

The Development History and Future Trend of Computer-Assisted Teaching

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Abstract. As the world population continues to grow, computer-assisted instruction can help alleviate the educational problems of a large population. Since the first example of computer-assisted instruction, Programmed Logic for Automated Teaching Operations, appeared in the 1960s, computer-assisted instruction's development has constantly been changing. Because of the attention and research of relevant workers, computer-assisted instruction covers more and more fields. Moreover, with the development of artificial intelligence technology, the functions of computer-assisted instruction are increasing, and the depth of teaching is increasing, which has a significant and far-reaching impact on the education sector and has a good development prospect in the future. This paper summarizes the systems, software, and algorithms of computer-assisted instruction since the 1960s compares them and combs the formation and development of computer-assisted instruction. After entering the 21st century, the development of Artificial Intelligence has provided a new direction for computer-assisted instruction. In the future, computer-assisted instruction will become more personalized and interactive, providing good learning guidance for self-learners.

Keywords: CAI, Educational Problem, AI.

1. Introduction

With the continuous development of the world population, the demand for high-quality education is increasing, and computer-assisted instruction (CAI) [1] is an excellent way to solve this problem. CAI refers to helping students in teaching through computer technology. There are generally six forms: practice, individual guidance, dialogue and consultation, simulation, and problem-solving. CAI can provide students with an excellent personalized learning environment, and it will continue to improve with Artificial Intelligence (AI) development.

The Programmed Logic for Automated Teaching Operations (PLATO) [2], developed in 1960, marked the beginning of CAI and the rise of computer education. It helped address the educational challenges posed by a rapidly growing population. PLATO system is the first CAI case in the world. Its first generation was developed by Donald Bitzer in 1960 and had been responding to the need for the higher education of retired soldiers after World War II. As computer technology has advanced, the forms of CAI have also evolved.

Over the past six decades, CAI has progressed from simple drill-and-practice programs to more interactive and personalized forms of instruction. Join the significant development here. At the end of the 20th century, the main form of CAI was to assist teachers' teaching in face-to-face classrooms, such as PowerPoint or geometric sketchpad invented by Robert Gaskins in 1987. Salman Khan founded Khan School in 2008 and began creating educational videos. As videos became more popular, Khan Academy was established as an independent organization to provide a more organized and comprehensive learning experience. Khan Academy provides free, high-quality educational resources, including video lectures, practice questions, and assessments, to learners of all ages worldwide. The platform covers various subjects, including math, science, computer programming, history, art history, economics, and more. After that, the same type of software in many different fields also came out

one after another. For example, many neighboring countries are intended to help people from non-native English countries to learn English and pass the corresponding language qualification tests.

In the decade of the 21st century, after several years of development, the scope of paperless teaching continued to expand, and Google classroom was created to conform to the trend. Google Classroom was invented to help educators create and organize assignments, provide feedback, and communicate with students more efficiently. The platform allows teachers to create and distribute assignments and collect and grade them electronically, which saves time and reduces the need for paper. It also facilitates communication and collaboration between teachers and students, allowing them to discuss and share resources in one centralized place. It is worth mentioning that after the outbreak of the epidemic in 2019, China has gradually used Ding Talk with similar functions for distance learning. However, its functions are still different from Google Classroom.

In the 60 years of CAI development, the incorporation of AI has played a significant role in this evolution, allowing for the development of intelligent tutoring systems and personalized learning experiences. With the help of AI technology, students can learn more in-depth things with the help of computers. For example, in the face of language learners, the application of speech recognition technology can give the computer have the ability to analyze whether the user's pronunciation is correct, making language learning more accurate and efficient.

The future of CAI is likely to involve even greater use of AI and virtual and augmented reality technologies. It could lead to the creation of fully immersive educational experiences and the ability to constantly track and adapt to individual students' needs. Overall, the evolution of CAI since 1960 has been marked by a shift towards greater interactivity and personalization. This trend is likely to continue in the future with the incorporation of AI and other cutting-edge technologies. This paper surveys and sorts out some representative systems, software, or algorithms since the early stage of CAI development in the last century, including time, reason, and target users, to sort out the development of CAI in the past decades. These studies have been tabulated as follows. At the same time, this paper also looks forward to some possible changes in the form of AI in the future. In the paper, some of the landmark software is listed and introduced in the Table 1.

Tab. 1 Introduction of Important CAI Software

Name	Type	Invention time	Motivation	Target users
PLATO [3]	system	1960(I)	Solve the problem of education for veterans after World War II	college students and students in poor area
		1961(II)	Expand user capacity	
		1963-1966 (III)	Application of the new programming language TUTOR	
		1972(IV)	Adjust to adapt to the market	
The Geometer's Sketchpad [4]	app	Introduced to China in 1996	The rise of computer technology in China and the need for mathematical research	middle school student
Khan Academy platform [5]	app	2006	Provides an advanced learning analytics module with useful visualizations.	Teachers and students
Duolingo [6]	app	2012	Use the gamified mobile-assisted language learning (MALL) to help learners study language.	Language Learners
Google Classroom [7]	app	2014	It promotes and supports the use of technology by teachers in education.	Teachers and students
Ding Talk [8]	app	2015	Multinational companies or large enterprises need online video conferencing for the development of internationalization,	Large enterprises and online course participants to the epidemic
ChatGPT[9]	algorithm	2022	Using artificial intelligence to help people learn anything.	Learners

2. The Evolution of CAI

The development of CAI in the past 60 years is mainly divided into three stages. The 1960s to the 1980s of the worlds are the initial stage of development, and the 1980s to the first decade of the 21st century are the reality of the

vigorous development of CAI. After the decade of the 21st century, with the rise of artificial intelligence, the development form of CAI has also changed. The time, characteristics, and representative apps of the tree states have been sorted out as shown as Figure 1.

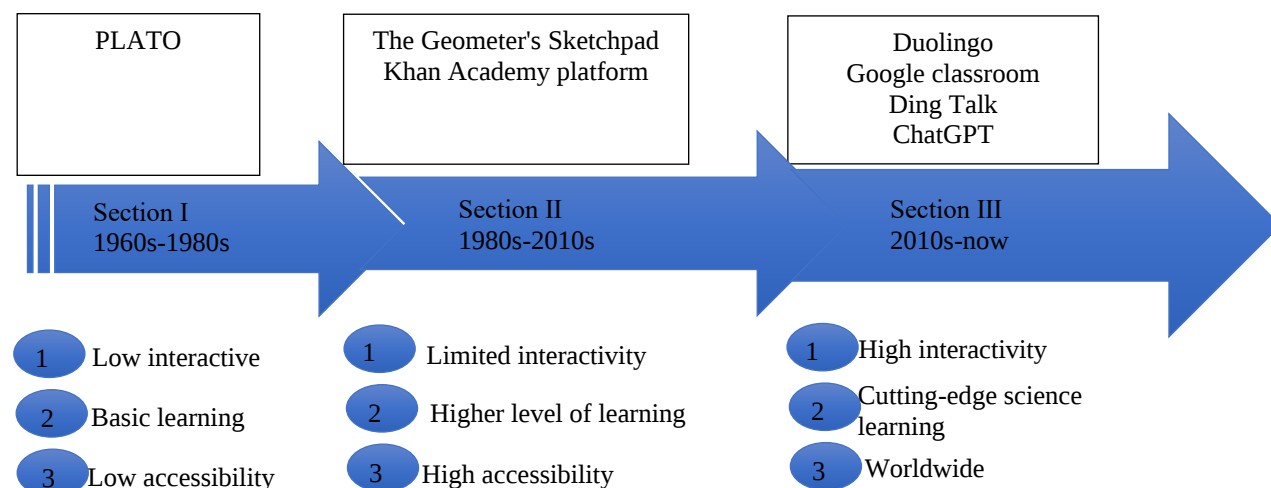


Figure 1. The evolution of CAI

2.1. The first stage

The first generation of PLATO can only accommodate one student, and with the continuous updating and iteration of Bizer, PLATO has gradually built the world's first distance education network. It can support remote communication within the same network and support multiple fields, such as science, machinery, language, music and many other fields with the help of TUTOR language. Later, due to its nature as a local area network (LAN), after the rise of the Internet, it was eliminated because of its high price, the difficulty of individual families to afford and the lower degree of freedom of information than the Internet. PLATO system plays a guiding role in the development of CAI.

Since then, due to the improvement and development of computer systems such as Windows and the rise of the Internet, the carrier of CAI is no longer a system like PLATO but a software like The Geometer's Sketchpad. A variety of software on a stable system can provide different kinds of help for teaching.

For example, The Geometer's Sketchpad [10] can simulate the drawing according to the formula and can intuitively show the abstract mathematical formula to the students. At the same time, it can also be applied to independent learning.

2.2. The second stage

The Khan Academy platform [11] is an efficient teacher-student interaction platform for college students, where students can quickly get their learning analysis and teacher feedback. Khan Academy's mission is to provide free, world-class education to anyone, anywhere. The Khan Academy approach is based on the idea that anyone can learn anything if they have access to the right resources and support. The platform's resources are designed to be accessible to learners of all levels and are self-paced so that learners can learn at their own pace. Khan Academy is widely recognized for its innovative approach to education and effectiveness in helping students learn. The platform is used by millions of students, teachers, and parents worldwide and is incorporated into the curriculum of schools and school districts in the United States and other countries. In addition to its core educational resources, Khan Academy provides educators with tools and resources, such as teacher

dashboards, analytics, and progress tracking. It also integrates with other platforms, such as Google Classroom, allowing teachers to assign and monitor the progress of Khan Academy activities within their classrooms. The platform allows educators to supplement the curriculum and provides additional resources and support for students who need it. It also helps give students access to additional resources and learning opportunities.

There have also been many learning software developed for self-study, such as Duolingo, whose invention aims to provide students with all kinds of language practice materials required to help students complete language learning without the help of teachers. It has a question bank and evaluation function, creating a good personal learning environment for students. There is a large amount of software of the same type on the market in the same period, providing students with self-study assistance in different subjects.

Google Classroom and Ding Talk have made further use of computer technology to promote paperless teaching, move teaching tasks and feedback to the Internet platform, and make teacher-student interaction more efficient and convenient through cloud technology, which is conducive to distance learning. Google Classroom can enhance the learning experience by providing a more interactive and engaging environment. Google Classroom is also a major advancement in the integration of technology in the classroom. It allows teachers to easily use technology to create and distribute assignments, provide feedback and communicate with students. This can help bridge the digital divide and give students access to more resources and learning opportunities. Overall, Google Classroom is a powerful tool that can make the educational process more effective, organized and interactive for teachers and students. It can help improve the quality of education, make it more accessible and keep pace with the rapidly evolving world of technology.

The purpose of nailing at the very beginning is to help enterprises manage employees more efficiently and conduct online meetings, so it does not have too many task distribution - statistics - check functions. After the outbreak of the epidemic in 2019, the function of nails as the carrier of the online classroom was fully demonstrated. The nailing live broadcast and video conference function has a stable network connection and completes interactive functions between both sides. In the video conference class, teachers can get real-time feedback from students, and students can also ask questions to teachers at any time through the raise of hand function. Nailing also clocks homework, which can carry out simple homework arrangements and wear pictures, voice, video, or text. However, as remote video classrooms dominate the software, it is not as professional as Google Classroom in this field, but it will become more interactive.

ChatGPT released by open AI in November 2021 can be applied in various fields. It is another epoch-making invention after AlphaGo. Previously, all kinds of AI that can conduct human-computer dialogue, such as Siri, can only answer specific questions. ChatGPT can recognize and understand natural language and give appropriate answers. ChatGPT can program, plan for all kinds of activities, and even answer emotional questions, such as love questions. It is a dialogue program that is highly similar to human beings, but its knowledge reserves are far more than individuals.

With the help of ChatGPT, students can solve their learning problems more quickly and efficiently. But just as the controversy caused by the invention of Baidu Homework Help in China at first, ChatGPT may also help students cheat in homework. It is reported that some students have used ChatGPT to write papers and won the first prize. However, if computers can write papers and can write better than humans, traditional education will undoubtedly be challenged. In the future education, computers may participate in more and more parts. Even in the near future, the occupation of teachers in basic education may also be replaced by artificial intelligence. Most courses will be able to be taught only by artificial intelligence. The advantage is that students' learning will be more autonomous, and their learning progress will be determined only by their own learning situation without considering other students in the class. Future teachers may no longer need too much professional knowledge but should focus on grasping students' psychology and assisting students. However, as the research of cutting-edge science cannot be replaced by artificial intelligence, the

study in the graduate or doctoral period may still be guided by professors with rich professional knowledge.

In fact, ChatGPT will undoubtedly change the world, and its impact will not be limited to the education sector. Its emergence and popularization may cause many low-skilled workers to lose their jobs.

2.3. The third stage

In the decade of the 21st century, the rise of AI enabled CAI to have more development breakthroughs. The blessing of AI enables students to get feedback on homework or practice without the guidance of teachers. AI can analyze students' learning and give feedback on different subjects. Although these functions were not mature in the previous few years, they have been widely used in many learning software and teaching aid systems in recent years. For example, face recognition can help professors count students' attendance, while voice recognition can help students practice oral English. The dialogue of AI can also be applied in teaching, for example, the voice assistant Microsoft Xiaobing released in 2014, whose dialogue function may be applied to enhance the interactivity of CAI after development. The newly released ChatGPT in 2022 also indicates that CAI.

3. Conclusion

There are several benefits to using CAI in an educational setting. Some of these benefits include targeted instruction, immediate feedback, and accessibility. Targeted instruction: CAI can provide individualized instruction based on each student's skill level and learning style. Instant feedback: CAI can provide students with instant feedback on their performance, allowing them to identify and correct any errors quickly. Accessibility: CAI can be accessed remotely, making it possible for students to learn at their own pace and on their schedule. Some of the disadvantages of CAI include limited interaction, limited creativity, and limited interpersonal relationships. Limited Interaction: CAI may need more interaction and personalization in traditional classroom settings. Limited Creativity: CAI may not allow the same creativity and self-expression as traditional classroom instruction. Limited Interpersonal Relationships: CAI may need more personal contact and guidance human teachers can provide.

The future direction of CAI is likely to focus on increasing the level of personalization and interactivity of the learning experience. This may include the use of artificial intelligence and machine learning to create customized lesson plans for individuals based on students' strengths, weaknesses, and learning styles. Another trend that is likely to continue is the use of virtual and augmented reality in CAI. These technologies can provide a more immersive and engaging learning experience that allows students to visualize and interact with complex concepts in new ways. Overall, the future direction of CAI is likely to focus on using the latest technologies to provide a more personalized, interactive learning experience.

The most current example is ChatGPT, which is an excellent CAI site that learns on its own and quickly from the questions that users ask in-depth. It can quickly search for knowledge on various sites, learn independently, and then translate that learning into answers for the user. This is an excellent trend compared to the old CAI websites or apps that could not answer questions from users like ChatGPT. They could only answer a specific range of questions. They could also not learn independently and had to wait for the software developers to update the program.

However, ChatGPT can learn on its own and can learn on its own to become more potent without open personnel. However, there is a problem because it is so powerful and can give users the answers they need in a brief period of time, which may allow some people to use ChatGPT to cheat, which has a very negative impact on the academic community, as many students can use this site to write the papers, they need to complete assignments that they should have done alone. This is a terrible influence on the academic community. In the future, super-smart software like ChatGPT should be able to automatically identify whether the instructions entered by the user are ethical or not and

whether it will affect being used for cheating so that more advanced and people can better utilize more intelligent CAI software.

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