APPRAISING ANIMATION AS AN INSTRUCTIONAL STRATEGY FOR ENHANCING QUALITY EDUCATION IN BIOLOGY

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Abstract

This paper is hinged on the conviction that the quality of a society depends on the quality of its citizens and the quality of the citizens depends on the quality of their education. Hence, quality education is imperative for a society to cope and compete favorably and effectively in today's fast changing world. Biology is a science subject that enables learners to acquire the knowledge and abilities needed for effective living in the modern age of science and technology. It is also a major requirement for higher learning in a number of science related professional fields such as medicine, agriculture, pharmacy etc. The goal of education cannot be achieved by doing the same thing the same way always. There is need for modification to remain relevant at all times. The desire for improvement in the quality of knowledge calls for changes in the pattern of interaction between the teachers and learners through innovation so that the product of school system can compete effectively within and in the global world. The innovation confers relevance and importance to the knowledge acquired in schools for quality and productivity. The process of innovation involves transforming the methods, techniques and approaches of making learning functional, relevant and qualitative. This paper seeks to appraise the use of animation in the teaching and learning of biological concepts as a means of producing quality and proactive learners that are relevant in the global world. The paper attempted to define animation as teaching tool that combine still and motion pictures with Sound and text to ensure effective instructional delivery. The place of animation in teaching particularly biology for productive education, features, benefits and limitation of animation in teaching and learning were equally highlighted. Various aspects of animation such as forms and classification were mentioned and suggestions on the use of animation such as teacher should be encouraged to use animation in teaching biology themes that are abstract in nature for better understanding and retention and others were equally discussed.

Keywords: Instructional Animation, Quality Learning and Productive Learners

Introduction

Enhancing teaching and learning outcomes through relevant instructional strategies has been a major concern in the business of education. This is greatly desired to enable teachers prepare learners that will be productive academically both during and after their learning period. This therefore calls for great transformation in the teaching approaches adopted by teachers especially at secondary school level to prepare students for the 21stcentury challenges in education. One of this challenges is thinking and devising the ways through which today's schools can be transformed to adequately prepare students for lifelong learning to confront the challenges of the 21st Century demand in terms of science and technology(Groff, 2013). The use of computer Assisted Instruction (CAI) in the business of education is fast gaining prominence and becoming one of the most important elements defining the basic competencies of Teachers and students in the global world. This is because the crop of students found in classroom in the last few decades are technologically driven because of their contact with the world of technology. It is therefore believed that today's students are different from their predecessors, they learn in new ways, and so need to be taught differently (Hwang, Tam, Lam & Land, 2012). This in a way means that teachers must also rise to this challenge and work extra miles to provide quality teaching in line with their students' new reality.

The main thrust of this paper therefore is to highlight how animation as a teaching tool can be used effectively in the teaching of some themes in biology curriculum for effective dissemination of information. CAI is a natural outgrowth of the application of the principles of programmed instruction to learning. The main objective of programmed instruction is to provide individualized instruction just to fulfill the special needs of the individual learners. In order to achieve this objective, some efficient devices are required (Nazimuddin, 2015). One of these devices as suggested by Aremu and Songodoyin (2010) is the use of instructional animation in presenting information in the classroom especially in the science area. These researchers affirm that computer animation is one of the new innovating technologies that have changed the ways in which teaching and learning is conducted in many parts of the world today. Therefore to be globally competitive there is need for teachers particularly in science to avail themselves of this transformation in classroom to produce quality and productive students that can equate their counterparts educationally in other states of the nation.

Instructional strategy is crucial to the understanding of scientific concepts (Akinsola and Animashun, 2007), effective instruction requires the teacher to step outside the realm of personal experience unto the world of the learners, It is in line with this opinion that suggestion of the use of animation as teaching tool is made in this paper. Many research works such as the work of Nazimuddin, (2015) reveal that it is the learners who must be engaged for learning to occur as well as commitment to learn, therefore the strategy used by teachers must engage learners and interactive in nature. Learning takes place as student process, interpret and negotiate the meaning of new information. What then can we use to shape the learning environment? How do we teach biological concepts in a way that student can use it, apply it and in general, work with it? Which is appropriate teaching approach that will permit students to broaden their conceptions and become aware that biology is a dynamic instrument in solving real life problems? The questions above could not be answered without students engaging in meaningful learning that will result in retention of concepts, meaningful learning requires the learner to communicate an in- depth understanding of concepts rather than rote memorization of isolated facts. Learning is expected to result in achievements that have relevance beyond school, therefore for meaningful learning to take place in biology, method or style of teaching needs to be innovative. Aremu and Okuntade (2014) noted that the teaching approach employed by teacher is a potent factor in motivating learners to learn. The desire to improve biology teaching through more effective instructional strategies and the increasing awareness in recent years of learner-centeredness has led to selecting other teaching methods like animation.

The level of science teacher competence needs to be raised to the level that will allow teachers to teach students using varied instructional aids with a focus on understanding concepts and content in biology rather than lecture that aid in transmitting textbook knowledge with the consequent student rote-learning and simple recall knowledge (Anyifite, 2010). Aremu and Okuntade (2014) affirmed that the present generations of students are cognitively more sophisticated and want learning to be fun, interactive and thought provoking. It has been observed from many available literatures that the use of animation can make this possible. Animation has

been affirmed by many researchers such as Olatoye, (2014) as an effective teaching tool that can engaged and get students interactive in the learning process.

Animation in Teaching

Animation has been described as presentation of learning media using both pictorial and verbal forms such as spoken and printed text (Aremu & Sangodoyin, 2010). It could also be defined as images in motion. Amarin, (2016) also described Animations as a form of dynamic representation that display processes that change over time. Zanin (2015) also defined animation as series of varying images presented dynamically according to user action in ways that help the user to perceive a continuous change over time and develop a more appropriate mental model of the task. The flexibility of learning through animation allows for a wider range of stimuli, thus increasing students' engagement in learning According to Bello, (2014) animation is expressed as an enriched device in which pictures are synchronized in the teaching and learning process in order to make it real. The question now is this, are teachers aware of the use of Animation as a teaching tool?, if they do, how effectively can it be put in use?. This paper therefore portrays the effectiveness of animation in teaching and learning difficult and abstract themes in biology. Computer animation is said to be one of the recent technological tools that enhanced the teaching and learning of biological concepts that are dynamic in nature. According to Amarin, (2016) animation is a brilliant and innovative new way that encourages learners to communicate stories, ideas and learn biological concepts in a creative and original way. It can be particularly useful as a tool in knowledge acquisition that encourages creative thinking in science students. Animations could be interesting and have the power to gain the attention and interest of the learners for hours together without boring them, this is said to be helpful to learners since it possess features that aids in learning difficult concepts that ordinarily would not have been possible.

Animation as an Instructional Tool for Quality Content Delivery in Biology

Animated instruction is an innovative strategy that supports quality teach and learning. It makes concept clearer, deepen skills, motivate and engage students in learning. It is believed to have the capacity to help students relate school experience with the world of work. Individuals taught biology using animated instructional strategy acquire knowledge, learn to create, discover and invent, so that products of the system can take specific task and functions that are essentials for transformation and modernization of the society in the quickest possible time Karlsson (2012) and Zanin (2015) in separate studies described animated media instruction as an integration of hardware and software used in the presentation of information for better comprehension of scientific concepts. Animation combining image, sound and action is used to represents some aspects of reality that are abstract and difficult to demonstrate directly to the learners, Gambari, Falode, and Adegbenro (2014) stressed that the capable features of Animation can enliven the learning experience since it promotes flexibility of learning and allowed a wider range of stimuli thus increased the student engagement in learning. According to Gambari (2010) animation has the power to attract learners' attention and increase their motivation to learn which will lead to better retention of concepts in learner. Biology is one of the science subjects recognized to be voluminous in content and has many themes identified as difficult to teach and learn by both teachers and learners, the chief examiner's report from

WAEC (2008, 2012 and 2014) and Akani (2015) all confirmed that several topics in biology curriculum were identified as difficult to teach and learn by both teachers and learners, such topic includes those related to cell division, genetics and evolution. It is therefore apparent to find motivating strategy that can attract and get the interest of the learner for better understanding of these themes. Animation has therefore been suggested by many researchers such as Gambari (2010) and Salisu (2015) as a teaching tool for better understanding of these themes that are abstract and difficult to understand by the learners, for example animation can be used for better explanation of the processes involved in homologous chromosome during gamete formation in genetics and cell division since the display of the process of separation and transfer of genes from parents to offspring can be made visible thereby turning the abstract nature of the process into real life phenomenon.

The use of animation in teaching and learning process is in agreement with some of the major learning theories because of their basic assumptions. Learning theories such as cognitive theory and constructivism proposed that humans learn by construction of knowledge through perception and processing of information in working memory. The main assumption of cognitive theory according the work of Bruner (1966) is that learners learn by building on the information they have already mastered that is, knowledge is constructed by connecting incoming information with the prior knowledge in the cognitive structure of the learner. Cognitive theory of multimedia learning is a supporting learning theory that expresses the communication of information to learners using text and pictures to foster meaningful learning (Baddeley (2012)) and confirmed that learning occurs when we build mental representations from words and pictures. The words can be spoken or written, and the pictures can be any form of graphical imagery including illustrations, photos and animation. Instructional animation attempts to use cognitive research to combine words and pictures in ways that maximize learning effectiveness. There is a general assertion according to Baddeley (2012) that people learn more deeply from words and pictures than from words alone and this is the underlying principle of multimedia learning. The theory also believed that, better acquisition and transfer of knowledge as well as retention of concepts is assured when information is delivered through the use of audio/visual aid and this is satisfied by instructional animation. To educationist achievement of these purposes (retention and transfer) makes up quality and productive or learning effectiveness (McLaren, DeLeeuw & Mayer, 2011). This paper is mainly interested in how words and graphic images (pictures) can be used to improve learner understanding of biological concepts. Animation as a teaching tool allow learner to have a mental model of what he learn and construct knowledge of his own that also assist in connecting the incoming information to the existing one in his cognitive structure.

Features of Animation

There are three basic features of animations that make them exciting instructional tools to learner. Karlsson (2012) identified these features as picture, sound and texts, these features give animation the capacity to easily attract the interest of the learners. Animation gives indication of certain movements and simulation that make abstract concepts real which could engage learners in collaborative learning through critical thinking and discussion. Its use has therefore been strongly encouraged by researcher such as Zanin (2015) who confirmed its efficacy as innovative, constructivist and

learner-centered when he reported that more than 80% of his student confirmed that they learn most biology concepts better when delivery of information involves animation compared to the use of traditional learning approaches that dominate most classrooms . Several empirically related studies such as the work of Gambari, Falode, and Adegbenro (2014) and Salisu (2015) confirm from their series of research that animation having visual and audio (sound) features can serve in better explanations of abstract concepts and have a positive effect on knowledge gain and accuracy. Karlsson (2012) and Salisu (2015) all affirmed that animation has been used in various disciplines to deliver instructional materials that are abstract in nature, microscopic and hard to present alone using static visuals, it is therefore considered a technological tool for effective dissemination of knowledge in biology. From these assertions, animation has the attributes of explaining concepts from different angle thereby conveying biological information in a more meaningful way to learners. This special attribute of animation makes it relevant teaching tool in biology.

Forms of Animation

There are two main forms of animation; these include narrative animation and non-narrative animation. Narrative animation represents one moment or one moment in a sequence of events with story as explanation to the demonstrated action by the animated program. Karlsson (2012) pointed out that the narrative picture builds emotional and mental model of the learner about the information contained in the content of the text thereby generating connection between the audio-visual senses. On the other hand non-narrative animations are pictures that do not tell a story or text that explain the represented picture. Non-narrative animation is an aesthetic graphic picture that does not narrate, or relate "an event, whether real or imaginary". Narrative animation is said to be dominant over non narrative in science classroom because of its audio-visual representation that attracts and capture the attention of the learners easily. Animation can be classified along various dimensions including the nature of the process being visualized, the level of the learner interactivity, the dimensionality and the level of abstraction as shown in the Table:

Domains by which animation may be classified

Domain	Category	Description
Process visualized	Transformation	Process involves changes in form that involve alteration to the graphic component in key characteristics such as size, shape, color or texture.
	Translation	Process involves changes in position involving motion of whole entities from one location to another.
	Transition	Process involves changes such as the appearance or disappearance of entities, fully or partly.
Interactivity	Non-interactive	Animation plays at a constant rate and for set length of time (no learner control).
	Interactive	Learner has some degree of control over the animation sequence, visible layers, level of abstraction or play rate.
Dimensionality	Two-dimension	

Level of abstraction	Three-dimension	
	Iconic/symbolic representation	Animation display a visible phenomenon, usually a realistic representation
	Conceptual/abstract	Animation illustrates non-visible concepts

Source: Amarin, N. Z. (2016)

There are various techniques used in animation classification, this include traditional animation, stop motion and computer animation. Of this, computer animation has gained a stronger ground in classroom teaching, it create the illusion of movement through a succession of computer-generated still images. This digitally created animation encompasses a variety of techniques including 2D animation and 3D animation. This animation takes less time than any other and it hold great potential as a teaching tool for creating multimedia instructional environments. It is user friendly because it can be manipulated by the user to demonstrate learning materials visually and the teacher can control every aspect of the animation.

Animation for Quality and productive Science Education

Animation could result in quality and productive teaching and learning in science generally and in biology specifically because of its features that enhance motivation and interest in the learning of abstract content in the field of science. Salisu (2014) and Soffar (2017) are unanimous in their opinion that animation has the following as benefits in teaching and learning of scientific concepts.

Animation is a suitable means of conveying information to learners with disabilities such as dyslexia.

It also confirmed that presentation with texts and graphics convey information better than text alone because they involved demonstrations that are both audio and visual.
Animations provide a valuable ways of communicating, abstract dynamic, complex sequences of physical events effectively better than graphs.
Animation assists learners to fulfill cognitive function, that is, it supports students' cognitive processes that ultimately results in their understanding of the concepts involved in the subject matter.
Animation enabled instructors to demonstrate content and concepts visually exactly the way they want since they have control of every aspect of the animation.
Skills and understanding, animation as an instructional strategy offers opportunity for cooperative learning among the students, this interaction helps learners in building skills and better understanding and retention of concepts through the method of teach others.

Interactivity: This is a mutual action between the learner, learning system, and learning materials. Students learn faster and develop better interest toward it when learning environment involved fun and is exciting particularly through the use of audio and video techniques which are integral part of animation as a teaching tool.

Engagement: Interactive learning with live-action animation, simulation, video, audio, graphics, feedback, expert advice, and questions and answers maintain students' interest and reinforce skills. Through continual practice, learning is absorbed and integrated into daily performance.

The interactive nature of animation enables students to apply Imagination and Rational thinking that help learners in problem solving. Animation enhances students' ways of rational thinking which enable them to invent and explore multiple solutions to a problem.

Limitation of Animation in Science Education

Despite the multifarious benefits of animation as teaching tool, several limitations are still observed according to Spanjers, Wouters, van Gog & Merrinboer (2010) and Phan, (2013) as shown below:

Animation may carry potential for misconceptions since in most cases they are simplified version of a phenomenon
Animation can give the false sense of safety as related to the science that requires important attention to safety such as the experiments involving volatile chemical as in chemistry and biology.
Some information of real-life learning is lost in the animation processes.
The teachers must have certain programming technology and experiences to implement this computer animation programs. Therefore, Animation is not easy for every subject teachers.
Complex and abstract information portrayed in fast-paced animation is frequently too transient to enable essential cognitive processing, therefore, do not provide learners with sufficient time to process all of the elements in an animation. This may hinder learning by inducing high cognitive load.

Conclusion

The paper concluded that the teaching method adopted by classroom teachers has great effects on learners in term of understanding and retention of concepts hence the need for teachers to adopt appropriate teaching method that will enhance learners' interest in the learning process. The various features of Animation as a teaching tool can assist teachers in presenting difficult and abstract concepts that make learning of such concepts easy, understanding with better retention in the learners, it is therefore viewed as a means of enhancing students' learning and better means of disseminating knowledge in various aspects of biology curriculum. In conclusion the paper summarized some of the advantages of animation such as one of the best teaching approach in disseminating information to learners with disabilities, better engagement of learners in the learning process. Some limitation of animation such as giving false sense of safety as related to the science that requires important attention to safety such as the experiments involving volatile chemical as in chemistry and biology and some information of real-life learning is lost in the animation processes were mentioned.

Suggestions

Instructional animation was found to be effective as a teaching strategy in science and mathematics from the results of some empirical related literature reviewed when compared to conventional method, biology teachers should therefore be encouraged to use it.

Several research works in the effectiveness of animation on the learning of biological concepts shows that male and female students were positively affected in terms of achievement; biology teachers should employ this strategy to improve male and female students' achievement and retention in senior secondary school level.

Topics such as Genetics and Cell Division which are identified as difficult to learn can be made easy and interesting with the use of animation by assisting students to visualize the abstract concepts to clearly understand how the process takes place and avoid misconception.

Learner can be motivated to learn and understand if animations are involved in learning abstract concepts through observation. Teachers in the areas of biology should be encouraged to diversified there method of presentation through the use of innovative approach such as animation.

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