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EFFECT OF ANIMATION IN TEACHING-LEARNING OF BIOLOGY

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ABSTRACT

Technology had a long history that started with the discovery of cutting stones and the art of making tools from it till the invention of smart technologies. Over this long period technology had evolved from stones and metal tools to digital and electronic tools. Along with its evolution, it had transformed the manner in which people work and think. Today we apply digitalized and electronic form of technologies in almost everything we do like for communication, transportation, gaining information, writing, working at home or at the office and in many more tasks that we perform. It had also evaded the boundaries of school and influenced the mode of teaching; the pen and paper are replaced by iPod and stylus, printed books are being digitalized into eBooks and conventional classroom replaced by Animation to make pace with the digitalized world. The rationale behind this paper is to unfold the historical evolution of Educational Technology as to trace the development of Animation to understand its concept, to cull out its possible uses in a biology classroom and review its effects on teaching-learning of biology.

This paper highlighted the great output of teachers and students in biology with the use of animation in teaching-learning of biology. Basically, this paper focused on that researches which describe the role of the animation in the biological concepts. Animation supports teaching by enabling multimedia use of technology, versatility in expressing content promote flexibility, aid in instructional preparation and enhance learner's interaction and participation in the biology classroom, all these factors make teaching effective. The improved efficiency of the teaching of biology will boost learning among students by enhancing attention and increase retention, enhancing motivation, developing ICTs skills, improving conceptual understanding of the biological concept.

KEYWORDS: *Technology, Animation, Biology, Effect of Animation, Suggestion*

INTRODUCTION

Technology has altered the look and functionally of the society. The world is becoming digitalized day by day. This digitalization and electronic mode of communication had evaded the boundaries of school and influenced the mode of teaching. Today, the pen and paper are replaced by iPod and stylus, printed books are being digitalized into e-Books and conventional classroom placed by the use of technological tools to make pace with the digitized world. The following paper traced the evolution of Animation, its scope, and effect of the biology teaching and learning.

Concept of Animation

Animations are the most known kind of pictorial forms. The animation is the rapid display of a sequence of pictures on the computer screen the word ‘animation’ is derived from the Latin word ‘anima’, meaning "life" or "soul." Thus, an animation is the act of bringing something to life (Balakenship). According to Baek and Layne animation is “the process of generating a series of frames containing an object or objects so that each frame appears as an alteration of the previous frame in order to show motion”.

In a general sense, the term ‘animation’ can refer to any display element that changes its attributes over time. Taken this broadly, examples such as words that fly across the screen or objects that vibrate, blink or change their color would be regarded as ‘animation’. But animation in a stricter sense can be interpreted as “a pictorial display that changes its structure or other properties over time and which triggers the perception of continuous change” (Schotz &Lowe).

Gonzales proposed a broader definition of animation as “a series of varying images presented dynamically according to the user action in the ways that help the user to perceive a continuous change over time and develop a more appropriate mental model of the task”.

Betrancourt and Tversky define “Animation refers to any application, which generates series of frames so that each frame appears as an alternative for the previous one and where the sequence of frames is determined either by the designer or the user”.

Biology

Science is a broad field that includes Mathematics, Physics, Chemistry, Computer Science, Biology and Home Science. The two Greek words ’Bio’ meaning life and ’logos’ standing for study, when joined give the word biology. It is therefore, a systematic study of living objects. It covers all aspects of living creatures their occurrence, nutrition, health, reproduction, and inheritance. (Das, J.C,1985)

Animation in Biology

Certain process in biology like cell biology, RNA-polymerase, transcription, translation, molecular biology, protein synthesis, osmosis, diffusion, an anatomy of the body, dissection, circulatory system, other maybe have a certain problem with the teaching-learning by traditional method and create many confusions about the above concept of the biology. For the promotion of the better teaching-learning of the biology much innovative method used by the teachers ‘time to time. The traditional methods of biological teaching have owned important but some time these are less effective in the promotion of biological knowledge. Present scenario of education is the era of technology to promote learning. Computer-assisted programme is the new innovative approach to the scientific knowledge and encounter with the many problems related to the scientific subject like chemistry, physics, and biology. Biology is basically the study of the living things and life process of the

living animals. By the nature biology also is a science which has some specific quality and characteristic rather than another subject. In biology, many time teachers feel failure in understand of the biological concept to the students and realize the need for some effective teaching-learning material for the improvement of the biological knowledge. "Animated concept facilitated better condition to the teaching and the learning of the biology" (Black, 2005; Whang, Tversky& Morrison, 2007). In order to enable students to learn better, their advanced mental process skills have to be developed. In other words, the skills needed in order to create a solution for problems and learn by comprehension instead of memorizing have to be given to students. Various authors have been involved in major projects aimed at developing top quality animations for the teaching-learning of biological events and process. In spite of increasing availability of animations, particularly as part of textbook packages, there has been little research into the value of animations versus static illustrations in science teaching. The animation programs that have been used vary in their difficulty to learn as well as in the time and cost of producing animations, but each has its own value. McClean et al. (2005) are part of a consortium (The World Wide Web Instructional Committee at North Dakota State University) that was formed to develop "high-quality animations" for the teaching of the cell and molecular biology. Animation as a distinctive technological tool can be used to enhance the overall process of communication in pedagogy. Its effectiveness is mainly determined by how the issues related to the basic elements of communication are addressed while preparing and presenting animation instructional material. According to the 'bottom-up' model of animation comprehension, "the comprehension is primarily a process of encoding the information in the external display" so that improving the display necessarily improves the understanding (Hegarty&Kriz).

Effect of Animation on Teaching-Learning of Biology

Substantiating the use of Animation as a tool of instructional preparation, instruction delivery and as a learning tool, it is evident that Animation certainly has an edge over other educational technologies existed. Teaching activity in the education and training process has an important role in presenting permanent information to students. In order to enable students to learn better, their advanced mental process skills have to be developed. In other words, the skills needed in order to create a solution for problems and learn by comprehension instead of memorizing have to be given to students. Therefore, effective science education has to be provided in school. Accordingly, in science education teaching the skills for reaching information is much more important to provide the available information is much more important to provide the available information to students (Black, 2005; Tversky, & Morrison, 2007; Aksoy, 2012).

Delivery of Content

A chief feature of Animation is the 'interactivity with the content'. As illustrated in the earlier section, the various animated software come loaded with many interactive tools that aid in the manipulation of the content of the biology in numerous ways. "Animations as moving illustrated materials are used more often at schools to depict dynamic changes over time and location and illustrate phenomena or concepts that might be difficult to visualize" (Mayer & Moreno, 2002; Ruiz, Cook, & Levinson, 2009). In traditional teaching, settings it is difficult to describe the movement of electrons in an electric

system or chemical reactions between substances. Computer animation is highly effective in the demonstration of processes that cannot be viewed naturally or that are difficult to demonstrate in the classroom or even in the laboratory (Fleming, Hart, & Savage, 2000). On the basis of the above studies, we can say that animation promotes delivery of content in the teaching-learning of biology.

Promotes Flexibility

One of the most promising is the animation based learning environment. "Animation is a dynamic representation that can be used to make a change and complex processes explicit to the learner" (Schnotz, & Lowe, 2003). Series studies have shown that "learning in computer-based animations environments enhanced the understanding of complex concepts and systems compared with traditional learning environments that concentrate on verbal explanations" (Park, 1994; Rieber, 1991; Tversky, Bauer-Morrison, & Betrancourt, 2002).

Support Transfer of Knowledge

Transfer of knowledge is one of the key components of higher order thinking skills. More general components of higher order thinking skills include raising questions, making comparisons, resolving non-algorithmic and complex problems, coping with disagreement, identification of hidden assumptions and planning scientific experiments (Zohar &Dori, 2003, Zohar, 2004). Animations may be relatively more effective for those with low prior knowledge, because it shows the motion in a mechanical system explicitly, and do not rely on the learner's ability to infer motion from static diagrams. Earlier study findings showed that integrating animated concept (Brain POP) into learning process significantly increased the ability to transfer scientific and technological knowledge of elementary school's students (Rosen, Y. 2009).

Enhance Learner's Interaction and Participation in Classroom

Interaction is the main part of the effective teaching-learning of any subjects. With the help of interaction, students express their problem to the teachers. Both researchers and educational practitioners have believed that animation would facilitate learning. In traditional classroom setup, the instructor often uses 'chalk and talk' method for teaching. Usually, learner's attention in the traditional classroom is directed by the explanation of the instructor and the text or static diagram written on the blackboard. When students see a static diagram in the classroom, they may have to mentally animate it to understand how the system works. Whereas, if they view the same course content in the animated form they merely have to perceive it as it (Tversky, & Morrison 2007; Nielsen 1995, Hall, 2012; Mayer & Moreno, 2002).

Enhance Attention

Attention is the most crucial to teaching-learning of biology at every level of the education system in our country. "Animation aids in attracting the attention of the learners through its multimedia effects as mentioned" (Tversky& Morrison, 2002). In an experimental study by Sanger, Brecheisen& Hynek (2001) One can animation enhance student's attention about diffusion and osmosis in biology, it was found that students in the experimental group were more attentive, actively involved, asking questions and making connections with what they have learned before, whereas students in the control group were less attentive and create many confusions about the concept of the osmosis and diffusion. Like other observation founded by Aksoy (2012) in their also experimental study describe that students with the animation were captivated.

Increase Retention

Animations also enhance the retention of information by providing the new way of teaching-learning. It gives the more senses involvement in the learning by which retention level increase and learning become more effective. (K. Abdul Gafoor& C. Shemi2007). Study of the GokhanAkshoy (2012) related to "the effectiveness of the animation in the science analyze the use of animation in the scientific concept also increase the retention ability of the students (7^{th} grade)".

Improving Conceptual Understanding

Conceptual understanding is the important part of any type of learning. In the learning of the biological concept, the understanding has own respect and play an important role in the promotion of the biology learning. Inanimation with instructional learning delivered material of any concept makes more beneficial for the students (M. Kannan, 2007). In another study, students who viewed "animations illustrating the molecular processes of diffusion and osmosis were less likely to exhibit misconceptions and were less likely to have anthropomorphic views of matter" (Sanger et al. 2001). Similarly, in biology, students who viewed an animation cell death scored significantly higher on the subsequent than those who did not view it (Stith 2004).

Enhance Motivation

Use of animations has a significant effect in teaching-learning of the abstract topics of science and technology courses. Use of animations together with teaching methods and techniques and having the students actively participate in the process ensure the provision of effective and efficient education. Studies have pointed out that using animation in the lesson helps to increase learning motivation. It makes difficulty understood problems easily understandable. Students explained the necessity and feasibility of the animation "such teaching is more interesting and engaging, animation helps to understand the topic easily and clearly (Soika, K., Reiska, P., &Mikser, R., 2010, Moreno et al., 2001).

Increase Curiosity

When we talk about the curiosity with respect to the education technology we consider the arguments of S. K. Mitra that "the education technology which developed the curiosity in students about learning." on the analysis of this comment we conclude that animation also a technology which is used in the many educational subjects like biology, chemistry, language education and other also. "Animation as learning tools increase the curiosity in the students in the learning of the scientific concept including biological concept also" (Barak, Ashkar, &Dori, 2011).

Academic Achievement

Animation technique enables higher academic achievement in comparison to traditional teaching methods is in line with the results of the previously conducted studies (Frailich, Kesner, &Hofstein, 2009; Sanger, Brecheisen, &Hynek, 2001). So that teachers can apply in teaching for the abstract concept and also learners enable to understand.

Pros and Cons of Animation Technology for Biology

Reflecting the use and effect of Animation, certain benefits of this technology can be concluded for Biology teaching and learning. These are following:

- It supports the versatility in expressing biological content (Nakhleh, 1992).
- Helps the teacher to the delivery of content in an effective way.
- Helps in the gaining and sustaining student's attention, retention and motivation that foster positive attitudes towards their learning.
- Improve conceptual understanding among learners about the typical topic of biology.
- Helps teachers in explaining the abstract and complex concepts of Biology through visual interactivity. (Levin, Anglin & Carney, 1987; Weiss, 2002).
- Enable teachers to adopt ICTs Skills. (Nimavathi&Gnanadevan2001).
- It provides the better condition to the conventional classroom and gives the better outcome of the teaching and learning. (Tversky, & Morrison 2007)
- Help the learners to visualize something which can't be seen easily in the real world (Ainsworth, 2008).
- It provides a valuable way to communicate dynamic, complex sequences of biological events more effectively than text or a conventional method. (Stith, 2004; McClean et al., 2005; O' Day, 2006).

Limitation of Animation in Biology

Every education technology apart from aiding the teaching-learning process will have some drawback too. Critically reflecting at use and effect of the Animation, following shortcomings have emerged, listed below:

- Replacing the conventional teaching method with the animation in some cases it can even hold back rather than improve teaching. (Campbell et al., 2005).
- Use of any technology has importance and trace out some special training for its use so it may even not promote learning depending on how they are used (Mayer &Moreno, 2002).
- Availability of too much information can be confusing to the learner (Levy, 2002) and is difficult to grasp.
- There should be special technological tools for the use of animation in biology.
- If the teacher overemphasized the animation technology i.e., the focus is more on the technology than on the lesson itself, it will distract the learners. (Smith, et al.2005).
- The animated concept is many time costly effective for teaching and learning.

SUGGESTIONS

It would not be wrong to say that Animation has the potential to revolutionize the way teachers teach as quoted by the

- The use of animation in biology is simple and does not require any traditional things. Animations have three characteristics. These are the pictures, display of certain movements and simulation (Weiss, Knowlton, & Morrison, 2002). So there is a need of the basic knowledge of the animation creation for any particular biological concept.
- A teacher must also pay attention to the amount of content they are choosing should be according to the learner ability.
- The use of animation in the biology also influenced by many other technical, like availability of electricity, technical staff and situation so there. So there should be a good arrangement of basic condition for technical use.
- Sometime Animation creates disturbance among student if the making of animation is not according to student's ability so teachers should be always kept in mind it.
- In the above discussion, we concluded that animation mostly effective in enhance motivation, delivery of content, increase attention, improving conceptual understanding, increase curiosity in the biology. So animation also used by the teachers in other subject likes language, social science, Math.
- There should be provided additional management facilities for the use of animation in education like a workshop for the teacher and updated software.

CONCLUSIONS

In the era of education technology, it's a compelling need to provide technological teaching and learning in biology to the teachers and the students of this digitalized world. As this not only leads to the development of ICT skills but also provides continuity with their global environment. Animation has emerged as a promising instruction tool that could impact on biology through digital convergence. The use of the Animation technique in biology support to expression, flexibility engagement of content that could be controlled by use has a much positive effect on the biology (teaching & learning) as evident from the researchers and reviews across the globe. Animation supports the teaching of biology by enabling versatility in expressing content, promote motivation, promote flexibility, transfer of knowledge and enhance learner's interaction and participation in biology classrooms, all these factors makes biology teaching effectively. The improved efficiency of teaching will boost biology learning among students by enhancing attention, increase retention, increase curiosity, enhancing motivation, improve conceptual understanding of biology. The Animation technology is relatively new to the Indian context which is basically a form of pictorial presentation, has become the most prominent feature of technology-based learning environments. Animation refers to simulated motion pictures showing the movement of drawn objects. Educational animation is one of the most elegant tools for presenting materials for learners. Its significance in helping learners to understand and remember information has greatly increased since the advent of powerful graphics-oriented computers. It may be very useful for learning about some topics in the natural sciences, where educational modeling and preparing materials convenient for learning can reduce the time required in class and increase the efficiency of the educational process.

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