

The innovative evolution of teaching materials: Trends and future prospects

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Abstract: The way we teach has changed a lot over time, thanks to new technology and different ideas about how to learn. This article looks at how teaching materials have changed from the past to now and what might happen in the future. It starts with old tools like clay tablets and papyrus scrolls and moves to modern digital and interactive tools. Important changes, like the printing press, audiovisual aids, and digital resources, are talked about because they made big differences in how we teach. The article also talks about current trends, like using artificial intelligence (AI), virtual reality (VR), and augmented reality (AR), and open educational resources. These trends are changing how we learn by making it more fun, personalized, and easier to access. In the future, the review expects that new technologies will keep pushing the boundaries of teaching materials, with AI, VR, AR, and blockchain being very important. The article ends with suggestions for policies to help these changes, focusing on investing in digital tools, training for teachers, and making sure everyone can benefit from these new technologies. This detailed look gives useful ideas for teachers, leaders, and researchers, showing how new teaching materials can make learning better, more fun, and more fair for everyone.

Keywords: Artificial intelligence, augmented reality, educational technology, virtual reality

Abstrak: Cara kita mengajar telah banyak berubah dari waktu ke waktu, berkat teknologi baru dan berbagai ide tentang cara belajar. Artikel ini membahas tentang bagaimana materi pengajaran telah berubah dari masa lalu hingga sekarang dan apa yang mungkin terjadi di masa depan. Dimulai dengan alat-alat lama seperti tablet tanah liat dan gulungan papyrus, lalu beralih ke alat-alat digital dan interaktif modern. Perubahan-perubahan penting, seperti mesin cetak, alat bantu audiovisual, dan sumber daya digital, dibicarakan karena semuanya telah membawa perubahan besar dalam cara kita mengajar. Artikel ini juga membahas tren terkini, seperti penggunaan *artificial intelligence* (AI), *virtual reality* (VR), dan *augmented reality* (AR), serta sumber daya pendidikan terbuka. Tren-tren ini mengubah cara kita belajar dengan menjadikannya lebih menyenangkan, lebih personal, dan lebih mudah diakses. Di masa mendatang, tinjauan ini memperkirakan bahwa teknologi baru akan terus mendorong batasan materi pengajaran, dengan AI, VR, AR, dan blockchain menjadi sangat penting. Artikel ini diakhiri dengan saran-saran kebijakan untuk membantu perubahan ini, dengan fokus pada investasi dalam alat-alat digital, pelatihan untuk guru, dan memastikan semua orang dapat memperoleh manfaat dari teknologi-teknologi baru ini. Pandangan mendetail ini memberikan ide berguna bagi guru, pemimpin, dan peneliti, menunjukkan bagaimana materi pengajaran baru dapat membuat pembelajaran lebih baik, lebih menyenangkan, dan lebih adil bagi semua orang.

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Kata kunci: Kecerdasan buatan, augmented reality, teknologi pendidikan, virtual reality

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INTRODUCTION

The history of teaching materials is an interesting story that shows how education and technology have changed over time. From the beginning of formal education to today's digital world, teaching materials have always changed to help students and teachers. In the early days of education, teaching materials were very basic. Ancient societies, like the Egyptians and Greeks, used simple tools like clay tablets and papyrus scrolls to write down

and share knowledge (Saettler, 2004). These materials were mainly used for writing and math lessons. The invention of the printing press by Johannes Gutenberg in the 15th century was a big moment in the history of teaching materials. The printing press allowed books to be made in large numbers, making educational content available to more people (Eisenstein, 1980). Textbooks became common in classrooms, providing a consistent curriculum for students.

The 19th and early 20th centuries brought more improvements in teaching tools. The introduction of blackboards and chalk changed how teachers taught, letting them show information in a visual and hands-on way (Cuban, 1986). Also, using things like maps and charts became more usual, which helped students understand hard topics better. In the middle of the 20th century, new audio-visual materials made big changes. Tools like film strips, overhead projectors, and educational TV shows became common in teaching (Reiser, 2001). These new tools offered fun and interesting ways to teach, fitting different ways students learn. The digital age has brought about a new way of using teaching materials. The growth of computers and the internet has changed education, making digital resources easily accessible. Interactive programs, online classes, and multimedia shows are now important parts of modern education (Molenda, 2008). The increase in open educational resources (OER) has made high-quality teaching materials more available to everyone, letting teachers share and adjust content freely (Bliss & Smith, 2017).

In the past few years, technology has become more and more important in schools. Virtual reality (VR) and augmented reality (AR) are now being used in classrooms to give students a more exciting way to learn (An, 2021; Damopolii et al., 2022). These new tools help students understand difficult ideas better and keep them interested. So, the story of teaching tools shows how education keeps getting better. From old clay tablets to modern digital resources, teaching tools have changed to help both students and teachers, making learning easier and more fun. Over many years, the way we teach has changed a lot because of new technology and different ideas about how to learn. The article examines this evolution, pointing out important moments and new trends that are influencing the future of education. Its main goal is to give a complete picture of the current trends in teaching materials, look at how they affect educational practices, and predict what will happen in this area in the future. The article follows the history of teaching materials, mentioning important milestones and technological improvements. It discusses the use of digital technologies, the rise of interactive and multimedia resources, and the increasing importance of personalized and adaptive learning tools.

In the future, new technologies and trends will greatly influence teaching materials. Important steps, like investing in digital resources and teaching educators how to use new tools, will help us get the most out of these changes (Mhlanga, 2024; Mustofa et al., 2024). This article gives a complete look at the history, current state, and future of teaching materials, providing useful information for teachers, leaders, and researchers. This article provides a comprehensive overview of the evolution of teaching materials, key milestones shaping current practices, technological impact, current trends and future prospects.

METHOD

The research is based on a thorough review of existing literature, which involved a systematic search of academic databases for relevant peer-reviewed articles, books, and

reports. It identified and summarized important developments in creating teaching materials, from ancient tools to modern digital resources. The analysis looked at how technological advancements, such as the printing press and digital tools, have influenced education. It also examined current trends like AI, VR, AR, and open educational resources. Future possibilities were explored through discussions with experts and various theoretical frameworks.

RESULTS AND DISCUSSION

Evolution of teaching materials

The development of teaching materials over the years shows big improvements in how we teach and the technology we use. At first, teaching materials were very basic. Ancient societies used things like clay tablets and papyrus scrolls to write down and share knowledge (Saettler, 2004). These simple tools started the idea of written lessons. The creation of the printing press in the 15th century changed education a lot by making books more common. This made learning more consistent and available to more people (Eisenstein, 1980). Textbooks became very important in education, giving students organized information to learn from.

In the 19th and early 20th centuries, blackboards and chalk were introduced, enabling teachers to show information visually and interactively (Cuban, 1986). Visual tools like maps and charts also became common, improving the learning experience. In the mid-20th century, audiovisual materials were introduced, such as film strips, overhead projectors, and educational TV programs (Reiser, 2001). These tools offered engaging ways to present information, catering to various learning preferences.

The digital age has greatly changed how we teach. With the rise of computers and the internet, we can now use digital tools like interactive programs, online classes, and videos. These new methods let students learn in more personalized and flexible ways. Recently, technologies like virtual reality (VR) and augmented reality (AR) have taken teaching to a new level. These tools provide more engaging and easier-to-understand lessons for complex topics. From ancient clay tablets to modern digital and immersive tech, the evolution of teaching materials shows ongoing improvements in education. These changes make learning more fun, tailored, and effective, meeting the needs of both teachers and students.

Key milestones shaping current practices

The development of teaching materials has seen several important steps that have greatly influenced today's education methods. These steps show progress in technology, teaching methods, and making education more accessible, all of which improve the learning experience. Here are some of the main milestones briefly:

The invention of the printing press

Johannes Gutenberg's invention of the printing press in the 15th century changed education by making books more accessible. This new technology made learning more equal, enabling the large-scale production of textbooks and other educational resources. This helped to standardize and increase access to knowledge (Eisenstein, 1980).

Introduction of blackboard and chalk

In the 19th century, blackboards and chalk became common in classrooms. This straightforward and useful tool helped teacher's show information in a visual and

interactive way, making it easier for students to stay interested and understand the material (Cuban, 1986).

Advent of audiovisual materials

In the middle of the 20th century, tools like film strips, overhead projectors, and educational TV shows started being used. These tools offered exciting and interesting ways to share information, helping different types of learners and making teaching better (Reiser, 2001).

Development of digital resources

The late 20th and early 21st centuries saw a big change in education called the digital revolution. The introduction of computers and the internet made it possible to create digital teaching tools like interactive software, online classes, and multimedia shows. These tools made learning more personalized and flexible (Molenda, 2008).

Emergence of open educational resources

The growth of open educational resources (OER) in the early 2000s has made it easier for more people to access good educational materials. OER lets teachers share, change, and use content without restrictions, encouraging teamwork and new ideas in teaching (Bliss & Smith, 2017).

Integration of advanced technologies

New technologies like virtual reality (VR), augmented reality (AR), and artificial intelligence (AI) are changing how we teach. These tools provide more interactive and engaging ways to learn, making difficult topics easier to understand and more fun (An, 2021; Hastuty et al., 2025; Susanto et al., 2024). These developments show that teaching methods are always improving, meeting the changing needs of teachers and students. By using these new technologies, modern education can offer more effective, inclusive, and enjoyable learning experiences.

Impact of technology on teaching materials

The effect of technology on teaching resources has been significant, particularly in recent times. Here are some important aspects:

Enhanced digital competence

The use of digital tools in education has greatly increased teachers' ability to use technology effectively. Research shows that incorporating digital tools into teaching helps teachers improve their basic computer skills and better integrate technology into their lessons (Timotheou et al., 2023).

Improved student performance

Digital tools have been shown to improve student performance. For example, a thorough study found that using technology in secondary schools helps teachers and students, resulting in better grades (Kidega et al., 2023).

Increased accessibility and flexibility

Technology has made education easier to access and more flexible. The move to online and remote learning during the COVID-19 pandemic showed how digital tools can offer new ways to learn, letting students study from any location (Msafiri et al., 2023).

Challenges and inequalities

Even though digital technologies have many advantages, they also bring some difficulties, like differences in how well people can use them. During the pandemic, schools that didn't have much experience with digital tools had a harder time, which made the gap between them and other schools bigger, and students learned less (Okoye et al., 2022).

Continuous digital transformation

Bringing digital technologies into education is a long and complicated process. It needs constant changes and better ways to make sure everyone, including students, teachers, and school leaders, can use these tools well (Arifuddin et al., 2025; Valverde-Berrocoso et al., 2022). These ideas show how technology is changing education, making it more active and fair, but also bringing new problems that need to be solved.

Current trends in teaching materials

Recent developments in teaching resources show a shift from old methods to new ones, driven by fast-changing technology and the changing demands of today's education. Here are some important trends that are currently influencing this field:

Integration of digital resources

Digital tools have become essential in today's education, providing many helpful ways to improve teaching and learning. These tools include things like e-books, websites, videos, educational programs, online classes, slideshows, and interactive games. Using these digital tools has many advantages. One of the main benefits is that they can offer customized learning experiences. For example, adaptive learning systems change the material and speed based on how well each student is doing, making sure everyone gets lessons that fit their needs. This personalization helps with different learning styles and speeds, making education more effective (Gligorea et al., 2023).

Engagement and interaction are greatly improved with digital tools. Resources like educational games, videos, and simulations make learning more fun and interesting for students (Li et al., 2024). Websites like Khan Academy and YouTube have many instructional videos that cover different subjects and levels, making difficult ideas easier to understand. Also, digital resources make education more flexible and accessible. Online courses and e-books can be used anytime and anywhere, giving learning opportunities outside the usual classroom (Sarker et al., 2019). This flexibility is especially helpful for remote learning and for students who need to manage education with other responsibilities. So, digital resources are very important in modern education because they can personalize learning, increase engagement, and offer flexible access to educational materials. These tools are changing traditional education.

Use of interactive learning tools

Interactive learning tools are important parts of today's teaching materials. They are made to get students involved in the learning process. These tools use technology to create exciting and interesting educational experiences that work for different learning styles and help students understand better. There are many kinds of interactive learning tools. Here are a few examples:

Gamification is a common interactive learning tool that adds game-like elements to educational activities. Websites like Kahoot! and Quizlet use quizzes, points, and

leaderboards to make learning enjoyable and competitive. This helps boost students' motivation and participation (Maraza-Quispe et al., 2024).

Virtual and augmented reality (VR/AR) tools create engaging learning experiences by mimicking real-world settings or adding digital information to the actual world. These technologies help students see complicated ideas and learn by doing, without needing physical materials (Dembe, 2024; Nahri et al., 2024). For instance, VR can let students visit places virtually, and AR can put educational content on top of what they see, making abstract concepts more concrete.

Platforms like Google Classroom and Microsoft Teams help students learn together by allowing them to work on projects, share materials, and talk in real-time. These tools are important for teamwork and communication skills, which are key for group learning (Singh & Bhuyan, 2024).

Interactive simulations and animations are commonly used in education. Tools like PhET interactive simulations let students experiment with scientific ideas in a virtual lab, offering a safe and fun way to explore and understand difficult concepts (Mashami et al., 2023).

Adaptive learning platforms, such as DreamBox and Smart Sparrow, use algorithms to customize the learning experience based on each student's performance. These tools change the difficulty and type of content shown, making sure each student gets lessons that fit their needs (Marienko et al., 2020).

So, interactive learning tools are very important in today's education. They keep students interested, adjust learning experiences to fit each student's needs, and encourage teamwork. Using these tools helps teachers make learning more effective and enjoyable.

Personalized learning materials

Customized learning materials are made to fit the specific needs, skills, interests, and ways of learning for each student. This method is different from the old "one size fits all" way of teaching, focusing instead on making the speed and content of lessons perfect for every learner. There are many types of customized learning materials. Some important ones are explained briefly.

Adaptive Learning Technologies. These tools use special rules to change the difficulty and type of content based on how well a student is doing. Platforms like DreamBox and Smart Sparrow give instant feedback and create unique learning paths, making sure each student learns at their own speed (Gligorea et al., 2023). These technologies use rules and data analysis to adjust teaching to each student's personal needs, making the learning experience more effective, interesting, and flexible.

Learning Management Systems (LMS). A learning management system is a software tool created to handle, provide, and monitor educational courses, training sessions, or learning activities. Platforms like Canvas and Moodle enable teachers to build customized learning spaces. These systems can store various digital materials, keep track of student progress, and offer personalized assignments and tests (Kasabova et al., 2023). LMS platforms have several important features that assist teachers and administrators in managing effectively, delivering content, tracking progress, reporting results, communicating, collaborating, and customizing to fit the unique needs of different schools or corporate training programs (Chahal & Patel, 2021).

Student-Focused Learning Plans. Personalized learning usually means making special learning plans for each student. These plans have clear goals and steps for each student. Teachers and students work together to create these plans, paying attention to what the student is good at, what they need help with, and what they like (Hughey, 2020).

Fun and Interactive Lessons. Personalized learning often uses fun things like quizzes, games, and activities that help students learn. These tools keep students interested and work well for different ways of learning, making school more effective and fun (Bernecki, 2021).

Adaptable Learning Spaces. Personalized learning also changes where and how students learn. Whether in a classroom or online, students can pick places that fit their learning style best, making their education better (Cole et al., 2021).

So, personalized learning materials are really important in today's education because they give students lessons that are just right for them. By using smart technology, managing learning systems, making special learning plans, creating fun activities, and having flexible classrooms, teachers can make learning more effective and interesting for students.

Collaborative and open educational resources

Collaborative and open educational resources (OER) are very important in today's education. They help make learning more accessible, flexible, and innovative. These resources show how important it is for teachers and students to work together. Tools like Google Classroom and Microsoft Teams make it easy for students to work on projects together, share materials, and communicate well. This teamwork helps improve learning by encouraging cooperation, thinking critically, and solving problems (Sandanayake, 2019). Also, these tools let teachers create and share teaching materials together, making the learning environment more lively and inclusive.

Open educational resources (OER) are materials used for teaching and learning that are free for anyone to use, change, and share. These resources can include textbooks, course materials, videos, tests, software, and other tools that help people learn. The idea behind OER comes from the belief that everyone should have access to good educational materials, no matter where they live or how much money they have (UNESCO, 2022). OER has many advantages. They offer cheaper options than traditional textbooks, which helps students save money. Also, OER can be changed to fit different educational needs, allowing teachers to adjust materials to better suit their students (Bliss & Smith, 2017). This flexibility makes learning more personal and encourages new ways of teaching. Additionally, OER supports continuous learning by providing materials that can be used at any time.

Collaborative and open educational resources are very important for improving the quality and availability of education. By encouraging teamwork and offering freely available, flexible materials, these resources help create a more fair and effective educational environment.

Future Prospects

The future of education is likely to be greatly shaped by new technologies, changing global patterns, and well-thought-out policy suggestions. These factors together aim to improve the quality, availability, and efficiency of education around the world.

New technologies

Technologies like artificial intelligence (AI), virtual reality (VR), and blockchain are expected to change how education is done. AI can tailor learning experiences to each student's needs, give instant feedback, and handle administrative tasks (UNESCO, 2022). VR and augmented reality (AR) provide interactive learning environments that make difficult ideas easier to understand and more fun (AlGerafi, et al., 2022). Blockchain technology can secure and confirm academic records, making the system more transparent and less prone to fraud (UNESCO, 2022).

Global education trends

The COVID-19 pandemic has sped up the use of digital learning, showing how important it is to have education systems that can adapt and stay strong. Mixing online and in-person teaching, known as blended learning, is becoming more common, giving more options and fitting different ways of learning (Platonova et al., 2022). Also, there's more focus on continuous learning and skill-building to help students get ready for the quickly changing job market (Mustafa & Lleshi, 2024).

Policy recommendations

To make the most of new technologies and trends, we need to follow some important steps. Governments and schools should improve internet and technology so that all students can use good online learning materials. They should also include AI and other advanced tools in teaching and train teachers to use them well. Additionally, we need to create education policies that help everyone, especially those who don't have easy access to technology.

So, the future of education will depend on using new technologies, flexible learning methods, and fair, forward-thinking policies. These changes will help make learning more personalized, interesting, and available for students everywhere.

CONCLUSION

This article discusses the major improvements and continuous changes in educational resources. It looks at how teaching materials have developed over time, starting from simple tools like clay tablets and papyrus scrolls to the advanced digital and interactive technologies we have today. The article emphasizes how important inventions like the printing press, audiovisual aids, and digital resources have changed education. It also talks about current trends, such as the use of artificial intelligence, virtual and augmented reality, and open educational resources. These new ideas are changing how we teach by making learning more engaging, personalized, and accessible to everyone.

In the future, the review predicts that new technologies will keep changing how we teach. AI can create personalized learning plans, VR and AR can make learning more engaging, and blockchain can make education more transparent. These technologies are set to greatly improve education. Also, the move towards combining online and in-person learning, which was sped up by events like the COVID-19 pandemic, is likely to continue. This will give education more flexibility and strength. The review ends by saying that we need smart policies to support these changes. Investing in digital tools, training teachers, and making sure everyone has access to these new tools are key to getting the most out of these new teaching methods.

The article gives a complete look at how teaching materials have evolved, are used today, and might change in the future. It offers useful ideas for teachers, leaders, and people who study education. By using these new ideas, the education field can make better, more interesting, and fairer learning spaces for all students.

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