

# Assessing the Ways in Which Multimedia Technology Impacts High School Learning

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## ABSTRACT

Multimedia technology is now considered a widely employed tool to promote science teaching and learning for secondary school students [1]. The previous study has accurately identified that multimedia teaching approaches, such as instructional videos, are more vitally significant than books [4]. In order to better understand the role of multimedia technology, it is essential to introduce multimedia technologies into classroom teaching, which is referred to as multimedia learning [8]. In addition to the traditional communicative verbal instruction, multimedia teaching also includes the use of recorded media, cartoon video, and audio-based information to present learning content [8]. This paper will not only focus on the positive and negative effects of multimedia application but also explore several conducive factors that teachers can adapt to ensure and facilitate the effective use of multimedia technology in high school education.

**Keywords:** *multimedia technology, multimedia teaching methods, secondary school students, positive and negative effects, effective incorporation*

## 1. INTRODUCTION

### What is multimedia technology?

Multimedia is an interactive computer system that combines two or more media, including pictures, text, sound, and integrated animation, in a computer application [8]. By utilising this computer medium, teachers can present more diverse learning contents, facilitate the interaction between students and the medium, and lay a solid foundation of professional knowledge, thereby optimising the teaching and learning environment and enhancing the educational quality [5]. In contrast, multimedia-assisted teaching techniques have brought fundamental changes to the traditional education system [5], propelling educational reform and progress at an unprecedented speed. In this case, multimedia technology profoundly affects the educational process as it promotes the teaching environment and provides supplemental materials for students to enhance their learning efficiency.

## 2. ADVANTAGES OF MULTIMEDIA TEACHING

As the most essential and supportive element in the learning process [3], multimedia technology has played

an indispensable part in facilitating high school students' insight into scientific knowledge. Firstly, multimedia technology can endow students with an opportunity to learn dynamically and effectively, thus alleviating most of the challenges they have in their studies [11]. For example, when acquiring those scientific contents in high schools, such as biology, chemistry, and physics, students may be confronted with the difficulty of combining the science theory with practical application in this complex and esoteric learning process. However, Wellington [13] argues that using multimedia technology in science education can promote the association of 'thinking' and 'doing'. According to Zheng et al. [14], compared with those studying traditional educational schemes, students equipped with multimedia devices can gain higher achievements in genetics studies in UK high schools. Indeed, with regards to the obscure acquisition of those scientific theories and concepts, even the most vivid teacher oral presentation can be inevitably inferior to multimodal sources of knowledge on advanced devices, which provides students with the opportunities to learn visually and interactively. Therefore, multimedia technology can function effectively in enhancing students' comprehension of science subjects.

Secondly, multimedia technology also has a favourable impact on improving students' collaborative

and communicative abilities, which encourages them to stimulate initiatives in learning at the same time. Based on the characteristics of multimedia itself, this advantage will further promote the development of the education industry [3] as the information and communications technology (ICT) facilitates the communication among students, those modern technological devices, and the learning contents. Moreover, the collaborative sharing technology enables students to foster independent learning habits. [3] interviewed with a British high school student, identifying that multimedia teaching was more engaging than traditional methods. Students' attention can be attracted by multimodal and diverse sources of information, including textual and audio or video ones. After the class, students can use multimedia to not only communicate and exchange the learning materials but also review and consolidate the newly acquired knowledge in time.

Furthermore, the introduction of multimedia resources is relatively favourable to optimising the learning environment and generating a positive schooling atmosphere. According to constructivist learning theory, the learning environment should be "a place where learners can work together and support each other as they use a variety of tools and information resources to guide learning objectives and problem-solving activities." Under this circumstance, the application of multimedia allows learners to increase their learning quality and reinforce effective stimuli in the learning process. For example, the foreign language education in high school is inclined to be too monotonous, demotivating, and exam-oriented to provide an immersive and communicative language learning experience, which renders it difficult for students to devote their effort to acquire it. On the contrary, with the help of the multimedia educational model, teachers can utilise stimulating animations to engage students in meaningful oral English communication scenarios effectively. Also, learners' English pronunciation, linguistic awareness, and communicative abilities can be enhanced in the process. Therefore, multimedia technology is proven to function effectively in providing a specific teaching context so that language learners can be voluntarily integrated into a vivid and interactive English scene mode.

More importantly, multimedia teaching can deliver numerous helpful information in a limited period of time. In this regard, multimedia technology is vitally significant to not only enable teachers to maximise the effectiveness of knowledge imparting but also allow students to take the initiative in assimilating and digesting diverse information with high efficiency [6]. For example, in a high school art class, the medium of animated videos can transform the textual information appearing in students' reading assignments into audiovisual instruction, which helps them better understand the content and meaning of the text. Also, the

multimedia teaching instrument of table pictures can present an organised structure of the necessary writing skills so that students can carry out the writing task efficiently [6].

Correspondingly, it is clear that the use of multimedia technology at the senior secondary level in the UK can not only facilitate students' comprehension of complex scientific knowledge but can also increase their level of engagement and participation in the class by encouraging them to exchange information in multiple manners [6]. It is also conducive to optimising the teaching and learning conditions, allowing students to thoroughly exploit the learning materials in the time allotted [6].

### **3. DISADVANTAGES OF MULTIMEDIA TEACHING**

Despite these aforementioned positive effects of multimedia on students' science acquisition, it may also have numerous detrimental consequences on students in higher education, such as the overuse of multimedia technology and the unexpected technical malfunction encountered in the teaching and learning process. According to Watter and Diezmann [12], it can provoke a pedagogical crisis when all the stakeholders afford excessive efforts and energy to acquire the complex operation of multimedia technology. Besides, students with inappropriate self-discipline may be attracted by the colourful multimedia pictures or videos contained in the courseware rather than purely concentrating on the learning content itself, which eventually leads to a decrease in their learning efficiency.

In addition, the network instability, equipment breakdown, and other technical problems encountered during the teaching process can bring about disturbances in the classroom and a reduction in learning efficiency. According to the results of a survey conducted by Elliot et al. [3] in a number of UK high schools, "the most critical issues that prevented multimedia usage were (1) lack of time to access portal resources (58%), (2) lack of school IT infrastructure (35%) and (3) delays in loading movies due to bandwidth issues (33%). Therefore, multimedia technology may encounter numerous unforeseen challenges in the actual educational process, which is difficult to solve in a timely manner considering the limited time available for high school classes. If technical difficulties with multimedia technology cannot be resolved in the long run, students' learning and real educational progress will be hampered. For example, a 'timeout factor' was identified when multimedia software was applied in a UK high school as the software could not be used for more than 25 minutes [3]. In both cases, the practical application of multimedia technology in education continues to be imperfect. It may interrupt the teacher's preparation of the course, which motivates educators to propose targeted approaches to address these multimedia challenges.

#### **4. HOW SHOULD TEACHERS USE MULTIMEDIA TECHNOLOGY EFFECTIVELY?**

In light of multimedia technology's positive and negative effects on learning in high school, students can actively improve their capacity to reflect on the information disseminated by multimedia technology, thereby building critical thinking [10]. Regarding teachers' responsibilities, they should not only consider the effective integration of multimedia resources with curriculum topics but also ensure that technology enhances the delivery of pedagogical knowledge [12]. To increase the efficacy of multimedia technology in high school education, it is essential that teachers uphold a scientifically rigorous attitude towards the technology and thoroughly evaluate its impact on solid and competent instruction. Firstly, since teaching methods are considered an essential factor in imparting course materials [3], teachers should make full use of multimedia equipment and select the most appropriate multimedia resources rigorously in advance to guarantee instructional effectiveness. As a result, those resources be effectively and adequately utilised to encourage students to accept and internalise the new knowledge.

In addition, Elliot et al. [3] argue that when introducing multimedia, teachers should emphasise strengthening students' critical thinking, scientific learning literacy, and learning autonomy. This is primarily because students can grasp the gist of learning contents and broaden their horizons to extensive materials under multimedia pedagogy, thus promoting independent thinking and problem-solving skills. Dorit and Barry [2] have also demonstrated that multimedia technology can help high school students develop higher critical thinking, rational judgment, and problem-solving skills. Therefore, teachers should take these two factors into account, not only by utilising effective teaching techniques but also by thoroughly fostering students' independent and reflective skills to improve the efficiency and quality of learning.

#### **5. CONCLUSION**

Multimedia technology is a double-edged sword. On the one hand, the rational use of multimedia technology at the senior level encourages teachers to enrich their teaching methods and further amplify students' learning efficiency. However, multimedia education can also pose a number of negative consequences, ultimately resulting in a decline in education quality. Therefore, teachers should bear in mind the necessity to consider whether the technology is adequate for the learning content, select appropriate teaching resources, and maintain a balance between the two to ensure the quality of learning in senior schools. In addition, students' independent thinking, critical judgment, and scientific attitudes

towards the use of multimedia technology should also be appropriately cultivated so that students can independently increase their learning outcomes.

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