital science popularization project of cultural relics is a science popularization project that breaks away from the traditional media such as TV, radio, newspapers and periodicals, relies on emerging media such as mobile phones, computers, virtual reality equipment, etc., and can be produced interactively and interactively, and is committed to the digital protection of cultural relics. Users can learn relevant knowledge about cultural relics online and interactively through the project, which can achieve good effect of popular science education.

The digital restoration map of "Zheng Zi Shi Ding" in Tianjin Museum has moved the cultural relics from offline to online in a digital way. This project is based on PBR (Physically Based Rendering) production technology, including high-precision 3D modeling, mapping, real-time rendering, etc. By making normal map, height map, metallic map, etc., combined with real-time light effect rendering technology, a true stereoscopic feeling is formed.[3] Use digital means to reproduce the original appearance of cultural relics in the past, so that users can understand the historical background of cultural relics, traditional patterns, modeling characteristics and other contents on the virtual new media platform. As shown in Figure 5, the low mesh of the "Zheng Zi Shi Ding" completed in Maya has few facets.

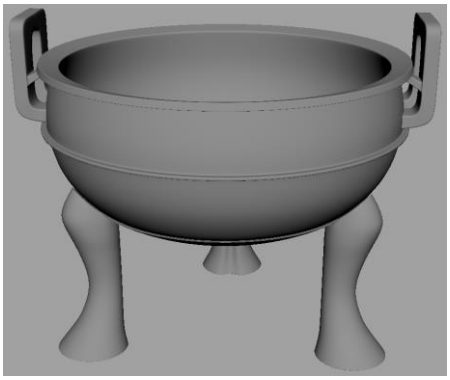

Figure 5. Low mesh.

As shown in Figure 6, the high model of "Zheng Zi Shi Ding" completed in ZBrush contains details of cultural relics.

Figure 6. High mesh.

As shown in Figure 7, the final effect of "Zheng Zi Shi Ding" with real materials completed in Adobe Substance 3D Painter.

Figure 7. Digital restoration effect picture of "Zheng Zi Shi Ding".

4.3 Virtual Private Network (VPN) Science Popularization Motion Graphic Animation Project

Virtual private network is to establish a private network on the public network for encrypted communication. It is widely used in enterprise network. VPN gateway realizes remote access by encrypting data packets and converting the destination address of data packets. VPN can be realized through servers, hardware, software and other ways.

This project is to make MG popular science animation, the working principle of popular science VPN, introduce the working process, and turn the obscure VPN working principle into a vivid MG animation. MG animation integrates graphic design, animation design and film language. Its forms of expression are rich and diverse, with strong inclusiveness, and can be mixed with various forms of expression and artistic styles.[4]

As shown in Figure 8, the MG animation screenshot shows an application scenario of VPN, where users need to access the resources of the laboratory exclusively through remote timesharing.

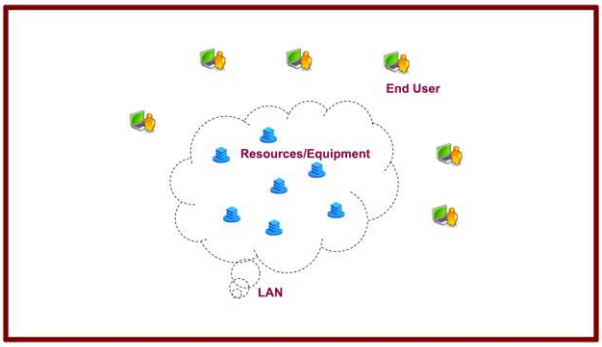

Figure 8. Screenshot of VPN application scenario in MG animation.

As shown in Figure 9, it is an animated screenshot of the proposed solution. A user reservation management system is deployed on the Web server, through which users can reserve time to use laboratory resources. After approval, the requirements will be transmitted to the programmable VPN gateway system, and VPN accounts will be created in advance according to the appointment start time, and access control links will be set. After the start time of user reservation arrives, use the VPN account to establish a channel with the required resources. After the appointment end time arrives, the VPN gateway system logs off the VPN account and clears the access control link. Such text description is complex and difficult to understand. In the form of MG popular science animation, these abstract knowledge described by large paragraphs of text can be transformed into film and television language containing dynamic graphics, dynamic text, sound and other elements. This kind of film and television language is intuitive, interesting and easy to understand, which can improve the communication efficiency and achieve good science popularization effect.

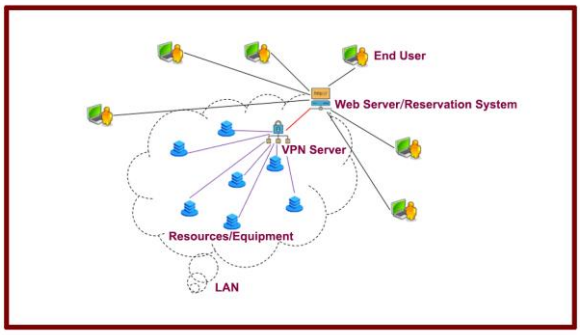

Figure 9. Solution screenshot in MG animation.

5 SUMMARY AND OUTLOOK

With the rapid development of new digital media technology, a new method of popular science education has emerged. This paper analyzes the problems faced by popular science education. The form of popular science education is no longer restricted to the traditional forms of text, graphics, images, audio, etc. It proposes to use new media platforms, focus on talent training, strengthen popular science education for young people, play the role of all media, and form a good social atmosphere, use animation New popular science education methods such as new virtual reality technology. The development of new digital media technologies will inevitably lead to more and more exciting new methods of popular science education.

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Design and Implementation of Automatic Programmable VPN Gateway.

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