



STUDY ON THE EFFECTIVENESS OF ANIMATED VIDEOS AS A SUPPLEMENTARY LEARNING TOOL IN BIOCHEMISTRY

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ABSTRACT

BACKGROUND: Lectures emphasize learning by listening alone and often students may not be receptive. To overcome this, one can use innovative teaching-learning methods to impart interest and attention and for this animated videos can be used as a supplementary teaching learning tool.

OBJECTIVES: To study the effectiveness of animated videos during lecture on the academic performance and to analyse whether the use of animated videos during lecturing create an effective learning environment.

MATERIALS AND METHODS: This educational interventional study was conducted at Sree Gokulam Medical College And Research Foundation, Trivandrum. About 134 undergraduate students admitted to first year MBBS course were participated after giving informed consent and were divided in to two groups based on systematic sampling method. Study tools included PPT slides, animated videos and structured questionnaire. The score of post test of the two groups was compared by unpaired 't' test. Feedback obtained from students used for assessing the student's perceptions about the subject and attitude towards the teaching learning methods used.

RESULTS: Students exposed to animated videos during lecture showed a significantly better performance in post test along with a positive change in the attitude towards learning in comparison with students attending lecturing only, while the perception about the subject was same in both groups.

KEYWORDS : Biochemistry, Animated Videos, Student's Performance, Assessment

INTRODUCTION :

Medical students build their clinical knowledge on the grounds of previously obtained knowledge in basic medical sciences. Biochemistry is considered to be a difficult subject by medical students. As far as the Biochemistry component in the medical curriculum is concerned, there seems a general consensus that medical students understand enough about Biochemistry to know how it can elucidate their investigations of a clinical problem or how it can enlighten to medical advance. Unlike other pre-clinical subjects where the students can correlate topics with specimens, dissections or real life examples, conceptualization in Biochemistry is often a challenge. Since didactic lecturing has been the main teaching learning method in Biochemistry, the dynamic concepts with complex mechanisms are difficult to explain during lecturing even with the use of still power point slides.

The applications of communication technology provide new possibilities for improving the effectiveness of teaching learning process.^{1,2} Over the past few years, there has been a steep increase in the use of animation to communicate dynamic molecular processes to a large group of audience. Since animated videos have the potential to explain the dynamic and changing process at the molecular level which are not observable, these can be used to deliver better representation of the concepts in Biochemistry. The molecular processes taking place inside the living system can be clearly presented in animation than in static illustrations. The moving graphics can attract the viewers and attain audience motivation. When students have more visual experiences, they would have better learning outcomes than just imagining the processes in their mind. By giving them visualized information in a right way, animated videos help in clear and deep understanding of the processes easier and can remember all the information better. Moreover, animations directly guide the learner's attention to the specific parts of the content those are difficult to conceptualize the students through static pictures.

REVIEW OF LITERATURE:

Studies reported the influence of animated videos in creating students motivation and interest in learning complex dynamic mechanisms in premedical subjects^{3,4}. Balsley *et al.* remarked that animated videos can be used to illustrate microscopic and sub microscopic processes taking place at the cellular

and molecular level⁵. According to Bradley Stith, lectures using animated videos lead to more complete understanding of the cell biology concepts than lectures alone that used only static illustrations⁶. Animated videos have the potential to serve both affective function and cognitive function⁷.

The best feature of animated videos is that they could deliver complicated information in detail with high accuracy even though that can not be seen by naked eyes⁸. Three dimensional animations can describe the medical processes with high accuracy even those that can not be seen by naked eyes. Animated visualizations showing both structure and molecular processes convey important scientific concepts in Biochemistry and Molecular Biology. Animations visually help students to understand difficult concepts related to the dynamics of complex chemical systems including molecules and reactions⁹.

RESEARCH QUESTION

Whether the use of animated videos during lecturing in Biochemistry class for medical students improve student's perception, motivation and thereby academic performance.

OBJECTIVES:

1. To study the effectiveness of animated videos during lecture on the academic performance of first year MBBS students in biochemistry in comparison with didactic lecture
2. To analyse whether the use of animated videos during lecturing create an effective learning environment resulting in the motivation in learning

MATERIALS AND METHODS:

STUDY DESIGN : Educational interventional study

STUDY SETTING :

Dept of Biochemistry, Sree Gokulam Medical College And Research Foundation, Trivandrum

STUDY PERIOD : 24th May to 20th Aug 2018

SAMPLING METHOD : Systematic sampling

INCLUSION CRITERIA :

First year MBBS students who were willing to participate after getting informed consent

EXCLUSION CRITERIA :

Students who were absent in any one session of the module and those who were not willing to participate in the study.

SAMPLE SIZE : 134 first year MBBS students

METHODOLOGY:

About 150 undergraduate students admitted to first year MBBS course during the academic year 2017-18 were willing to participate in the study by giving informed consent. Students were grouped in to two based on systematic random sampling after getting the ethical clearance certificate from Institutional Ethical Committee. About 16 students who were absent either in any one session or post test excluded from the study. There were 70 students in the control group in which the topic was presented by conventional didactic lecture. The experimental group consisted of 64 students to whom the topic was presented by using animated videos as a supplementary teaching learning tool along with didactic lecture. The topic of 'Electron transport chain and biological oxidation' was presented separately in six sessions. One group was taught by conventional didactic lecturing. Other group was taught by using animated videos along with lecturing. At the end of all sessions a post test was conducted by using peer reviewed question paper consisting of both MCQs and SAQs. Marks obtained was entered in Microsoft excel and analysed by SPSS version 16. The feedback regarding the students perceptions and attitude was collected by using peer reviewed structured questionnaire for which the reliability test for internal consistency was analysed. Then control group were exposed to animated videos.

STATISTICAL ANALYSIS:

Data analysis will be done using SPSS version 16. The score of post test of the two groups will be compared by unpaired 't' test. Questionnaire used to collect the feedback about the perceptions and attitudes of students was analysed by reliability statistics. Internal consistency of the 10 items questionnaire is 0.72. Feedback obtained from students using the structured questionnaire with a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree) for assessing the students perception and attitude about the subject and teaching learning methods used. Descriptive statistics was done and difference in perception and attitude of students in both groups was analysed based on Mann-Whitney U test. A p value <0.05 considered to be statistically significant.

RESULTS:

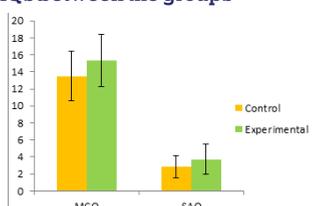
A statistically significant increase in the mark of post test observed in experimental group (18.94±4.31, mean±SD) in comparison with control group (16.34±3.54, mean±SD) (p<0.001) (Table 1). The animated videos exposed group scored higher marks in both MCQs and SAQs in comparison with control group (Graph 1).

Table 1: Comparison of marks in post test between the groups

Group	Marks of post test	t-value	p-value
Control	16.34 ± 3.54	3.83	<0.001
Experimental	18.94 ± 4.31		

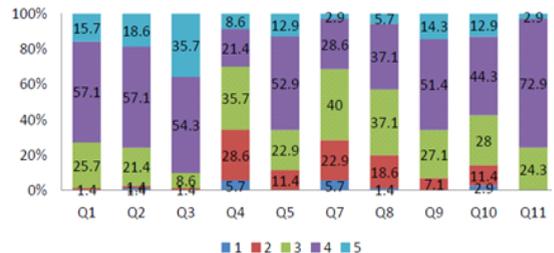
Analysis done by unpaired 't' test. Data expressed as mean ± SD

Graph 1 : Comparison of marks (Mean ± SD) obtained in MCQs and SAQs between the groups

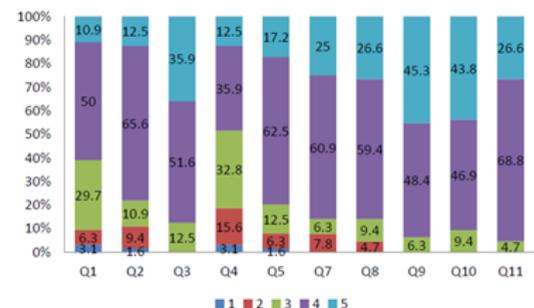


No statistically significant difference was observed between the two groups regarding the perception of students about the subject. About 57% of students in the control group (Graph 2) and 50% of students in the experimental group (Graph 3) commented that Biochemistry is an interesting subject. About 57% of control group and 66% of experimental group agreed that Biochemistry is more difficult to understand than other preclinical subjects.

Graph 2: Perception of students attending didactic Lecture (Control group)



Graph 3: Perception of students attending Lecture with animated videos (Experimental group)



A significant difference in the attitude and interest towards the teaching learning method observed between the two groups (p=0.000) (Table 2). The students in the experimental group commented that the sessions of lecturing with animated videos was very effective for maintaining attention of students and this method of teaching is ideal for generating interest in subject and motivation for active learning.

Table 2: Comparison of perception and attitude of students between the two groups

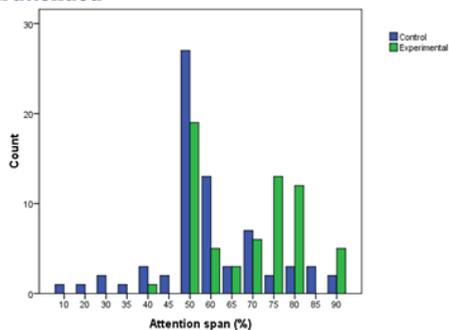
Questions	Median ± IQR		u	Z	p
	Control	Experimental			
Q1.Biochemistry is an interesting subject	4 ± 1	4 ± 1	1.89E3	-1.71	0.087
Q2. Biochemistry is more difficult to understand than other subjects	4 ± 0	4 ± 0	2.13E3	-0.52	0.603
Q3. Knowledge in biochemistry helps to better understanding of disease concepts	4 ± 1	4 ± 1	2.21E3	-0.14	0.89
Q4.Do you feel that didactic lecture is a very effective teaching method in Biochemistry	3 ± 2	3 ± 1	1.73E3	-2.34	0.019
Q5.Do you feel that power point presentation during lecture is an ideal teaching learning method in Biochemistry	4 ± 1	4 ± 0	1.91E3	-1.61	0.106

Q7.The method of teaching you have attended is effective for maintaining attention of students throughout the class	3±2	4±1	918.0	-6.23	0.000
Q8.This method of teaching is ideal for generating interest and motivation in the subject	3±1	4±1	1.13E3	-5.32	0.000
Q9.This method of teaching is effective in understanding the concept of selected topic in Biochemistry	4±1	4±1	1.23E3	-4.86	0.000
Q10.Do you recommend this method for teaching other subjects also	4±1	4±1	1.16E3	-5.13	0.000
Q11.Overall how do you assess this teaching method	4±0	4±1	1.41	-4.62	0.000

Analysis done by Mann-Whitney U test. P<0.05 considered statistically significant

Regarding the attention span of students, 38% of students in control group commented 50% attention span while 29% of students in the experimental group had 50% attention span. But 47% of the students attending the lecturing with animated videos reported more than 75% of attention span while only 14% of students attending the conventional didactic lecturing reported an attention span more than 75%. (Graph 4). These observations indicate an impact of animated videos along with lecturing in generating interest in subject, maintaining attention throughout the class and motivating the learning process.

Graph 4 : Comparison of attention span of students in the session attended



DISCUSSION

The objective of this study was to analyse the effectiveness of animated videos during lecturing in generating interest in subject, maintaining the attention span, improving the motivation for active learning thereby enhancing the academic performance of students.

The results showed a statistically significant difference in the marks obtained in post test between the two groups of students. Group of students to whom the animated videos were shown scored a statistically significant higher marks in comparison with the group of students attending the traditional lecturing only. This result indicates the usefulness of animated videos as a supplementary teaching learning tool in Biochemistry. This view is in concordance with recent studies of Hoyenk *et al.*¹⁰ who studied the effectiveness of three dimensional digital animation in teaching human musculoskeletal system. In their study, comparison was made between the two groups of students from different academic

years and the results reflect the effectiveness of digital animation in recalling anatomical knowledge requiring spatial ability.

The present study observed a significant impact of animated videos in enhancing the attention span of students during lecturing, generating interest in the topic and imparting an increased motivation in learning which are ultimately reflecting in the academic performance. A critical literature review conducted by Ruiz *et al.*¹¹ reported that the benefits of animation vary according to learner characteristics such as prior knowledge and spatial ability. The features of animation that appear to facilitate learning include permitting learner control over the animation pace that allows the learner to interact with animations and splitting the animation activity in to segments. Pollock *et al.*¹² and Tversky and Morrison¹³ argued that animations are more effective than static sequential images for teaching dynamic events. Stith conducted a study to analyse the value of animations over static illustrations in science teaching and reported that the students who viewed the animations scored significantly higher on the test than those who had not viewed the animation⁵. Mc Clean *et al.*¹⁴ conducted a more comprehensive study on the effect of animation based educational modules and reported that student's retention and content material became significantly better when the student received a lecture coupled with the animation. O'Day DH¹⁵ conducted the effect of animated videos on signal transduction pathways and reported that animations provide students with insight in to biological processes in a way that traditional lecturing and static graphics do not.

Several previous studies showed a tendency of effectiveness of animation based learning on problem-solving transfer when compared with text-based learning¹⁶. Studies reported that the psychological educational dimensions of teaching and learning with animations lead to construction of knowledge transfer ability which is one of the most important thinking skills.¹⁷

CONCLUSION:

Present results showed a significant impact of animated videos during lecturing on student's perception and attitude towards the subject as well as learning process resulting a significant improvement in the academic performance .

LIMITATIONS OF THE STUDY:

The present study focussed on the effect of animated videos during lecturing on the change in perception and attitude towards learning and thereby on the academic performance. A remaining question is whether teaching with animated videos affects additional aspects of knowledge, abilities and skills.

SAMPLE SIZE:

This study was conducted in a small group of students in a single medical college, and the duration of the study was limited. This study is recommended to be conducted in a large group of students in more number of medical colleges.

TOPIC FOR TEACHING :

Only a single topic was selected for the study. This study is recommended to be conducted in different topics in different medical colleges.

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