Possibility of using Multimedia Application for Learning

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Abstract - **Technology is developing quickly. Multimedia, a form of technology, is being used as a teaching tool these days. Many researchers and educators have found suitable ways to design multimedia applications in order to achieve fruitful educational outcomes. Not that all we are going to discuss here, the definition of multimedia, and the connection between multimedia and learning tools, concept of multimedia applications, how they are formed using a different media, the type of educational element that effect to learn in their natural environment and the real-world issues. The definitions and characteristics of multimedia and educational elements are explained in this article.**

Key Words - Multimedia; Interactive Media; Educational Multimedia; Modality Principle; Multimedia Design

I. Introduction

In the education field, we use audio, video, slides, overhead transparencies, etc., to assist in the teaching process inside the classroom. The word 'multimedia' describes a combination of different media. When computers became prevalent in society, people started using them to perform various tasks to make their life easier. Computers are a powerful resource that we can use for many things. Interactive multimedia is a reliable technological innovation, and it has the potential to modernize the way we read and explore educational things. Multimedia is an interactive as well as educational tool. These types of interactional tools are likely to make educational subjects more interesting. The objective of using multimedia as an educational tool is not to eliminate the teacher from the classroom; rather, it is just a tool, which makes it easier for both students and teachers to learn as well as teach particular subjects. Multimedia tools include well-designed programs that simulate the teacher's role by adding various educational elements to the cognitive process. The learning process involved in multimedia programs facilitates active learning and ensures that users are practicing a subject rather than merely reading about it. Actual communication between multimedia programmes and students constitutes a proper learning process interactive multimedia is a new technology that is introducing new methods in the learning process to the new generation. Teachers should be able to easily access these multimedia applications to monitor their students' progress and modify the application's contents according to the students' characteristics.

Park and Hannafin stated that most of the aspects of interactive multimedia systems, which are used for teaching, are questionable. Here, we can see the difference between computer-based instructional methods as well as sequential media [1]. In modern society, as there are numerous media choices available to choose from, it is important that developers of these instructional multimedia applications use appropriate elements for their applications. Interactive multimedia applications are crucial, as they are the only reason for further investment and research in this field. Through this paper, we will discuss the key elements and implications of building an educational multimedia system. We will also discuss theories, which can be use to build a proper guidance system for developers to build and select the proper elements to build multimedia systems. Finally, we will review several different educational elements that can be used for educational purposes for multimedia systems.

II. Literature review

Multimedia is a revolution that has changed the world rapidly and built a technologically savvy generation. This has led to changes in how we teach and learn. With multimedia, it is easy to communicate, and it helps us do so more effectively. As Neo and Neo (2000) noted, "Multimedia application design offers new insights into the learning process of the designer and forces him or her to represent information and knowledge in a new and innovative way" [2]. Indeed, different learning methods are likely to require new approaches to learning, motivation and methodologies [3]. Moreover, well-structured learning methodologies could be used to simulate different approaches to compelling ideas using multimedia elements, since

today's students see multimedia as a tool for obtaining more knowledge [4]. Van den Brink et al. (2000) reported that tasks that teachers carry out in traditional a classroom setting are altered when using multimedia elements for educational purposes. Students are generally willing to working with teachers, as they need their teacher's individual help. Students think that learning using multimedia is different from traditional classroom learning. In this context, the relationship between students and teachers is much more relaxed, and the students are more independent in learning activities.

Multimedia technology creates a path for communication and learning methods. This path contains all of the latent resources of the method as it is applied in a new and stimulating way [6]. Moreover, Säljö (1999) pointed out that multimedia elements support students by allowing them to exchange their opinions and articulate theoretical issues related to the given topic:

> "the interactive character in multimedia can support reasoning by amplifying the nature and boundaries of objects and events. But the full realization of the potentials of such experiences will still rely on students' access to conversation partners who carry on discussions in which these models and concepts are validated. The creation of knowledge is essentially a matter of learning to argue, and it will help for learners to participate in ongoing conversations with partners sharing interests and commitments. Multimedia technology is not be seen as replacing such communication but rather as providing a resource for supporting it." [7]

Li, Tsai and Tsai (2008) found that multimedia is really helpful in technical and vocational education. It aids teachers in teaching subject-related information while maintaining teaching quality, thereby creating an expanded and comprehensive teaching environment [8]. Similarly, Norton and Hathaway (2008) noted that for students to develop their knowledge, they must both learn about and experience the given subject. In this light, it is essential to improve the quality of multimedia applications. For instance, animation and colourful images help students memorise information and can increase their learning capacity [9]. Rolfe and Gray (2011) point out that the advent of new technology has meant that traditional approaches have needed to move to include advanced technology, such as multimedia, which has enhanced methodologies for learning. The use of multimedia for processes of teaching and learning has become a significant part of modern educational technology [10]. Finally, Gilakjani (2012) identified three motivations for using multimedia applications: to raise the interest level, to elevate short-term memory to long-term memory and to increase the understanding of a particular subject. Indeed, different learning methods can be used for different students.

Multimedia applications use several learning methodologies to address several different aspects of learning, depending upon the students' needs [11].

Moreover, when multimedia is used as an educational tool, one must consider the teaching/learning technique, educational materials, the characteristics of the students, and the relevant learning methodologies. The previous literature reveals that multimedia applications can surely be used as an educational tool. Moreover, if we refine the multimedia application and apply specific guidelines to develop it, the outcomes will be more fruitful. In the research described earlier, there were many guidelines, and the significance of these will be discussed later in this paper.

III. Multimedia

Before starting discussion on our topic, we must clarify the definition of 'Multimedia'. The word 'Multimedia' is a reasonably new one in its field. It is used to describe several different mediums when they are merged together. We can define multimedia according to its common characteristics: texts, graphics, animations, video, and sound. These are all combine to create multimedia, but they can also be organized and presented differently. In other words, multimedia can be define as numerous media elements combined into one whole subject, which produces fruitful outcomes for its end user. All these media elements are making communication more organized and clear than ever before.

Several researchers have provided definitions of multimedia. Moore et al. defined multimedia as follows: the use of numerous media devices in a coordinated manner, such as coordinated slides used with audiotape [13]. Fenrich defined multimedia as follows: 'Multimedia is the exciting combination of computer hardware and software that allows you to integrate video, animation, audio, graphics, and test resources to develop effective presentations on an affordable desktop computer' [14]. Mayer defined multimedia as follows: a form of media, which is used for the purpose of presentation, using text and images as the presentation materials. He later mentioned that multimedia is a form of media, which are generally, is implicitly incorporated and merged, with numerous components of several different media, such as sound, animation, text, graphics, and video [15]. Finally, according to Vaughan, 'multimedia is any combination of text, sound, animation, and video delivered by computer or other electronic or digitally manipulated means. It is a woven combination of digitally manipulated text, photographs, graphic art, sound, animation, and video elements' [16].

IV. Multimedia & Education

Under this topic, we discuss the possibility of using multimedia applications as an educational tool. Regarding education, multimedia applications can be apply creatively and reflectively. Multimedia application suits several learning subjects such as cross-curricular subjects. The key objective for using multimedia applications for education is to teach something difficult students. Through the 'learning to learn' concept, students can be taught how to determine and apply specific strategies to achieve success in every subject. What we aim to achieve through this is approach is to increase students' knowledge on particular subjects and give them a purpose for learning them. Learning theory in multimedia involves refining students' skills and preparing students to identify certain challenges, build their personalities, and enhance their knowledge. The 'learning to learn' concept differs according to fundamental epistemological and ontological assumptions.

Moore proposed some norms for multimedia use in education:

- It should serve to strengthen students' learning.
- It should help provide a good learning environment. Educational elements in multimedia should be accessible in various presentation forms.
- It should help to improve the logical thinking skills of users. Learners need to analyse by themselves what they have learned and come to a proper decision about it.
- User-friendly UIs should be develop to motivate users. They should also be attractive and interactive [13].

Fenrich stated that most previous research results are not significant, as it is not referring to the certain teaching requirements. Nonetheless, he believed that the benefits of learning through a multimedia environment are applicable to both students and teachers:

- Students have their own space to study, and they can manage their studies according to their needs.
- Students can work according to their own timetable, whether it is day or night.
- Students can study with a tutor, and they can choose what is helpful for their studies according to their psychological background.
- Students can do their studies actively, and they can receive quick feedback [14].

Specific requirements need to be fulfil to achieve effective learning outcomes by using multimedia applications for educational purposes. Our current research results as well as previous research results show that multimedia applications can be used for educational purposes. Certainly, multimedia provides an essential environment to deliver good outcomes. Multimedia helps to understand how learning takes shape by providing a real-world experience, increasing stability by using several different audio-visual aids, and finally, by generating a flexible learning environment.

Herrington proposed some guidelines for building multimedia applications to make them suitable for educational purposes:

- Develop it systematically aware with the application.
- Introduce the issue briefly.
- Provide short guidelines on how to access and operate multimedia applications and their elements.
- Teachers should be present at all times when students use a multimedia application. This makes things easy for both students and teachers, as teachers can assist student when needed.
- There should be an option for providing hints when students are struggling to answer difficult questions.
- Proper guidance should be proved when students use an application. However, this does mean the answer to a question should be given away directly. It only means that proper guidance should be proved to reach the next level.
- When an issue troubles more than one student, and when they require support to continue, teachers should advise the whole class instead of providing advice individually [17].

Most researchers agree and confirm that multimedia applications can be used to support educational subjects. They can help students to obtain positive educational outcomes. Teachers, educators, and researchers believe that multimedia applications can produce passive educational methods to achieve more collaboration. Additionally, multimedia applications can increase the knowledge of users more striking and motivate them to practice more, even if the educational model they are operating under is passive.

V. Rational for a Multimedia Learning Application

A. *Effective Teaching Materials*

Teachers use multimedia applications to make presentations on a particular subject. This helps to encourage students to learn particular subjects effectively. These presentations combine several different media elements. Multimedia presentations combine several different media elements. So multimedia applications with learning platforms are programme to simulate different situations and help students to understand difficult subjects easily. Multimedia applications with learning platforms are

programme to simulate different situations and help students to understand difficult subjects easily. They help students to understand the most relevant parts of that subject. Multimedia applications also help teachers to prepare teaching materials in less time than it would take without the use of such applications.

B. Reduced Psychological Barriers

Presentations that were done verbally, could be a reason for students' short-term memory. But presentation done using audio and video always resulted in higher recall than presentation without visuals. Additionally, in the traditional teaching environment, the effectiveness of a lesson depends on the performance of the teacher and his or her teaching strategies. A multimedia learning platform gives users the chance to learn and practice the selected subject repeatedly until they become experts.

C. Quality of Teaching and Expanded Education for its Users

Most of the people believe that multimedia applications can wipe out humans from current traditional in-class teaching activities. However, this is not true. In reality, a more stable environment will be achieve with the use of multimedia applications. Negative influences, which affect teachers' psychology, will be decrease and teaching quality will be enhance with the help of these multimedia applications. Additionally, users will be able to learn at any convenient time and under any circumstances using these applications.

D. Learning and Quick Feedback

Multimedia applications can be effective in the teaching role, as it is programme to give quick feedback to its users/students. In traditional classroom teaching, learning efficiency depends on the mood of the teacher as well as the teaching methods used. Multimedia applications, which are used for educational purposes, provide opportunities to learn and practice continuously.

E. Tangible Understanding

Multimedia applications used for educational purposes comprise solid ideas and several concepts, which aid the teacher in conducting their class using image presentations, texts, numbers, and presentations in sequence. These applications can be used to develop a demonstrative model, which can be used for practical training purposes. Multimedia applications allow students to use this application at their convenience.

VI. Modality Principle

As per the modality principle, multimedia comprises both audio and video rather than merely the latter. According to Penney, presentations that were done verbally, could be a reason for students' short-term memory: 'in short-term memory tasks, auditory presentation almost always resulted in higher recall than did visual presentation' [18]. Thus, Penney stated that presentation materials should contain a mixture of both audio and video elements. This could be effective for students' long-term memory. Many researchers have shown that to keep one's attention on something (especially on educational matters), both the eyes and ears should focus visually and auditorily. The final outcome is to be expected when the two optical sources are spatially disconnected and both sources cannot access foveal vision at the same time, or the audio sources are disguised. Barnsen has stated that 'Given any particular set of information which needs to be exchanged between the user and system during task performance in context, identify the input/output modalities which constitute an optimal solution to the representation and exchange of the information' [19].

Mousavi et al. studied short-term memory and examined modality effects related to multimedia learning. They found that multimedia presentations do not activate only the short-term memory of students, as long as the presentations use both audio and visual elements. Regarding the first two studies, students were accessible for several different learning tool under different situations. In the first group, the students had to observe a diagram and connect with the statements and listen to statements played from a recorder. The second group had to study the diagrams and statements. The third group had to study the diagrams while listening to the statements from the recorder. Studying was reasonably improve when the audio mode was use for presentation in both experiments. Further experiments, which used both visual and verbal presentations, were perform consecutively. However, the presentation, which was done using the modality principle, was found to be the best. Thus, the modality principle was effective and helped students to absorb the presentation's contents best. This indicates that modalities help to increase memory. When activating both auditory and visual resources for presentations, modalities help to increase long-term memory [20].

VII. Cognitive Principles for Multimedia Design

In our study, we present the definitions and classifications of the cognitive principles, which should be used for designing multimedia for the purpose of reading. When multimedia is explore as an educational tool, the need for precise terminology becomes understandable. According to Sweller and Chandler, the term 'split attention' is considered effective and acceptable for discussing theoretical issues [21]. In the past, this effect referred to either connectivity effects or progressive modality effects. Allport mentions that none of the above mention are not the split attention, its procedure is to indicate the further issues and making suggestions that needs to pay attention, as it is the structural blueprint. However, given the situation, it needs support from traditional theories, and it should be immediately

eliminat as the most recent research outcome in the neuropsychological field. To find the solution to this problem, we planned to replace the term 'split-attention effect', which denotes numerous effects of a different cognitive nature, with 'modality effect', according to the case. The modality effect obviously specifies the effects of using different modalities to signify audio and visual materials in a multimedia lesson [22].

Finally, our conclusion could be generally dependent on differences in the situation. Previous studies have shown that spatial ability, information synchronization ability, and experience can be adjust to some extent. Previous studies have always chosen inexperienced students to determine spatial-contiguity effects and modality effects and arrive at effective research results. Verbal information, in the auditory mode, enables students to increase their memory capacity. Students who have low experience in mental model for the educational substantial would have be the ones who benefit the most from the cognitive resources available. Finally, it must be note that role character of the student go through metamorphoses in multimedia learning.

VIII. Research

In this section, we highlight how multimedia applications can benefit students and examine the contributory factors that make it a convincing alternative for educational purposes. We have taken 96 students as a sample from two different countries (36 from Australia, and 60 from the UK) and four teachers. The interviews that we carried out with students and teachers aimed to discover how multimedia applications and elements should be used as educational tools. We gave the teachers a questionnaire, which mainly centred on the types of tools they used for teaching purposes and their results after using multimedia applications.

We then set up an experiment using multimedia. This exercise needed to take into account several factors: the students' level of memorisation, creativity and learning skills (which represent different analytical levels), gender differences and the ability to receive their feedback on possible improvements. In this light, we will discuss the effectiveness of using multimedia as an educational tool. The most relevant method for testing effectiveness is to evaluate the method's results in this case, games) in comparison with the results of the traditional method.

To this end, we divided the students into two groups: 1) students who learned with multimedia elements; and 2) students who learned with usual in-class activities (not using multimedia elements). We tested the students' learning abilities and skill levels (which covered different analytical levels), and obtained their feedback on possible improvements. The following charts show the results.
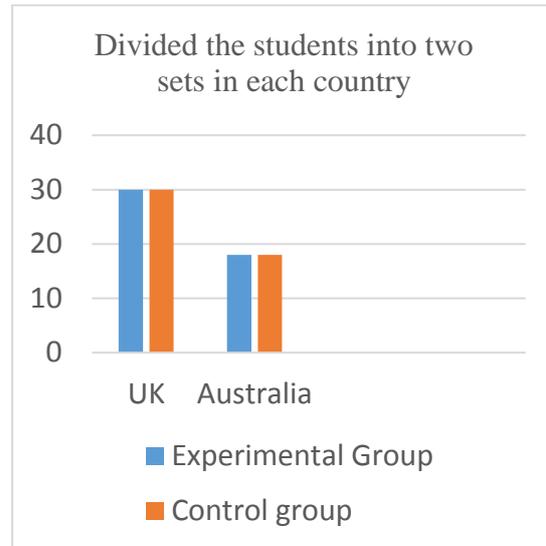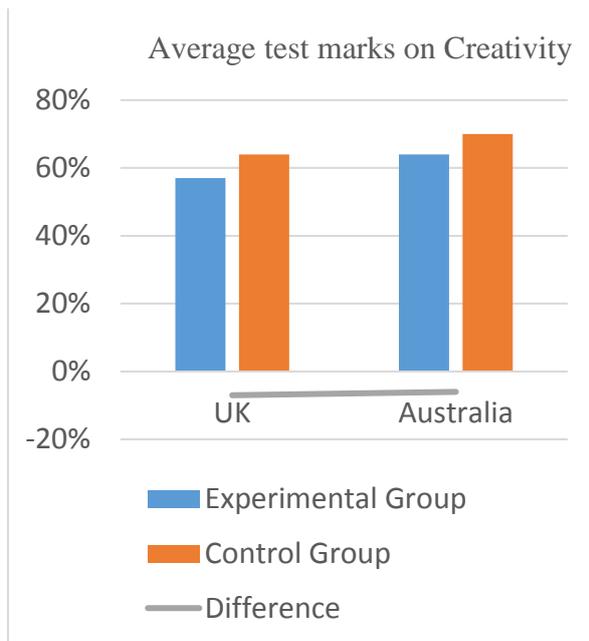

(Chart 1)

Chart 1 shows the division of the students by country. The aim was to find out whether multimedia applications had any effect and whether it can be used an educational tool.
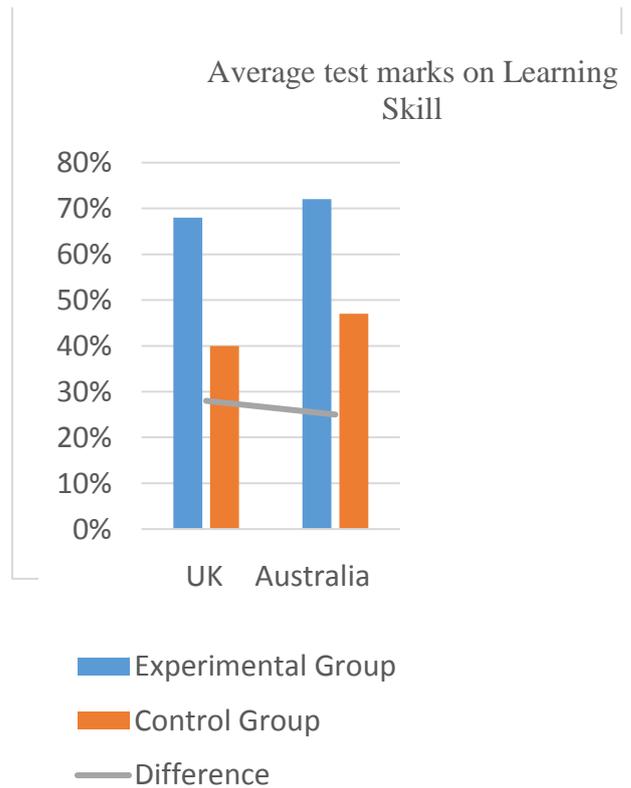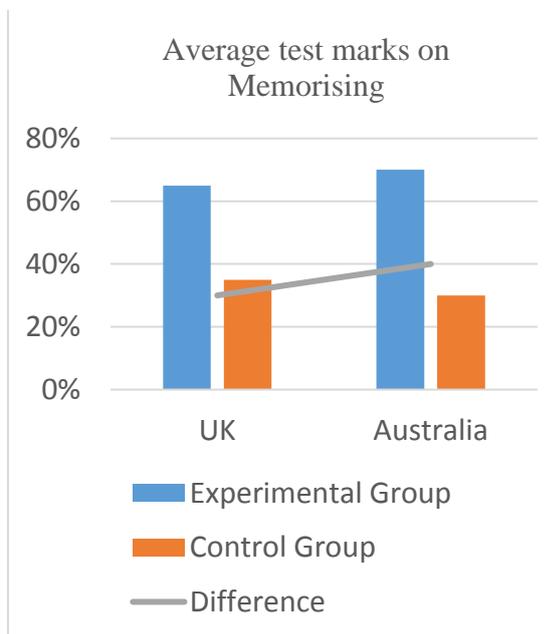

(Chart 2)

Chart 2 shows the results of the learning skills tests from each country and within each group. According to the results, more progress is made by the experimental group than by the control group.

Average test marks on Creativity

(Chart 3)

Chart 3 shows the results of the creative skills tests by country and within each group. According to the results, the experimental group's scores went down when compared to the control group, suggesting that the use of multimedia is not effective for learning and practising creativity.

Average test marks on Memorising

(Chart 4)

Chart 4 shows the results of the memorisation skills tests by each country and within each group. According to the results, more progress can be seen in the experimental group when compared to the control group.

Through this study, we have found that using multimedia applications is beneficial for learning purposes. The methodology that we have

highlighted here would lead to successful outcomes. Regarding the results shown here, the experimental group shows a significant increase in knowledge in many ways when compared to the control group. Generally, when comparing the control group and the experimental group, there is a significant difference, as the knowledge of the experimental group increased due to the use of multimedia elements during instruction.

The techniques discussed here offer support for the claim that using both audio and video is helpful for learning quickly and is effective for long-term memory, making recall easier. Moreover, it helps students to develop their educational level and other useful skills. Students really liked working with the technological items, even as part of their in-class activity. The teachers commented that multimedia applications fitted well into their lesson plan and were an acceptable teaching tool in class activities. This reveals the success of multimedia in bridging the gap between teacher and student. It also helps students to discover the easiest way for them to learn and memorise. Teachers are always there to guide and monitor the students' progress while their students are involved with such multimedia applications.

This evaluation had three effective outcomes. First, multimedia applications help students to produce skills and refine their educational skills and objectives. The logical and theoretical consistency of the content helps them to achieve this as well. Second, the main idea of the application of multimedia is to learn enthusiastically. This method has been very successful in this regard, as it makes students more engaged with their studies, and they pay much more attention to their studies than before. In the final outcome, we can see that the students were actively participating in this method, and they were able to socialise and work more actively through teamwork than they had earlier. These aspects help to maximise the educational role of multimedia and help students to succeed.

IX. Conclusion

Multimedia and learning theories are two major factors in education. In the present day, several multimedia applications are use for the purpose of education, such as simulation games, presentation applications, and e-quizzes. A good multimedia learning application can be develop based on cognitive objectives, which are focus on and compare different levels of learning of topics. Multimedia can be use as an efficient learning tool, as it usually helps to increase the motivation of its users and enhance the interaction between the multimedia application and its users. Herrington proposed nine characteristics to build proper multimedia applications, which were suitable for use in educational purposes. Reliable contexts, activities, expert performance, and multiple perceptions provide designs and allow proper multimedia applications to be develop within

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learning environments. Cooperation, reflection, and expression help to deliver better education outcomes for students. To make effective interactive learning systems, multimedia application developers must follow the principles and guidelines, which we have discussed through this article. We are certain that these guidelines can be use to develop a perfect multimedia application that merges several mediums. Through this article, we have demonstrated some methods based on modality theory, which could help developers to create an effective multimedia learning application.

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