



Teaching and Learning through Multimedia Tools : A Systematic Review

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ABSTRACT

Getting proper education is still one of the main issues in developing nations. Various approaches, including Multimedia technology, have been undertaken to provide access to many people in developing countries. This essay examines the systematic usage of various Multimedia teaching and learning methods. It examines how Multimedia technologies have demonstrated to be a practical means of ensuring that everyone has access to high-quality education and aiding children in performing better in school. The review process entails a comprehensive search of pertinent scientific literature, selecting relevant studies based on predetermined inclusion criteria, analysing the literature, and synthesising. The studies have investigated the use of multimedia in learning and teaching. Currently available tools contain more than just text and images. They also include 3-D, animation, audio, and video. The study concluded that most Multimedia teaching and learning tools are designed with the subject's pedagogical content and the solution's users. On the other hand, the technology and components that went into creating the various Multimedia tools that various groups and themes used may be related to their success.

Keywords: Education, media in education, instructional techniques, pedagogical concerns, systematic review

Introduction

Multiple types of media, including text (alphabetic or numeric), symbols, images, photos, audio, video, and animations, are combined to form Multimedia. Technology is typically used in this process to aid with better understanding and memory. (Guan et al., 2018) Using both still and moving visuals in visualisation technologies aids communication and understanding. Chen et al. (2008); Alemdag et al. (2018) The hardware and software required to create and execute Multimedia applications are collectively referred to as Multimedia technology. (Kapi et al. 2017) Multimedia technology enables people to convey information or ideas using digital and print components through integration, variation, and engagement. In this context, the terms "digital" and "print" refer to software or other Multimedia resources to provide people with information that will aid their understanding of concepts. Specifically, the educational system is evolving due to information and communication technology (ICT) (ICT). ICT refers to technology and software for collecting, processing, storing, sharing, and presenting primarily digital information. A significant component of information and communication technology is Multimedia technology. (ICT) It offers information through various media, including text, audio, and video. (Guan et al. 2018) It uses multiple technologies to provide information in the optimum forms, sizes, and formats.

However, Multimedia apps used in the classroom or for educational purposes must be well-designed and complex enough to mix the various cognitive processes so that students can imitate the teacher as closely as feasible. The market currently offers a wide variety of Multimedia apps. These apps have been employed for various educational reasons, including arithmetic, science, physiology, physics, and physical education. (Ilhan and Oruc, 2016, Jian-hua and Hong, 2012, Al-Hariri and Al-Hattami, 2017.)

The primary issue, however, is still how to use the applications to provide students with a fascinating experience by providing them with the knowledge that enhances their conceptual understanding. Even if it is crucial to create various instructional apps, each has its purpose, unique features, target audience, and advantages and disadvantages. Therefore, there needs to be much research done on component synthesis and taxonomy because they will impact how people learn, how teaching is done, and how broadly used. While some Multimedia systems have been implemented, tested, and performed admirably, others have not.

The success tales also differ according to their context, intended audience, and usage. Therefore, this research aims to comprehensively evaluate the academic studies that have examined the use of various Multimedia teaching and learning technologies. The main objectives are finding out what existing Multimedia-based tools are, how they are utilised, where they may be employed, and how they impact the educational system. The study aims to identify the currently available Multimedia-based teaching and learning aids, comprehend how they are utilised and their limitations, and know about their application domains, assessment techniques, technological components, and consequences on the educational system.

The study is built around the following research topics to achieve this:

- (1) What types of Multimedia teaching and learning technologies are used?
- (2) What Multimedia component is appropriate for a particular audience?
- (3) In what way do the current accessible tools make use of Multimedia components?

- (4) Evaluation techniques that are beneficial to a successful outcome.
- (5) What determines whether or not using Multimedia tools for teaching and learning is effective?

This study's primary objective is to assist educators in selecting the Multimedia resources and programmes used in classrooms. In this study, the components of various well-known Multimedia programmes are taxonomically organised and broken down. We examine the outcomes of several case studies. In addition, challenges to using ICT and Multimedia in teaching and learning are identified, as well as open cases and choices for future research.

Ideas and Resources for Using Multimedia in Teaching and Learning

Students can create mental representations of various media aspects to aid their knowledge processing using Multimedia or digital learning materials. Digital learning tools display information made up of material and occasionally learning exercises using a combination of text, image, video, and audio. According to studies on the use of Multimedia in education, people learn more effectively when they combine words and pictures than when they merely use words. (Mayer, 2008; Chen, Liu, & Mayer, 2008) Eady and Lockyer (2013) used a variety of instructional strategies. In their study, the authors demonstrated how they could interactively engage students when introducing ideas to them, explaining how to do something, starting a group activity, and providing various types of content.

Multimedia tools used in education can generally be divided into two categories: those used to educate and those used to learn. Eady and Lockyer (2013) provide a list of various Multimedia or digital learning materials available. Several studies, such as Guan et al. (2018), have demonstrated that multimedia tools can play an integral role in the education of students, as well as their widespread adoption. Technology is typically used in Multimedia, and the frequency with which it is used in education is a testament to its value. Almarabeh and colleagues (2015) Several methods that Multimedia application technologies can support instruction and learning are listed below:

- (1) The capacity to transform abstract concepts into reality
- (2) The capacity to convey much information quickly and efficiently.
- (3) The capacity to motivate kids to learn
- (4) Aids teachers understand the stage of their students' learning.

When you refer to "Multimedia built for learning," you are referring to how words and images used in various contexts aid in creating mental images. By providing tools that can be used in simulations, e-learning, computer games, and virtual reality, they are designed to assist people in learning. These resources aid in comprehending information that is presented orally and visually. 2018's Alemdag and Cagiltay You need to be familiar with theories like the cognitive theory of Multimedia learning to understand how individuals learn from instructional Multimedia. Three presumptions regarding how individuals learn from instructional Multimedia form the basis of this hypothesis. According to these assumptions, there are two channels, limited capacity and active processing. Alemdag and Cagiltay (2018) Dual-channel learning assumes that students can easily distinguish between what they hear and see. Due to the limited capacity, each channel can only process a specific amount of data simultaneously. Teachers will not need to provide their students with much material if they comprehend these. However, students will know what they can and cannot do when processing information. According to active processing, humans are active agents who can manage the many types of information they deal with when choosing, organising, and integrating it.

When ICT is used effectively, the learning environment shifts from being centred on the instructor to the learner. (Coleman et al., 2016; Guan et al., 2018) According to Coleman et al. (2016), moving from teaching to learning fosters student-centred learning in which teachers serve as facilitators rather than subject matter experts. As a result, the teacher's position is altered from knowledge transmission to facilitator, navigator, and co-learner.

Multimedia technologies improve classroom instruction by making it more efficient, entertaining, motivating, interactive, and of high quality, while also satisfying the needs of various learners. (Keengwe et al. 2008a)

Teaching and Learning with Multimedia Technology: How Can It Be Done?

Using multimedia technologies can benefit teaching and learning, according to researchers in information technology (IT) and education technology. In many different ways, education and learning can be accomplished by using software tools in the form of software tools. It is essential to provide students with a practical experience in almost all subjects they study to succeed.

There cannot be enough emphasis placed on the value of multimedia technologies and apps as teaching and learning tools. The same results were observed in other research that examined how Multimedia technology impacts the educational system. The importance of using Multimedia tools in math classes was demonstrated by Milovanovi et al. (2013), who also discovered that these tools significantly enhance students' learning. Numerous pieces of data demonstrate how Multimedia aids in student learning. (Janda, 1992; Keengwe et al., 2008b; Kingsley and Boone, 2008)

Multimedia communication is quite similar to face-to-face conversation. It is easier to understand and more transparent than writing. (Pea, 1991) Multimedia technology facilitates the coordination of various ways of presenting the same subject from various points of view, accommodates individual variances, and makes it easier to understand abstract concepts. Computer-based techniques can be an excellent way to connect pupils to their studies if they are used with the correct typefaces and designs.

Multimedia technology improves teaching and learning. However, there are specific issues with how technology is applied in the classroom. These issues include difficult-to-use programming or user interfaces, a lack of resources, a lack of knowledge and expertise, a lack of time, and a high maintenance cost. (Putra, 2018; Al-Ajmi and Aljazzaf, 2020).

Evaluation of Multimedia Methodologies

The evaluation process determines if a Multimedia programme achieves its objectives and benefits its target audience.

According to Kennedy and Judd (2007), those who create Multimedia technologies expect how users interact with them. These concepts may be instructive or practical. (concentrating on the interface) It is crucial to remember that there are several methods for evaluating Multimedia, and most of the time, tests, comparisons, and polls are employed. The fundamental objective is finding a proper balance between an evaluation's validity and speed. (Mayer, 2005)

Despite the subjective nature of surveys and the limitations of comparative studies, eye tracking can collect objective data on student behaviour and emotions without requiring the student or the researcher to be consciously aware of what is happening. A multidisciplinary field called eye tracking research monitors how the eyes move in response to visual input. (Horsley et al., 2014) Researchers can empirically and objectively assess learner comprehension of Multimedia content, learner attention during Multimedia content analysis, and cognitive demand of the content using eye-tracking data. (Molina et al., 2018) Because it can assist children in learning crucial information, eye tracking is quite intriguing. It is due to the complexity of traditional data collection methods, particularly when it comes to the interests and preferences of youngsters. (Molina et al., 2018)

In the past, people looked at how frequently and how long students utilised internet resources to try to understand how they behaved while using them. Morris et al. Nie, and Zhe (2020) demonstrated that online visual tracking in the classroom is more successful over time than the conventional manual way of analysing student behaviour. They discovered that the visual monitoring behaviour used in online classrooms might be broken down into several sub-components, including selection, presentation, mapping, analysis and collecting, and studying students' facial expressions.

A Comprehensive Overview of Multimedia Tools, Technologies, Components, and Applications

We discovered more about the many kinds of Multimedia tools mentioned in the papers, the technologies that were utilised to create them, the Multimedia elements employed, and whether the tool was meant to be used for teaching or learning by doing a systematic review.

Publication	Multimedia Tool	Technology	Stand-alone/ Web-based	Multimedia Components
Akinoso (2018)	Multimedia tool for teaching Mathematics	Computer Representation	Stand-alone	Text, Graphics, Audio and Video
Aloraini (2012)	Teaching tool	Computer Representation	Stand-alone	Text, audio, video and animation
Hwang et al. (2017)	Web-based application	HTML, JavaScript, CSS	Web-based	Text, image, annotation
Ilhan & Orue (2016)	Teaching tool for teaching social studies	Computer Representation	Web-based	Text, audio, video and animation
Maaruf S.Z., Siraj S.	Multimedia interactive teaching materials	Microsoft PowerPoint authoring tool	Stand-alone	Visual art materials, including images and text

Table 1 Summary of multimedia tools, technology, components and applications for education

Stand-alone and web-based tools are the two categories of Multimedia tools detailed in Table 1. As Multimedia technology has improved, many programmes have been developed and utilised to enhance teaching and learning across various subjects. The table demonstrates how to recognise several components of a Multimedia programme. Multimedia tools included text, music, video, images, animation, annotations, and 3D.

Conclusion

The behaviour of students when using Multimedia learning resources has been examined in several studies. Agulla et al. (2009) used a learning management system (LMS) to track student behaviour, which provided data on how much time had been spent reading materials on the computer. It could be accomplished through speaker verification, face tracking, and fingerprint verification. Alemdag and Cagiltay (2018) systematically evaluated eye-tracking studies on Multimedia learning. As multimedia usage was gaining popularity at the time of this research, the primary objective was to examine its effects on college students. Additionally, the researchers found that although eye movements were related to how students choose, organize, and integrate multimedia information, they were also used to examine metacognition and emotions.

Eye-tracking was utilised by Molina et al. (2018) to assess how well primary school students utilised Multimedia. To determine what students were thinking as they were learning and how they thought about what they were learning, some research combined verbal and eye tracking data. (Stark et al., 2018).

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