The Historical Evolution of Educational Technology: from the Printing Press to Online Education

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ABSTRACT
This paper provides a comprehensive study of the historical evolution of educational technology. From the printing revolution of the 15th century to the rise of modern online education, this paper reviews how the printing press transformed the dissemination of knowledge, that triggered the democratisation of education and laid the foundations for the establishment of a public education system. It also examines in detail how advances in electronic technology in the 20th century, including television and computers, which have greatly expanded the scope of education, making it more personalised, accessible and providing a diversity of teaching and learning styles. With the development of fast-paced and multi-tasking lifestyles of modern society, this paper examines the development of online education and its far-reaching impact on the education community, which has not only removed geographical limitations and made quality educational resources accessible to students worldwide. It also looks at the possible problems, challenges and opportunities facing online education. This paper aims to deepen our understanding of the changes in modern education and to broaden our vision for the future by examining the historical evolution of educational technology.

Keywords: *Educational technology, Typography, Online education.*

1. INTRODUCTION

Educational technology, from the printing press to the computer, continues to change the way we live. Printing has changed the way we access information and knowledge; it has made the dissemination of knowledge widespread and easy, thus triggering a process of democratisation of education. And electronic technologies, such as television and computers, have become the main tools for people to access information and learn knowledge and skills. These changes have not only increased access to information, but also provided us with more opportunities for learning and communication.

However, with every technological advance comes a new challenge. Competition between old and new media can be disruptive to the education system, while also raising questions about educational equity. Online education in particular, while it has broken down spatial limitations and made quality educational resources accessible to students across the globe, issues such as cybersecurity, intellectual property protection and equity in online teaching and learning remain. Understanding the historical evolution of educational technology will therefore help us not only to better understand modern educational change, but also to find ways to address existing challenges.

2. THE PRINTING REVOLUTION AND THE DEMOCRATISATION OF EDUCATION

The invention of printing opened up new ways of disseminating information, not only as the main form of books but also as the main carrier of human knowledge. Before the invention of printing, books were printed mainly to meet the needs of the upper classes for knowledge[1]. Compared to other ways of spreading knowledge, printed books have several advantages: firstly, they can reproduce precisely the knowledge contained in existing books, because in printed books every word is reproduced precisely; secondly, they can reproduce all the valuable

information in existing books; and thirdly, they can be printed in large numbers in a short time.

Before the invention of the printing press, knowledge was mainly transmitted orally, where everyone could hear the answers proposed by others to the same question, but it was difficult to remember them; everyone could have a different answer to the same question. This method of transmission was not conducive to the accumulation of knowledge and experience, nor to the transmission of human thoughts, feelings and beliefs.

After the printing revolution, knowledge was fixed on printed matter, and with the written word as the carrier and the printed word as the medium, knowledge was disseminated on a large scale. This led to a series of changes, including a reconceptualisation of the role of the teacher and the content of teaching, a rethinking of teaching methods, and a reconfiguration of the organisation of education. These changes also contributed to the democratisation of education.

2.1 Changes in the Role of Teachers and Teaching Content

In traditional education, teachers are the authority on knowledge and they are usually considered to be the discoverers of knowledge, the transmitters of knowledge and the interpreters of knowledge. Teachers teach primarily through the transmission of knowledge. Thus, in traditional education, teachers often act as the 'seeders of knowledge'. In modern education, however, the role of the teacher has changed dramatically. Teachers in modern education are considered to be a 'profession' rather than a 'profession' and are not 'scholars' but 'experts'.". In modern education, teachers are expected to teach students more so that they can do the jobs that society will need in the future. This change has also led to changes in the content and methods of teaching and learning. In traditional education, knowledge is acquired from textbooks or syllabuses and its content is fixed. In modern education, teachers need to determine the content and teaching methods according to the needs of their students.

2.2 Change in Teaching Methods

Before the advent of the printed book, knowledge was mainly transmitted orally, which was not only inefficient and costly, but also difficult to grasp as the content changed and students' learning abilities improved. As a result, education at the time was mainly based on the 'duck and filler' method, whereby teachers taught students a large amount of standardised content. While this approach enabled students to acquire knowledge as quickly as possible, it neglected the development of their own abilities. For example, teachers focus more on instilling content from textbooks than on guiding students to explore and discover for themselves.

After the printing revolution, knowledge began to appear in books in written form. Instead of relying on teachers to explain their knowledge, students could read the text directly. This approach not only made learning more efficient, but also stimulated students' interest in independent and inquiry-based learning. In this context, teaching methods are gradually changing from 'fill-in-the-blank' to 'inspirational'. Instead of explaining theoretical knowledge and concrete examples to students, teachers guide students to explore and discover new knowledge on their own. In this context, the teacher's main task is to stimulate students' curiosity and desire to explore knowledge, so that they can actively learn and acquire skills.

2.3 Innovation in the Organisation of Education

Before the advent of the school, educational activities were generally organised by the family and the church. The invention of the printing press made schools possible. Schools brought pupils together and organised their study time and content in a single place, with the freedom to choose where they would study and to leave it at will. This freedom of choice of space and time met the need for individualised education. At the same time, the organisational structure of schools changed. There were three main types of early school: church schools set up in churches or monasteries, academy schools set up in convents and religious schools set up in monasteries[2].

2.4 Impact of Democratisation of Education

Before the invention of printing, knowledge was mainly transmitted orally, and people generally did not have knowledge and lacked the awareness of learning and applying knowledge. After the invention of printing, human knowledge was disseminated on a large scale through the written word, which to a certain extent contributed to the

development of human knowledge and social progress. At the same time, the widespread dissemination of information posed a number of challenges, one of which was the contradiction between the growing demand for information and the limited supply of information. This contradiction has contributed to the democratisation of education, making it possible for more and more people to have access to high-quality, diversified knowledge and information, and to process and manipulate information. This change has led to a focus on the processing and handling of information in the educational process.

And after the invention of printing, people could acquire knowledge through written records or printed books. The democratisation of education contributed to the improvement of the quality of education and produced a large number of educated, scientific and sociable people for society.

3. THE POPULARITY OF TELEVISION AND COMPUTERS AND DIVERSIFIED TEACHING METHODS

In the early 20th century, with the development of electronic technology, many schools began to use audio-visual equipment to provide education for their students, which not only provided a more convenient, fast and flexible way for students to learn, but also provided teachers with a new teaching tool.

In the early 20th century, schools in the UK began to use radio systems and television for teaching. The radio system was used to broadcast news, music and entertainment in the classroom so that students could continue their studies outside of school hours. Television was widely used in the UK, including the Today Show, the Evening News and Newsweek. They provide detailed coverage of news events and provide a rich source of television programmes for students. According to statistics, around half of all students in the UK have watched television programmes and more people are becoming exposed to them as television technology becomes more popular. The school also employs a number of professional people to guide students in watching television programmes. For example, the Radio Corporation, established in 1913, was the first television teaching company in the UK, specialising in teaching television to students.

Between the 1920s and the 1940s, various forms of education were invented as educational technology developed and became more widespread. In addition to classroom teaching, more new ways of teaching and learning emerged, such as email, distance learning and online courses.

Between the 1940s and the 1960s, Internet technology became widespread. Computers provided a new learning environment for students, enabling them to undertake more personalised learning and research.

From the 1960s to the late 1970s, a new way of learning emerged - Computer Aided Teaching (CAT), a form of teaching that uses computers to process and analyse teaching materials and provide personalised teaching services for students. With the development and popularity of computers and Internet technology, we can now access various educational resources, distance learning and collaborative learning through the Internet. As the Harvard Business Review points out, "Computers are transforming our entire education system".

3.1 Early Television and Radio

Although the original television equipment was just a few simple tools, it had a profound impact on British society. At the time, television was introduced into the classroom as a new teaching tool whose main purpose was to inform students about the world and stimulate their interest in knowledge. The Daily Telegraph once commented on the role that television played in teaching: "It allowed us to use a combination of sight and sound to enrich the learning experience of our students." Television not only provides a new platform for education, but it also helps teachers understand student learning in a variety of ways[3]. For example, the BBC works with schools to provide live coverage of schools. Schools use the BBC to broadcast programmes to viewers so they can get feedback from students on their lessons.

As television technology continues to gain popularity in UK education, major television stations in the UK have started producing television programmes for broadcast in major schools. These include news programmes, music programmes and entertainment programmes. Some of the most popular programmes are the Today Show and the Friday News, which provide students with a wealth of information on television as well as entertainment.

Between the 1930s and 1940s, a great deal of research and practice on television teaching and learning emerged across the UK. The BBC, for

example, ran several television teaching channels. Many schools at the time experimented with the use of television to improve student performance and interest in learning.

Between the 1940s and 1970s, information technology (ICT) was introduced into education with the development of electronic technology.

Between the 1960s and 1970s, a new form of education emerged - Remote Education. With the spread of Internet and computer technology, more and more students and teachers are accessing the Internet for distance learning, collaborative learning, etc.

3.2 Newspapers to Computers

The first newspaper, the New York Times, appeared in the United States at the end of the 19th century and was the first mass communication medium in the country.

In the early 20th century, educational technology in the United States began to develop in the direction of multimedia, and various multimedia teaching tools emerged during this period, such as slides, slide projectors and electronic projectors. With the popularisation of computers and the Internet, multimedia teaching has also been gradually promoted and applied [4].

Between the 1960s and 1970s, computers began to come into the school and educational technology began to move towards networking and digitisation. This form of teaching and learning was widely used between the 1950s and 1970s, and it provided students with a new way of learning - computer-assisted instruction.

In the late 1970s, with the spread of Internet technology, computer-assisted teaching began to receive attention and research.

Since the 1990s, computer-assisted instruction has been widely used in the classroom. The Project for the Reform of the Advanced Computer Aided Teaching (ACAT) was launched at Oregon State University in the USA in 2000. The project has gained widespread attention and popularity in American universities. Many universities have begun to use computer technology to design and manage their courses, which provides a new way of learning for students. In addition, some universities have combined computer-assisted teaching with other educational approaches, resulting in various forms of blended teaching (Combinatorial Teaching). In addition to classroom teaching, schools organise extra-curricular activities and study groups, which make use of computer technology and the internet.

3.3 The Dawn of the Internet Age

In the 1970s, computers became widespread around the world. At the same time, people began to apply computer technology to the field of education.

With the advent of the Internet in the 1980s, online education was created as a new form of learning. Internet education refers to a form of education that takes place on the Internet, a form that includes both distance education and distance training[5].

With the development and popularity of Internet technology, many schools are experimenting with the use of the Internet as a new teaching tool. For example, many schools have set up their own websites to provide their curriculum, courseware, learning materials, etc. At the same time, many schools are also using their websites as a platform to provide some new learning resources to their students. For example, the University of Chicago in Illinois, USA, has established the Centre for the University of Chicago Education Network (CSN).

4. ONLINE EDUCATION: CHALLENGES AND OPPORTUNITIES

The growth of online education has changed the way in which teaching and learning is conducted and has brought challenges. Online education providers provide students with an opportunity to access quality educational resources, but they also bring with them new issues. With the development of online education platforms and applications, many students are more exposed to cybercrime, cyber violence and hacking, all of which are unsafe environments. In the past, schools and libraries were the main source of cyber security. Now, schools and libraries face greater cybersecurity risks as students are more likely to access unsafe websites. While there are still many problems with online education, it offers solutions in addressing educational equity and improving the professional skills of teachers. Online education also provides an opportunity for students to access a high quality education that is not only delivered within the school, but can also be delivered online or remotely.

In the future, online education will face a number of new challenges such as cybercrime, cyber violence, hacking, student attrition, school privacy and intellectual property issues[6]. As online learning becomes more popular, attention will need to be paid to these new issues and measures taken to ensure the security of online education platforms and applications and to safeguard student privacy. These issues are huge challenges for online education providers and will require significant resources to address.

4.1 Challenges and Opportunities Presented by Old and New Media

In the future, online education will be integrated with other forms of teaching and learning and will continue to be an important part of school teaching. In this context, online education needs to address a number of key challenges. Firstly, online education needs to ensure the quality of its courses, teaching and service and to address some of the existing issues. Secondly, online education needs to be integrated with other forms of teaching and learning, such as teaching support systems and online learning centres. Finally, online education needs to be integrated with traditional teaching methods, such as one-to-one tutorials, classroom discussions and group discussions.

In the future, online education will face many challenges and opportunities.

Firstly, in today's society, students are faced with more pressure and uncertainty about their studies and they need more time to complete them. At the same time, many students have one or more computer devices and devices to study on at home or outside of school. Online education therefore needs to provide a more student-friendly way of learning to meet these needs.

Secondly, online education needs to address technology issues to improve the quality and efficiency of teaching and learning. Technology issues will become increasingly important as the number of students increases, technology evolves and cyber security continues to improve. With the acceleration of social and cultural change and the impact of ongoing technological advances, many will be considering where and how education will be delivered in the future. This means that there is a need to consider the different challenges and opportunities that students may face.

Online education offers an opportunity to share knowledge, access resources and learn skills with the world. As such, it may pose some challenges and present some opportunities. These challenges and opportunities will drive the continued development, innovation and evolution of educational technology.

4.2 Integration of Online Education with Other Technologies

The emergence and development of online education has provided students with a new way of learning. With online education, students can access learning opportunities from anywhere via the internet and can get better teaching and learning results compared to learning in a classroom. However, online education also offers many other advantages. Firstly, online education offers students more opportunities for personalised learning. For example, students can learn on different devices at different times and places, and can use learning tools at home, at work or anywhere else. Secondly, online education can also help teachers understand the learning patterns of their students. Online education platforms can track student progress and behavioural data to identify problems faced by students, provide support and solutions to problems. Finally, online education also provides an opportunity for teachers to innovate their teaching methods. For example, teachers can make the materials and software they use in their teaching available online for other teachers to use.

Although online education may face many challenges and risks, it is still the future of education. With the emergence of new technologies, products and services, education technology will be deeply integrated with other fields in the future. Education technology will affect not only all parties involved in the education process, but also all areas of society as a whole, such as human resources, business management, government decision-making and healthcare.

5. CONCLUSION

People’s lives have changed dramatically since the 16th century, but we continue to experience change. During this period, humanity has undergone many major changes, such as the Industrial Revolution and the Enlightenment, which have had a profound impact on society. In the field of education, too, great changes have taken place, from the age of print to the electronic age, where the speed and scope of knowledge dissemination has changed dramatically.

If we look back at this history, we see that the development of new technologies such as printing, radio and television has been revolutionary. The development of these technologies has had a profound impact on education, not only expanding the scope of education but also greatly increasing the efficiency with which we learn and educate our knowledge. Of course, there is also a need to acknowledge that these new technologies may bring new problems. For example, before the age of the Internet, we had to go to school to learn culture and language. As technology continues to develop and become more widespread, more educational resources and opportunities are available to people through the internet. If we want to maintain students' interest in knowledge and culture, we must pay attention to the negative effects of the Internet.

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