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Multimedia in Education:

Training Educators to Design Learning Experiences with Multimedia

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Abstract

This article reviews the various forms of multimedia increasingly utilized by educators in teaching. It explores applications in classroom settings and provides an overview of the tools available. Additionally, it highlights the positive impacts of multimedia on various aspects of teaching and addresses the challenges educators encounter when incorporating these tools. Finally, the article delves into the purpose of training educators in multimedia use and explores strategies at both the individual and institutional aspects to help teachers effectively integrate technology into education and support student growth.

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Introduction
With the technological advancements of the 21st century, multimedia has become a widely adopted tool in modern classrooms. Educational multimedia comes in various forms, offering diverse ways for teachers and students to engage with content. Integrating these technologies into the classroom allows educators to effectively deliver information, emphasize key concepts, and capture students' attention. Multimedia also facilitates the shift from traditional teaching methods to technology-enhanced education by supporting lesson delivery, fostering student interaction, and enabling timely feedback. However, educators still encounter significant challenges in accessing and mastering these technologies.

Types of Multimedia for Educators Use in the Classroom
Multimedia involves integrating various forms of media, including text, images, audio, video, animation, and interactive components. In education, multimedia enhances learners' comprehension, boosts engagement, and supports effective assessment. Common classroom uses of multimedia include videos, digital storybooks, interactive tools like games and simulations, and interactive whiteboards. The following content will introduce these four areas and share the multimedia tools teachers can illustrate in class.

Videos are widely utilized across all subjects, with YouTube being a popular platform. In lower-grade classes, educators often use interactive songs and read-aloud stories, while supplementary and informative videos are more common in higher-grade levels. As a learning resource, YouTube effectively presents concrete concepts and provides background knowledge, making lessons more engaging and impactful. As Hartatik, Nafiah, and Mariati observe, "YouTube can be used as a complementary learning medium and to exemplify mathematical concepts from a new perspective" (p.2615). Regardless of the subject, YouTube offers educators an expansive range of options to enhance their teaching.

Many digital storybooks incorporate text, audio, and animations, offering dynamic and engaging resources for classrooms. These tools help teachers ease budget constraints while providing a range of reading levels to accommodate individual student needs. Epic! is an excellent storybook platform for educators and students to use. Teachers can use it for group lessons, or students can independently explore the books at their own pace and personalize their selections. As Klop and Marais note, "The use of technology is a promising solution to support the development of literacy and to compensate for the language gap between linguistically advantaged and disadvantaged children"(p.2). With advances in technology, digital books help address the challenge of limited physical book availability in classrooms and offer students greater access to stories they enjoy.

Digital simulation refers to a computer-based tool designed to replicate real-world scenarios and environments, offering students interactive and experiential learning experiences. Gamified educational tools further enhance interactive learning by bridging the gap between theory and practice. Simulations are particularly popular in STEM classes, where teachers often use them to

reinforce and review concepts during lessons. One excellent resource is PhET, which provides a wealth of simulations, teaching tips, and resources specifically tailored for STEM education. These tools help bring textbook content and theoretical concepts to life, making them more visual, practical, and relatable. By connecting knowledge to real-world scenarios, simulations deepen understanding and engagement. As highlighted in *Learning Science Through Computer Games and Simulations*, "They can individualize learning to match the pace, interests, and capabilities of each particular student and contextualize learning in engaging virtual environments" (p.58). For older students with access to computers or Chromebooks, the potential of simulators is greatly enhanced. Students can not only observe how teachers utilize simulators but also engage in independent exploration and learning.

Additionally, platforms like Kahoot! provide a fun and interactive way to reinforce learning. As a game-based website, Kahoot! can be used by teachers during review sessions to consolidate the day's lessons. Students compete in games while simultaneously revisiting and reinforcing their understanding of class content. Similarly, Blooket is another game-based learning platform that integrates educational material into interactive games. These platforms transform traditional lessons into lively and engaging experiences, making learning enjoyable and stimulating for students.

Many schools have started replacing traditional blackboards with interactive whiteboards, transforming classroom teaching and learning. Interactive whiteboards serve as a versatile tool for presenting lessons, making classes more engaging and dynamic, particularly with touch-screen capabilities. These features allow students to actively participate, fostering closer interaction between teachers and students. As Shi, Zhang, Yang, and Yang state, "IWBs are powerful technological devices that can help teachers convert the traditional classroom environment into a student-centered collective one, in which students can actively participate in learning processes that emphasize constructive, collaborative and personalized learning" (p. 283). Interactive whiteboards enable teachers to access various resources during lessons, such as video platforms, storybook websites, and simulators mentioned above, consolidating all classroom activities onto a single platform. This setup helps students maintain their focus on the whiteboard. For younger students, the interactive features make it easier for teachers to engage the entire class in focused learning activities. They can use the white page feature for imitation exercises, helping students follow along and practice. For older students, the whiteboard supports collaborative group activities, promoting teamwork and deeper engagement with the material.

Positive Effects on Educators

Multimedia and hypermedia technologies not only enhance students' comprehension and technical skills but also positively influence educators' learning and teaching practices. By offering diverse resources, advancing the reach of distance education, and enabling more effective feedback, multimedia supports educators in multiple ways. While technology usage is

now widespread, multimedia continues to play a vital role in developing educators' technical skills and enriching their professional growth.

Educational technologies offer plenty of resources, such as videos, animations, and interactive quizzes, to enhance classroom learning and make the process more engaging and dynamic. With this lively and interactive course experience, students are more inclined to learn independently and feel more motivated to actively participate in their education. As Moldavan, Capraro, and Capraro (p. 282) highlight, "Technology has opened pathways for learners to engage with mathematics content in authentic contexts as well as foster learner agency and autonomy." This demonstrates that integrating educational technology into education encourages greater student participation and enthusiasm for learning.

As Tester noted, "Using computers in the classroom has been a practice for decades. With the evolution of technology in education, computers are now utilized by K-12 students across the United States in various ways" (p.25). This highlights how technology integration in schools has long been a focus in the United States. Since the onset of COVID-19, distance and online learning have become increasingly prevalent. Although in-person teaching has resumed, blended learning remains widely adopted. Many schools and educators have recognized its benefits and continue to implement it. According to Tester, "Blended learning classrooms are more student-centered and allow teachers to leverage their time more efficiently" (p.27). This approach, made possible by technological advancements, creates positive outcomes and actively supports teaching and learning. In an increasingly interconnected world, technology bridges global knowledge, enabling students from different countries to access more learning opportunities and helping teachers deliver content more efficiently. As Shvardak, Ostrovska, Predyk, and Moskovchuk explain, "ICT helps the teacher to present the material in an understandable form for students at any level of education" (p. 365). Technology enhances the effectiveness and simplicity of teaching and learning, fostering stronger connections between students and educators in the world.

Moreover, technology, particularly artificial intelligence (AI), is transforming the way teachers track student assignments and provide timely feedback. AI becomes especially valuable in classrooms with a large number of students. As Celik observed, "They reported that technological tools and applications were very useful as they instantly answered students' questions and provided constructive feedback for the mistakes they made" (p.64). By dynamically adjusting difficulty, pace, and content, AI ensures a personalized learning experience, keeping students engaged and helping them retain information more effectively.

Challenges Educators Face

Although many educators believe that multimedia has a positive impact on the classroom, there are some barriers that educators must face when using multimedia technology.

With the appearance of COVID-19 and the development of technology, school districts have started to attach importance to online learning and delve more into educational tools in

classrooms. This poses a huge challenge to many educators, especially the elder teachers who lack the experience to integrate technology in their classrooms, which lends to a decline in course quality. Indeed, it's not just the educators' fault that this happens. As Ottenbreit, Liao, Sadik, and Ertmer mentioned, "The major barriers hindering teachers' technology integration included inadequate resources, limited time, insufficient training opportunities, and lack of money and support" (p.284). The reason for this situation is that educators lack the knowledge, resources, and support from districts. Schools and districts need to pay more attention to teachers' development.

Not only that, the rapid development of technology and artificial intelligence has led more schools to integrate technology for blended teaching. This has overwhelmed teachers who have been using traditional teaching methods. They need to spend extra time and energy to figure out how to use these technologies in the classroom. "Lack of adequate practical-authentic experience for preservice and in-service teachers resulting in limited opportunities for PR&A and decision-making concerning technology integration" (Forkosh, Phillips, Smits, p.2211). Teachers who lack the knowledge and ability to integrate technology will lower the level of their classes and will not be able to keep up with the level and quality of classes of other teachers who have this knowledge. This is also the result of the lack of teacher training opportunities mentioned above. In addition to improving teachers' ability to integrate technology, the digital divide is still a big problem. Teachers in schools with abundant resources are relatively fortunate and can experience and learn different educational technologies. However, teachers in rural or urban areas or schools with poorer resources do not have as much resource support to help themselves and their students improve their learning abilities. "Urban schools already experience pervasive challenges with budget constraints, limited supplies, and stringent limitations on technology" (Moldavan, Capraro, Capraro, p.281). There is no doubt that COVID-19 has exposed huge gaps in educational opportunities. Resources and the economy cannot meet the needs of teachers and students, the digital gap is becoming more and more obvious. Schools with resources can better integrate into society and make progress together with society, while those schools lacking resources can only maintain their original pace and cannot keep up with the progress and development of society.

Purpose and Methods of Educator Training
To accelerate the integration of technology into education and enhance student learning, it is essential to equip educators with the skills to use technology effectively. Alongside educators' efforts to learn and engage with technology, schools, and districts must provide ample support and resources to facilitate this process.

Purpose
The growing significance of digital technologies in society has created a pressing need to train educators capable of integrating these tools into teaching and preparing students for life in the

digital age. In today's world, various industries rely heavily on technology, and education is no exception. As Shvardak, Ostrovska, Predyk, and Moskovchuk observe, "It is predicted that the next generations will become even more attached to the world of digital technologies" (p. 364). This is especially relevant as the current generation of students learns in fundamentally different ways and is immersed in a technology-rich environment, making teacher training a critical priority.

Advancements in computer technology have introduced new approaches to teaching and learning. Supporting educators in utilizing technology requires not only their effort but also a stronger commitment from schools to provide comprehensive training opportunities. In the following sections, we will explore various strategies to train educators, focusing on both individual and institutional perspectives.

Methods - Educator Aspects

The teacher's learning process will directly affect the student's learning experience. Therefore, teachers should be more self-aware and learn the importance of integrating technology into education. For example, learn more models. "Teacher educators should also be responsible for developing preservice teachers' TPACK strategic thinking, which is 'knowing when, where, and how to use domain-specific knowledge and strategies'" (Jin & Schmidt, p.3). TPACK is a useful model that combines teaching content, teaching methods, and technology. After learning this model, teachers can more easily integrate technology into the classroom.

Although the road from traditional education to technology-integrated education is difficult, having a good learning attitude is a crutch on the road to success. Teachers should change their mentality to accept the changes in the social environment. "This means that training future primary school teachers using digital technologies is not only the optimal way to build an educational paradigm for them (Generation Z), but the only way to make them competent in relevant teaching practices for use in independent pedagogical activities" (Shvardak, Ostrovska, Predyk, Moskovchuk, p.364). As this passage says, today's society is surrounded by technology, and the new generation of students will have more and more opportunities to use technology. Teachers only through learning and mental recognition, can the changes in society be integrated into education so that students can keep up with the changes of the times and learn knowledge beyond textbooks.

In an educational environment, students are passive, and teachers are knowledge outputters. The flipped classroom is an interactive teaching method that has many benefits, one of which is to allow students to be active and output knowledge and ideas with teachers and other students. "This project provides for multiple higher-order cognitive tasks, including collaboration, self-assessment, accountability to group partners, peer instruction and peer assessment, meta reflection, and fostering of critical thinking skills" (Mohan, p.5). Teachers can present topics to students and let them demonstrate the topic using different technologies. This can help teachers understand and learn more technical knowledge from the perspective and direction of students and also allow students to have more interactions and improve their learning enthusiasm.

Methods - School and District Aspects

Integrating technology into education is a shared responsibility among educators, schools, and districts, all of which must provide the necessary support. As Chelliah and Clarke stated, "For universities to achieve advancement of quality in teaching and learning, approaches at different levels integrating initiatives and changes at the individual, interactional, and institutional level, are required" (p. 279). Achieving high-quality teaching requires collaboration across the entire education sector.

Offering targeted courses to teaching staff at schools and districts is crucial, especially for new educators. According to Liu, "Teacher education courses shape preservice teacher beliefs and, further, beliefs are predictive of technology integration and worthy of exploration" (p. 139). Training programs, as part of the curriculum, prepare new teachers and provide opportunities for in-service educators to expand their skills. These courses allow teachers to collaborate, share insights, evaluate outcomes, and discuss strategies. When schools prioritize teacher training and implement these courses, educators are more motivated to adopt and integrate new technologies into their classrooms. In addition, schools can also establish social media platforms where educators can connect, collaborate, and share their experiences with various technology tools. On such platforms, teachers can exchange insights, discuss test results, and support one another in overcoming challenges. By fostering this collaborative environment, schools can enhance their focus on teacher training and provide educators with comprehensive support to maximize their success in integrating technology into the classroom.

With adequate budgets, schools can empower teachers to use various educational technology platforms, enabling students to benefit fully. In many institutions, it has become common for students to have access to 1:1 Chromebooks. As Milchanoski-Bach explains, "The conception of one-to-one Chromebooks in the classroom as assistive technology to support in the learning process is still developing. Assistive technologies can be defined as devices that can help a person with a disability overcome challenges and increase learning outcomes" (p.2). Chromebooks are valuable tools that allow students to extend their learning beyond the classroom. Such investments reflect schools' financial support for teachers, creating more opportunities for professional development and training in using diverse educational platforms and technologies.

Conclusion

As technology continues to advance, its integration into classrooms has become increasingly frequent and complex. Multimedia has emerged as a popular tool for teaching and interaction, encompassing resources like videos, computer simulations, and interactive whiteboards. It also includes tools for independent student use, such as interactive storybooks and educational computer games. Research has shown that incorporating multimedia into classrooms not only enhances teaching practices but also helps educators improve their technological proficiency.

This, in turn, encourages students to think critically, create independently, and fosters a more engaging classroom atmosphere.

However, significant challenges remain, such as limited resources and funding in schools to support teachers' technological needs. Fully integrating technology into education requires substantial financial investment and resources. This responsibility extends beyond teachers; schools, communities, and other stakeholders must collaborate to provide the necessary support to help students thrive in a technology-driven world.

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