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Original Article

Multimedia As a New Approach for Learning in Physical Education

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Abstract

Background: Aim: To present the relevant research results that enhance the possibilities presented today with the use of multimedia applications. An attempt was made to explain its importance in the learning process in general and motor skills in particular. At the same time, we try to define the implementation process and the flags that need attention for the best possible results. Nowadays the use of digital technology has reached very high levels. Especially in the last two years with the COVID-19 pandemic, where distance learning was most used. Teachers have learned to use these digital tools to create attractive lessons for their students, who are already introduced to digital technology in their lives. The use of multimedia in education, as many research suggests, is a modern learning tool in the classroom, but recently they have been used in both physical education and sport. The effectiveness of multimedia use is based on the theory of visualization of information that helps the student store this information in their memory for subsequent recall, make the course more attractive/pleasant, so students are motivated to learn. In PA and sports it is used as a helpful tool, since the master of learning is practice. The means used to present multimedia in the classroom can be tablets, mobile phones, a laptop with a large screen view at the same time.

Keywords: multimedia, 3d animation, physical education, motor skill, learning

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1. Introduction

Until the recent years, learning was done through books or by following teacher's lectures and taking notes [1], which is insufficient in the present-day context. Concerns about increasing student and teacher productivity have led to new approaches [2]. Relevant studies to find new approaches that would contribute to better results concluded that the most important factor in the field of learning is the activation of students [3, 4]. Based on the new data, in order to achieve better learning, students need to gain relevant experience and practice during their studies. To achieve this, students must become familiar with the idea of working together and be able to learn how to tackle problems together and participate actively in the environment in which they are called to be active [5].

This approach focuses on making students much more active by focusing on how it will lead them to a different way of thinking and engaging in activities after solving potential problems themselves. This approach can easily be achieved through multimedia (showing skills, focusing on key points, asking questions in the picture, etc.), thereby effectively increasing the learning.

The result of the new approaches showed that students could remember >10% of what they were taught. This was due to the extra activity of students during the learning process [6].

This process of learning encourages and effectively forces students to solve problems, even by participating in games. The process of correct information analysis, the selection of the most appropriate solution and its application in a specific environment is what contributes to the most effective learning [4].

One of the strategies that favor learning is the visualization of information [7]. The image attracts attention and interest and makes the lesson more attractive; a simple text repels the student, since their daily life is full of images [8, 9]. In particular, comic book illustration is a universally understood language that evokes the senses, transforms the abstract into concrete and adds a touch of adventure, agony and often mystery to the reader's imagination [10].

Skill learning through multimedia is based on the theory of dynamic systems of children's development and learning skills. According to this theory, the movement is not only produced by the central nervous system (CNS) but is made by an ongoing interaction between skill, individual and environment [11]. More simply, the upcoming learning is an interaction between the environment and the collaboration of internal processes of musculoskeletal, neural and sensory systems. Another theory of learning is social learning theory, proposed by Albert Bandura [12], which emphasizes on the importance of observing, modelling and imitating the behaviors, attitudes and emotional reactions of others. According to Bandura's theory, human learning and behavior are influenced by cognitive, environmental and peripheral factors as well. The four steps in the Social Learning Theory of Bandura are: attention, retention, reproduction and motivation, which can be activated using multimedia.

From a pedagogical point of view, the theory of Paivio dual coding [13] holds a supportive position according to which people store and decode information in two connected memory systems, language (verbal information) and images (non-verbal information), that is, they encode them in a double way, so the image is more effective in learning, when accompanied by verbal text and vice versa. Based on the above, ways can be explored so that the computer contributes to effective learning with strategies based on teaching with simultaneous presentation of narration and animation .

Therefore, the purpose of the teacher is to create an active learning environment. Given that the learning of motor skills occurs with the use of three senses (hearing, sight, kinesthetics), the multimedia directly covers both of them as the practice will cover the third.

2. Internet as an Educational Environment

The idea of distance education rooted in the early 19^{th} century [14, 15], but its systematic application has a history of <100 years. However, since the 1980s, there has been a huge expansion of its application worldwide, due to socioeconomic reasons and mainly due to the development of new technologies [16]. The extension of the application of distance education also resulted in the expansion of scientific research concerning it.

Until the 1970s, research on distance education focused on comparing the means of distributing educational material. In other words, the researchers were mainly trying to determine which medium – television, radio or video – was more effective? Most of these studies did not identify significant differences between the different media [17–20]. In a critical review of all of this research, many subsequent researchers found weaknesses not only in research design but also in the methods used [21–23] . However, apart from any methodological problems, the most important problem of the first researches was that they did not provide specific instructions and directions in the educational practice itself, that is, they did not answer how the material should be designed according to the means used, as well as how the means ensure pedagogically effective communication. Finally, these researches were not based on any theoretical approach nor did they lead to its formulation, which characterizes the first stages of the development of a research field. However, beyond any problems they presented, these researches brought to the fore a question that will give rise to conflicting answers in the next historical period. The question is whether the use of a particular medium affects the effectiveness of the learning process and ultimately the educational outcome? The prevailing view that finally emerged in the mid-1990s was that the medium did not seem to affect educational outcomes, but did affect the ability to distribute and access educational material as well as the characteristics of communication [24].

Nowadays, the same question has comes back differentiated as follows: How can the special features of the media be utilized by designing educational material or educational programs in general [16]? In particular, developments in the field of information and communication technologies will play a catalytic role for two reasons: first, they will offer a variety of new ways of presenting and distributing educational material and second, these developments will focus on the interest of researchers – after an

initial period of indiscriminate application of new technologies – in the study of the pedagogical standards that they must meet [25, 26]. This shift will take place in part because of the spread of the Internet as an educational environment and as a means of communication in education.

3. Technology and Educational Software

One of the most important issues in the implementation of computer/Internet education is the design, production and evaluation of educational material. The educational material must meet certain special requirements: (i) to achieve the various teaching functions performed by the teacher in traditional education, such as guiding the student in their study, enhancing the student's interaction with the material, explanations, evaluation and the encouragement and (ii) be designed in such a way and use the appropriate means to enable the learner to choose the place, time and pace of their study. In addition, the writing of distance-learning material should be based on the principles governing learning [27].

Technology in recent years is evolving rapidly, having a great impact on all areas of human life. Video games are one of the most interesting and popular ways to integrate physical activity into people's leisure time [28, 29]. Technology plays a very important role in learning and acquiring motor skills as in their evolution everyone uses it to become as good as possible in the goals they have set. Its development contributes effectively to the 21st-century skills [30].

Moreover, in recent years, there has been a rapid change in childhood and the methods used to educate children and young people must reflect this change. Children learn better and faster when they enjoy what they do. Using cartoons as a tool that encourages and develops children's learning is not only fun but also effective. Using animation, children develop skills and abilities in storytelling, visual communication, cognitive, emotional, moral and aesthetic aspects, concentration, observation, problem solving and innovation.

4. Multimedia and Learning

Since there are several ways to improve the performance of athletes, there are several ways to learn the skills of the sport through computer. This is mainly achieved through the feedback through videos as well as through the use of video games, which in turn help acquire the motor skills for physical exercise. Regarding video games, in a review Merino Campos and Fernández [31], it was found that active video games have

increased skills (motor–cognitive–mental) in relation to motor activity and education. In addition, they concluded that motor activity interventions designed and measured using theories and behaviors were more likely to be successful than traditional exercise activities.

5. Multimedia in Education

Nowadays multimedia appears daily in people's lives. Multimedia is one of the most talked-about technologies related to some kind of information manipulation. According to the Multimedia Laboratory of the National Technical University of Athens, Department of Electrical and Computer Engineering [32], the term multimedia is a complex word, "multiple media" through which information is stored, transmitted, presented or perceived. The information in the multimedia is in electronic form. The use of multimedia has been shown to help students acquire complex or new ideas [33]. Nowadays and thanks to the development of technology, the use of graphics and 3D animation has proven to be very effective in the learning process. This approach is very attractive for students to involve with, enjoy and actively interact with the content resulting in an easier and better learning [34].

It seems that animation should be ideal in presenting dynamic content. Nevertheless, research on the educational effectiveness of cartoons is conflicting. While there are findings that show positive results in learning, other studies have found that there are no results at all and in some cases the results may even be negative. It is generally assumed that the specific characteristics of cartoons and how they are used are the most important factor in the effectiveness of learning.

Well-designed animations can help students learn faster and easier. They are also a great tool for teachers when it comes to explaining difficult concepts. Digital multimedia lessons not only increase learning ability but also inspire students' keen interest in learning, especially in the area of physical activity [35]. Today, it is possible to present issues using multimedia, that is, visual presentation. This is an element that helps a lot in the educational process. This type of presentation can be done in many different ways and to different degrees depending on the age of the students. Multimedia, because it uses symbols, images, cartoons, 3D animation, etc., has been proven to affect emotions and convey messages which will be easily understood and perceived by students irrespective of age, even by adults [36, 37].

Multimedia applications that integrate and represent digital information (narration, recorded dialogues, motion – animation, static image – graphics, etc.) facilitate learning. The presentation of the topics to be learned in visual form helps the educational process

to an excellent extent. The importance and role of teaching through the employment of multimedia has been demonstrated by many researchers and has also been presented by distinguished authors [36–38]. Additionally, and more specifically, Bliss *et al.* found in their research that the motivation behind animated material is high [39].

A noticeable number of researchers used various ways of animation to assist and enrich the educational process not only in class classrooms but also for adults, for example, in lifelong learning [40–46]. This approach has the advantage that it first secures students' attention, concentration and interest and then gives them the right to use their imagination and have fun while at the same time gaining knowledge.

Another old issue that is now being addressed in relation to new technologies is that of interaction [47–51] . For the study of interaction, specific theoretical models based on content analysis are proposed [52]. Research issues raised in relation to the use of new technologies concern educational software and collaborative learning environments [53–56] as well as the comparison with the classical educational methods [57, 58].

6. Motivation is an Important Factor of Success

In psychology, motivation is referred to as the intention to achieve a goal, which leads to behavior directed toward that goal. Bomia *et al.* identified motivation as a student's willingness, need, desire and compulsion to participate and succeed in the learning process [59]. They also reported that motivated students choose goals, within the limits of their abilities, take action when given the opportunity and exert intense effort and concentration in meeting learning objectives. They show generally positive emotions during the current action, including excitement, optimism, curiosity and interest. On the other hand, Skinner and Belmont pointed out that the least motivated or disconnected students are passive, do not try hard and give up easily despite challenges [60].

7. Feedback

In addition to the traditional feedback from the teachers, feedbacks can also be given using videos, where it contributes to the learning of motor skills. It is a very important part of learning and hence needs to be done right. Aiken *et al.* studied SC (self-control) video feedback and whether this method yielded better results in terms of basketball players' performance [61]. They concluded that SC video feedback helped improve the performance of basketball players regardless of their attention.

Another great way to learn a sport is virtual reality (VR) which is the simulation of a real or imaginary environment by a computer. In a study, Kiefer *et al.* argued that by using

VR in the right way and once young people understand its proper use, they will gain more motivation for physical activity and the development of motor skills [62]. Therefore, researchers have studied and found that VR education is based on perceptual motor behavior that modifies visual information in the virtual world and at the same time promotes the early development of motor skills in youth similar to the most natural development. Furthermore, Mestre *et al.* conducted an experimental study in which they used three different conditions (1 = no feedback; 2 = VR feedback and 3 = VR and teacher intervention) [63]. The researchers found that the feedback coming through VR had a positive effect on cycling, which helped to correct and learn it.

Another way of learning is self-controlled feedback which is beneficial for learning motor skills. Maarseveena *et al.*, who used self-controlled feedback in athletes, dealt with this controlled feedback [64]. Specifically, the athletes performed a specific skill and received feedback video on this exercise. It was observed that the athletes asked for feedback when they had successful attempts, that is, when they achieved the goal. Thus, the researchers concluded that self-controlled feedback is used both to confirm proper performance, determine and correct errors, and stimulate the athlete's participation in the learning process.

The effect of training through PETTLEP images (Physical, Environment, Task, Timing, Learning, Emotion, Perspective) on learning new skills has proven to be very important. Specifically, Afrouzeh *et al.* studied the effect of PETTLEP on beginner volleyball players learning new skills and concluded that it plays an important role in learning and delivering new skills [65]. Thus, technology has greatly aided both in learning the sport and in improving performance.

Another way to learn is through VR or video games, which in turn stimulates the psychomotor cognitive and emotional field. Finally, it is worth noting that this whole process of learning the sport through mobile devices is more fun and is preferred by children at such ages.

8. The Concept of Attention

In recent years, the concept of attention and the factors that affect it have been a major concern in the process of learning motor skills. Attention is defined as the skill that athletes develop in directing and focusing their senses at the right time on the right stimuli. Some of the factors that must be taken into account for the correct use of the instructions of attention are the coaching level of the trainees, the stages of learning the skill on which they practice as well as the order in which the instructions are provided [66]. Instructions that refer to learning motor skills directly affect performance [67].

Beginners and children in order to perform motor skills need a focus of attention, who use it in the planning of the execution and in a series of cognitive and perceptual processes related to the learning of a skill. That is, they must learn to focus on stimuli that are important to a particular response and isolate the trivial [68]. Thus, the trainee should direct their attention to the key points of the skill [11].

9. Mobile Learning

Mobile learning is an innovation in learning. According to Attewell and Savill-Smith , mobile learning is a subcategory of e-learning, it is any form of learning through small standalone devices that can accompany users anytime anywhere. As an educational tool, it is more flexible than e-learning [69]. Mobile devices are changing the nature of learning and introducing new teaching methods [70]. Because it is accessible anywhere and anytime, it is an effective way and offers better results in teaching [71]. It can be used in learning a sport or motor skills. This way of practicing is one of the most popular ways of learning sports.

There are several reasons and ways in which mobile devices can be integrated into physical education and sports [72]. These devices with the combination of multimedia application makes exercise more fun and attractive. The users spend more time exercising without wasting much time on the theory, since it is built into the media, they use it at the same time as exercise. These new educational tools are an effective way to introduce physical education, health and sport programs for students in schools [73]. More specifically, regarding mobile learning, Sismahendra*et al.* conducted two studies and came to similar conclusions about motor learning and whether it helps learning motor skills [74]. The conclusion was that mobile learning can help you learn motor skills, improve communication and help develop relationships.

10. The Usability of the Multimedia

The usability of an educational software is an important criterion for its quality and selection to be used to support learning. Software usability according to ISO 9241-11 is defined as ”the degree to which a system can be used by specific users to achieve specific objectives under defined conditions of use with efficiency, effectiveness, providing subjective satisfaction to its users.”

In recent years, cartoons have been used extensively in the field of research. Perales and Vilchez have studied the effect of well-known animated television programs on children and adolescents and the ways in which animation stimulates students’ active

participation in learning various objects [75–77]. Learning physical activities, such as sports and games, costs money and time. With repetition one can reach perfection, but this presupposes that the wrong actions are identified and avoided. The most accessible means of complementary learning are books and videos. Unfortunately, they only have 2D images, and readers or viewers who want to watch the way a particular movement is performed from another angle cannot do so. 3D learning environments bring together features that facilitate learning to a greater extent than their 2D counterparts. The faithful representation of reality and the enhanced representation of spatial knowledge, the possibilities for empirical learning and for the enhancement of motivation and engagement, the consolidation of learning and the facilitation of effective collaborative learning are some of them [78]. However, future research into 3D learning environments, such as simulations, video games and virtual worlds should highlight the basic principles of designing, implementing and using them for learning.

The rapid development of technology and especially 3D application, the ability to create a more attractive, friendly and ”perfected” teaching approach through it raises the question of its contribution to the educational process and especially to the learning of motor skills. The possibility of using the Internet at the same time should not be overlooked. Therefore, it is necessary to investigate this field. The application of a computer program allows the user to watch an object in 3D, because the object has the ability to rotate. The adoption of this technique for the presentation of a 3D medium that will allow users to see how the various movements-skills of a sport are performed will probably be very effective.

11. Conclusion

The evolution of new technologies, in combination with the familiarity of young people in them, creates a new opportunity in the learning process. Multimedia applications are attractive to young people. Games that use multimedia applications often require teamwork and collaboration, there is a need for problem solving and alternative ways of thinking. These are some of the skills that students need to develop today, all of which were difficult to cultivate with traditional teaching methods. If we take into account the small percentage of concentration in attendance during the traditional teaching methods, we can easily conclude that multimedia applications give a very important impetus to the teaching and learning process. Their implementation and even the greater development is an indisputable fact. So, it remains the teacher’s familiarization and study all the parameters for even better use and utilization.

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