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Digital Visualizer as an Aid-assisted Teaching in Anatomy

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Abstract

Background: Innovative medical education technologies are used as alternate mode of teaching-learning of anatomy to undergraduate students. As knowledge of anatomy helps students in their clinical area, effective innovative teaching-learning tools need to be explored to build up their competency in anatomy.

Aim: To find the outcome of application of digital visualizer in systematic teaching-learning of anatomy to undergraduate dental students.

Materials and methods: A cross sectional study was undertaken among first year dental students studying at Penang International Dental College, Salem, India. 50 students were divided in two groups. The groups were subjected to conventional and aid-assisted teaching using digital visualizer in a cross-over design on separate topics with comparable level of difficulty. Both groups were assessed by pre and post-test followed by feedback from them in reference to use of digital visualizer as aid in regular anatomy teaching-learning process.

Results: Both the conventional and aid-assisted teaching showed significant changes in students pertaining to gaining of subject knowledge and the mean post-test score was found to be higher with the use of digital visualizer. The post-test scoring using digital visualize in both groups was higher in osteology teaching (10.21±0.76 & 10.39±0.83) and cadaver specimen demonstration (8.76±0.44 & 8.80±0.41). In the feedback analysis, majority of the students considered digital visualizer as an innovative aid for teaching-learning in anatomy.

Conclusion: The use of medical educational technologies can assist as a comprehensive tool in regular teaching learning sessions. The study will be further continued for first year medical students of our institution.

Keywords – *Anatomy, Digital Visualizer, Medical education, Teaching-learning process.*

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Introduction

The use of advanced technology in medical education started gaining its importance over many years. The modern trend of use of advanced technology has been developed due to various challenges that were faced in medical education such as change in healthcare environment, new generation of learners' expectations, change in curriculum mainly focusing on competencies and milestones and finally rapidly changing technology and its advancement.[1] The prevalence of use of

technology for both undergraduates and postgraduates has become more common. The applications of advanced technology were used in training programs, continuing medical education and workshops.The technology aided teaching learning modalities facilitate the learners in all ways and means such as knowledge acquisition, improves decision making capacity, improves the necessary skills, and moreover the technology provides an educational environment that enables the learnersto learn without endangering the patient.

The advancement of computer technologies enables the teacher to assess the learner'scompetencies and milestones, and trains the student, to access the medical knowledge at any time and thus becoming a life-long learner.The use of technology in medical education should be an additional tool or method for learning process and it should not turn to be an alternative or replacement for face-to-face learning. Technologies should be one of the tools in the educational toolbox. The medical educators should focus on the use and application of new technologies to transform the learning process as a collaborative and empowering experience for the learners.[2]

Digital visualizer provides high resolution magnified sharper image of any material that is focused on its inbuilt camera. These high resolution images enable the demonstrator to display all minute details of any small objects to a large group of learners. When a computer or laptop is connected with this digital visualizer, demonstration of any structures / procedures can be done easily even to a larger group of learners or trainees in outreach sites also.[3,4] The first year students of medicine and dentistry in India are taught anatomy before they are exposed to patient care in the second year. The basic anatomy knowledge is very much essential for students to develop their clinical skills. The need of effective, innovative teaching-learning method has to be explored to enrich the competenciesof students in anatomy.[5]

During routine anatomy dissection the osteology and embryology demonstration is carried out for groups of 10-15 students (approximately). The implementation of competency based medical education (CBME) curriculum is much focused on the small teaching learning groupswhich is found to be difficult due to the paucity of faculty. In anatomy the osteology demonstration, embryology model demonstration, OSPE demonstration, basic clinical examination and basic clinical investigations interpretation (X-rays) can be managed well with lesser faculty to teach and train a large group of students through tutorials. In the conventional teaching method the students always complain that they were not able to interpret foramen in bones, parts in embryology models and so on. Some advanced innovative technological aids for better viewing and interpretation of demonstrated structures to the larger groups is very much essential in the current senario.[6] Digital visualizer was introduced in the teaching-learning process for MBBS students at All India Institute of Medical Sciences (AIMS), Jodhpur (2016).[6]In the present studydigital visualizer was introduced in the teaching-learning process for BDS students from Malaysia at Penang International Dental College, Salem, India (2017).

Aim

- To find the outcome of application of digital visualizer in systematic teaching-learning of anatomy to undergraduate dental students.

Primary objectives

- To assess the performance of students taught by digital visualizer

Secondary objectives:

- To compare the performance of students by routine conventional teaching methods and visualizer aided teaching methods.

- To compare the teaching-learning process of 2 different sections of anatomy (osteology and cadaver head & neck specimen demonstration).

Materials & Methods

The cross sectional study was approved by IEC of VMKV Medical College & Hospitals, Salem (Reference-VMKVMC/IEC/18/48). A qualitative and quantitative analysis was undertaken among the first year dental students studying at Penang International Dental College, Salem. 50 students were divided in two groups by random allocation method (Group A - 25 & Group B - 25). Groups were subjected to conventional and aid-assisted teaching using digital visualizer (Fig.1)

in a cross-over design separately for the topics from osteology and cadaveric head & neck specimen demonstration with comparable level of difficulty as two different sessions. Both groups were assessed by pre and post-test for both the sessions separately followed by feedback using validated structured questionnairefrom the students in reference to use of digital visualizer as aid in regular anatomy teaching-learning process. The mean, standard deviation and standard error mean of the assessment were calculated. The data were analyzed by paired t test to compare both the assessment using online GraphPadQuickCals t test calculator.

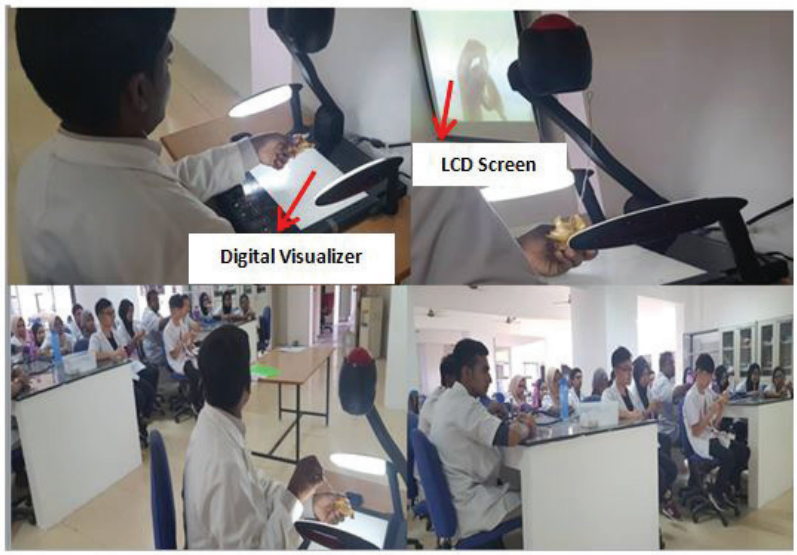

Figure – 1 Aid-assisted teaching using digital visualizer

Results

A cross-over design separately for the topics from osteology and cadaveric head & neck specimen demonstration was done as two different sessions for both the groups. Both groups were assessed by pre and post-test for both the sessions separately followed by feedback from the students.Both the conventional and aid-assisted teaching showed significant changes in the mean post-test score for both the sessions. The post test results of aid assisted teaching with the use of digital visualizerwas found to be statistically significant when compared to pretest (Table1). In the feedback analysis, it was noted that majority of the students considered digital visualizer as an innovative aid for teaching-learning in anatomy (Table 2).

Table – 1:Comparison of studentsperformance using conventional method and digital visualizer in osteology and cadaveric specimen demonstration

Groups	Assessment	Osteology demonstration		Cadaveric specimen demonstration	
		Conventional Teaching	Visualizer teaching	Conventional Teaching	Visualizer teaching
Group A	Pre test	3.56 ± 2.09	4.21± 1.24	3.44±0.51	3.84±0.85
	Post test	8.5 ± 2.04	10.21 ± 0.76	7.12±0.83	8.76±0.44
	P Value	0.001***	0.001***	0.001***	0.001***
Group B	Pre test	3.42 ± 1.91	3.17 ± 1.76	3.88±0.83	3.68±0.80
	Post test	9.78 ± 0.69	10.39 ± 0.83	7.01±0.87	8.80±0.41
	P Value	0.001***	0.001***	0.001***	0.001***

*Values are expressed as Mean ± SD, n = 25 in each group,# - non significant, * - significant, P value *P<0.05, **P< 0.01, ***P<0.001*. Statisticalanalysis –Paired t test.

Table – 2: Feedback of students on usage of digital visualizer in teaching process

S.no.	Parameters	Yes	No	Not sure
1.	Do you want the usage of modern teaching aids by lecturers?	50 (100%)	-	-
2.	Is digital visualizer teaching useful in osteology demonstration?	50(100%)	-	-
3.	Do you prefer this visualizer aid as support mechanism for face-to-face learning or as an individual tool?	49(98%)	-	1 (2%)
4.	Is it useful in terms of perception of minor details?	45 (90%)	1	4 (8%)
5.	Is there an ability to interact and clear doubt?	49 (98%)	-	1 (2%)
6.	In comparison of visualizer with conventional teaching at the table with bones, is this method better?	45(90%)	1 (2%)	4 (8%)
7.	Is the understanding of the topic easier with visualizer?	49 (98%)	1 (2%)	-
8.	Is identifying the structures with visualizer more clear and precise?	48 (96%)	-	2 (4%)
9.	Is it easier to memorize the details?	45 (90%)	1 (2%)	4 (8%)
10.	Is the linking of the structures with the verbal information faster and easier in thoughts with visualizer?	50 (100%)	-	-
11.	Whether we need to continue use of visualizer for demonstration?	49 (98%)	-	1 (2%)
12.	Does visualizer have a role in enhancing confidence in subject and improving knowledge?	47 (94%)	-	3 (6%)
13.	Does the use of digital visualizer make lecture interesting and interactive?	49 (98%)	-	1 (2%)
14.	Is digital visualizer good as an innovative aid for teaching-learning in anatomy?	49 (98%)	-	1 (2%)

Discussion

Today's student generations are tech-savvy and they have divergent domain of learning by visual, auditory, reading, kinesthetic modes (VARK).[6] The facilitators should train themselves in these teaching-learning modes and apply them to impart knowledge to students in their own way of interest.[7,8,9] Earlier the education system mainly focused on the educator only where topic was taught as an information by them and not on the learner, who has been just considered as receiver of the information. But now the scenario has been totally changed towards learner oriented education. For many decades the teaching-learning delivery medium was via the "chalk-and-talk" method and Overhead Projector

(OHP) transparencies were considered as popular techniques.[10] It was reported in various studies that use of traditional methods are considered to be the best for teaching-learning in biomedicine and medicine courses.[11]

Digital visualizer allows documents, books or slides, drawing, models and specimens to be displayed whenever required for demonstration and its usage is considered to be more feasible than overhead projector based presentation.[2]Various studies showed that the application of innovative teaching aids are necessary for illustrations and understanding not only in Anatomy,[12]but also in other subjects like Pharmacology,[13]Physiology,[14] Biochemistry,[15] Community medicine,[16] Obstetrics and Gynaecology[17] etc.

A study done by Ghatak et al., 2016using digital visualizer in India at AIMS, Jodhpur reported that both conventional and digital visualizer aid-assisted teaching when compared, digital visualizer teaching for osteology showed significantly higher post-test scoring(17.31±2.63) and embryology teaching also showed higher post-test scoring(15.72±1.79) whereas the post-test scoring of students using conventional methods was lower for both osteology teaching (14.46±2.76) and embryology teaching (14.08±2.30).[6] In the present study similarly the post-test scoring in both groups was higher in osteology teaching using digital visualizer(10.21±0.76 & 10.39±0.83) whereas the post-test scoring in both groups was found to be lower in conventional methods (8.5±2.04 & 9.78±0.69) (Table 1). The head and neck cadaveric specimen demonstration was also done using both methods of teaching. Similarly the post-test scoring in both groups was higher in cadaveric specimen demonstration using digital visualizer(8.76±0.44 & 8.80±0.41) whereas the post-test scoring in both groups was found to be lower in conventional methods (7.12±0.83 & 7.01±0.87) (Table 1).

Student's feedback on the use of digital visualizer in teaching-learning of anatomy:

Students' feedback is a need to evaluate any teaching-learning methodology and which helps the facilitator to identify the pros and cons of those various methods. [18] In the present study all the students preferred the usage of modern teaching aids by lecturers. The digital visualizer teaching was found to be useful in both osteology and cadaveric specimen demonstration for the students. In their feedback on the usage of visualize, students opined that their perception of minor details was good, identifying the structures was more clear and precise, understanding the topic was made easy, free to interact and clear their doubts, felt that the method was enhancing their confidence in subject and improving the knowledge. The students wanted to continue the use of visualizer for demonstration and also felt that it was good as an innovative aid for teaching-learning in anatomy (Table 2). The feedback was found to be similar to that of the study done by Ghatak et al., 2016.[6] Various studies report that any system can be considered possible in its execution but the system has to be constantly modified as per the requisites of the students.[19]

Conclusion

The use of newer medical educational technologies can assist as a comprehensive tool in regular teaching learning sessions but they cannot replace the conventional teaching methods. A thorough understanding and comprehension of a topic can be made much easier with the aid by the facilitator. The outcome of the study in application of digital visualizer in systematic teaching-learning of anatomy to undergraduate dental students was found to be more feasible and applicable. The performance of students taught using digital visualizer was found to be good than the routine conventional teaching methods. When the teaching-learning process of different sections of anatomy such as osteology, cadaveric specimen demonstration was compared with conventional method, the digital visualizer teaching method was found to be more effective for all sections. Infuture the study will be further continued for first year medical students of our institution.

Limitations of the Study: The study has to be done on more topics and in different sections of anatomy in a larger group of students. The study has to be continued over years together to show its effectiveness.

Ethical Clearance: The study was approved by IEC of VMKV Medical College & Hospitals, Salem (Reference-VMKVMC/IEC/18/48).

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Conflicts of interest of each author/ contributor - nil

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