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Effectiveness of Module Based E-learning as an Additional Tool to Compliment Didactic Lecture among Final Year MBBS Students

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Introduction and Back Ground

Lectures are the time tested and the oldest teaching method in a teacher's repertoire. There is a general view that lectures are not effective teaching learning method. In the first two years of undergraduate medical education, the students attend more lectures and they rarely see patients. By the time they complete their undergraduate course they would have attended many more hours of lectures both in clinical specialties and other specialties[1]. Hence effectiveness of this modality of teaching method merits our attention. The students rely substantially on lectures for their learning and this is likely to remain so in future also The effectiveness of lectures is dependent upon topic, the lecturer, the learner involved, the aids used and the time of the session.

In the wrong hands lecture can be boring .They may not fulfill the functions of developing, understanding and motivating students to learn. If the lecture is a monotonous reading of the matter from a text book, then the students will find it easier to learn from the book directly rather than listening to it [1] Various studies done also shows ineffectiveness of lecture as T/L method[2] The student feed- back analysis also shows that lecture is not an effective teaching learning method as opined by 71% of participants in a study[3]

So ultimately out- come of lectures depends upon the lecturer, the listener, the content and the context. But in-spite of all these factors lectures are here to stay

Various methods have been tried to make lectures user friendly like giving lecture hand-outs, making it more interactive. The university of Stanford department of biochemistry has come out with a lecture less model in medical education. Here they have introduced the system of modular learning. The student attendance also improved from 30-70%.It was also understood that the learning fueled by curiosity is retained. Lecture less medical school is an idea put forward in a publication in New England journal of medicine[4] Rapid development in technology has opened up newer avenues for learning. Windows based soft-ware for learning basic sciences and its applic-

ation in clinical scenarios have complemented the traditional modes of medical education[5]

Module based teaching in a class room has been found to be effective method.[6] Teaching with a module is a self -study method which manages a unit or topic as a whole. It can be used by students of any level both in the class room or in their own pace .This is also useful to incorporate all the newer methods of learning like e- learning, video simulation, demonstration into the learning process. Modular learning is not a linear process. There can be continuous interaction also with the other participants

Adding the module learning as an additional tool to compliment didactic lecture helps to relate to newer technologies and provide clear explanations and cognizance based knowledge to students. This helps to reinforce previous knowledge, and structure a balanced student's work load. It provides opportunities for students to pursue the topic in depth giving stress to must know and good to know domain and to give an overall information of how assessment will be done

In resource constraint countries medical schools have adopted e learning as an important tool in teaching. This can also help in staff crunched situation. An analysis done by frehywot S suggests that expanded access to education was at the core of e learning .It also provided supplementary to support faculty in expanding their teaching. e learning in medical education is a means to an end. It requires certain amount of institutional preparedness infrastructural resources and most of all receptivity among medical students and teachers [6]

Blended learning is a newer concept in medical education. This was introduced as a method of completion for traditional teaching methods. The blended education is actually combination of two or more methods that use other teaching methods such as multimedia seminars and e learning in addition to the presence classes[8]

E learning refers to the educational system in which educator and trainees are separated by physical distance but with the help of technology equipment and tools they are linked together.[7] There is definite limitation to e- learning as it lacks the humane touch which helps in imparting the psychomotor and affective domain in medical education[8]10

Objectives

1. To prepare a complete module for e learning in selected topics
2. Compare the effect of e-module as an additional tool along with lectures with that of classical lectures on the final year students both qualitatively and quantitatively
3. To assess the gain of knowledge of students after didactic lecture
4. To find out the opinion of students on the effectiveness of lectures
5. To qualitatively assess the effectiveness of e module on the students

Study design : Quasi experimental design

Study period : November 2015 to February 2016

Study setting : Sree Gokulam Medical College and Research Foundation

Study population : 2011 MBBS batch attending 9^{Th} semester posting (58 Students)

Operational Definition Module: A unit of educational course covering a particular topic

Lecture: teaching by giving a discourse on some subject to a class

E learning: Electronic learning using computer technology for health care education

The project approval was obtained from institutional review board

Study method

Module was prepared after detailed research on 7 different topics and subjected to peer- review in the department.

 The topics selected were

- ectopic pregnancy
- multiple pregnancy,
- breech,
- DUB,
- crypto-menorrhea,
- Abruption

- Instruments

The Whole batch (n) of students was taken as subjects. After getting consent from the students to participate in the study the students were divided into two groups at random. Pretest was given to both the groups

Lecture class was taken for the whole batch (n) for duration of 40 minutes by the investigator

Batch A (n/2) was given a module on the concerned topic by e-mail (intervention), immediately after the lecture and asked to study

Batch B (n/2) – was asked to study from lecture notes they had noted.

Post- test was given for the whole batch

The evaluation of the paper was done by another faculty to avoid bias and the marks obtained were tabulated

The module was then circulated to control groups after the intervention to avoid ethical issues

After the 7 exposures a peer reviewed questionnaire was circulated among the students who participated in the study- both study and control group regarding the various factors of the T/L method lecture and the intervention used

The marks obtained were entered in MS Excel sheet. Statistical analysis was done by soft -ware SPSS

The results were subjected to peer- review before it was submitted

Module Preparation. A detailed teaching module on 7 topics was prepared and was peer reviewed by the faculty in the department

Key words: Lectures , Teaching tool, Module, student feed- back, e-learning

Results

The data collected was subjected to quantitative and qualitative analysis

Table 1 Comparison of pre and post- test marks obtained for the study group in three modules

	n	Module -1		Module -2		Module -3	
		mean	SD	mean	SD	mean	SD
Pre-test	30	6.23	1.382	6.23	1.040	5.27	.980
Post test	30	9.10	.803	9.37	.556	8.13	.776
|t|	13.814			17.216		14.198	
df	29			29		29	
P	<0.001			<0.001		<0.001	

Table 2 comparison of pre and post- test marks obtained for the study group in three modules

	Module 4		Module -5		Module -6		Module -7	
	mean	SD	mean	SD	Mean	SD	Mean	SD
Pre-test	5.67	.959	5.93	.868	6.10	1.062	6.07	.980
Post test	9.00	.743	8.80	.761	9.17	1.08	8.63	.425
|t|	13.548		14.198		14.669		5.283	
df	29		29		29		29	
P	<0.001		<0.001		<0.001		<0.001	

Table 1 and 2 gives the Mean and standard deviation of marks obtained by students in the test group before and after e module learning in all the 7 different topics that was taught. Paired t test was used for statistical analysis.The absolute T value was obtained and p value calculated. It is found that the P values is <.001 in all the 7 modules. Thus intervention was found to be significant in all the 7 modules.

To test whether this difference is due the e modules given, independent t test is used to compare the difference in the pre and post-test marks of the two groups .(test and control groups)

Table 3 Comparison of pre and post- test marks obtained by study and control groups in 3 modules

	n	module -1		module -2		module -3	
		mean	SD	mean	SD	mean	SD
test	30	2.8667	1.13664	3.1333	1.00801	2.8667	1.10589
control	28	1.0000	.72008	1.0357	.99934	1.2143	.17334
t	7.410			7.952		6.169	
df	56			56		56	
P	<0.001			<0.001		<0.001	

Table 4 comparison of pre and post- test marks obtained by study and control groups in 4 modules

	module-4		module -5		module -6		module -7	
	mean	SD	mean	SD	Mean	SD	Mean	SD
test	3.3333	1.34762	2.8667	1.10589	3.0667	.20863	2.5667	.48585
control	1.0714	.89974	.6786	.13660	.6786	.13660	2.3929	. 1.19689
t	7.462		8.850		9.434		.317	
df	56		56		56		56	
P	<0.001		<0.001		<0.001		<0.001	

The p-value from the independent T testing was found to be highly significant as there is significant difference in the mean difference in marks of the two groups. This proves that the e module is effective as intervention in all the 7 modules taken together

A statistical test was applied including the anova test to check if there was difference in the effectiveness of the e module intervention between the 7 modules. For this again the mean difference in marks of the test groups were taken and levene test applied to test the homogenesity of variances. As this was significant an ANOVA test applied. It was found that there was no statistical significance.

Table 5 comparison of difference in mean marks obtained for each module im the study group

	N	Mean	Std. Deviation	95% Confidence Interval for Mean	
				Lower Bound	Upper Bound
Abruption	30	2.8667	1.13664	2.4422	3.2911
DUB	30	3.1333	1.00801	2.7569	3.5097
instruments	30	2.8667	1.10589	2.4537	3.2796
breech	30	3.3333	1.34762	2.8301	3.8365
cryptomenorrhea	30	2.8667	1.10589	2.4537	3.2796
multi	30	3.0667	1.14269	2.6400	3.4934
ectopic	30	2.5667	2.66113	1.5730	3.5603
Total	210	2.9571	1.45854	2.7587	3.1556

Table 6 Test of Homogeneity of Variances

Levene Statistic	df1	df2	Sig.
1.602	6	203	.148

Table 7 One way Anova test to analyze the variance of mean marks obtained in all seven modules in the test group

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10.848	6	1.808	.846	.536
Within Groups	433.767	203	2.137		
Total	444.614	209			

The anova test of variances shows that there is no difference in the type of topic that is selected that affects the learning process

Analysis of the Questionnaire

The questionnaire was given to both the test groups and control groups as the e module was circulated to control groups also after the post test. The questionnaire was distributed at the end of the study the following table shows the percentage of responses obtained for each question

Table 8 - % response of questionnaire SD-Strongly dis-agree disagree, A/D agree or disagree A Agree SA Strongly agree

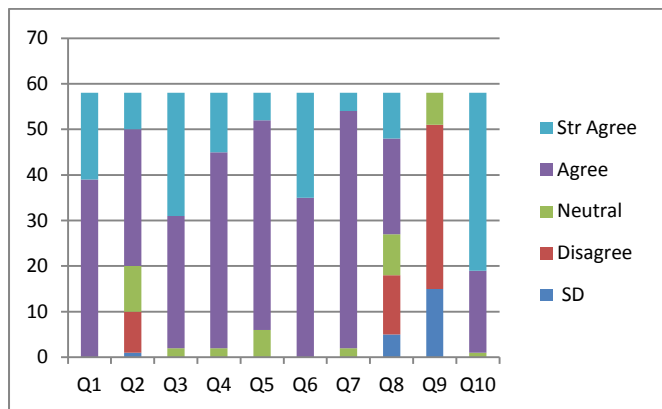|	SD(1)	D(2)	AD(0)	A(3)	SA(4)
Variable-1	0	0	0	67.2	32.8
Variable-2	1.7	15.5	17.2	51.7	13.8
Variable-3	0	0	3.4	50	46.6
Variable-4	0	0	3.4	74.1	22.4
Variable-5	0	0	10.3	79.3	10.3
Variable-6	0	0	0	60.3	39.7
Variable-7	0	0	3.4	89.7	6.9
Variable-8	8.6	22.4	15.5	36.2	17.2
Variable-9	25.9	62.1	12.1	0	0
Variable-10	0	0	1.7	31	67.3

Fig 1 The Bar chart showing the response of the questionnaire

All the participants in the study agree that the lecture classes are effective tool to impart knowledge. But 65.5% of the participants feel that there are gap areas to be filled after a lecture class 98.3% of the participants also feel that the effectiveness of the lecture depends on the lecturer.

Modules are helpful to understand the topic (96.5%) and it helped to reinforce the topic discussed (96.6%) 89.6% of the participants feel that the module circulated helped in clarifying the doubts that occurred during the lecture. All the participants felt that they can use the module for future use and 96.6% of the participants felt that the gaps that were there after the lecture class was reduced by the e module.88% disagreed to the opinion that modules were not effective as a T/L method. The technology ignorance was a hindrance to 53.4% of the participants.

Table 9 Analysis of the questionnaire after assigning numerical scores to the response

TOTCOD					
Scores		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	1.7	1.7	1.7
	3	39	67.2	67.2	69.0
	4	18	31.0	31.0	100.0
	Total	58	100.0	100.0	

Giving numerical scores for the likerts questionnaire we made the total score of the values obtained Score of 1 was given for strongly disagree, 2 for disagree 0 for neutral agree was given 3 and 4 for strongly agree. The total score was taken for each student and the mean score was calculated The score of 1 was given the poor performance, when the marks were between 0-10, score 2 10-20, average score 3 for marks 20-30 which is good and scores more than 30 was given very good and the frequency and percentage was calculated The results thus obtained is given in the pie chart below
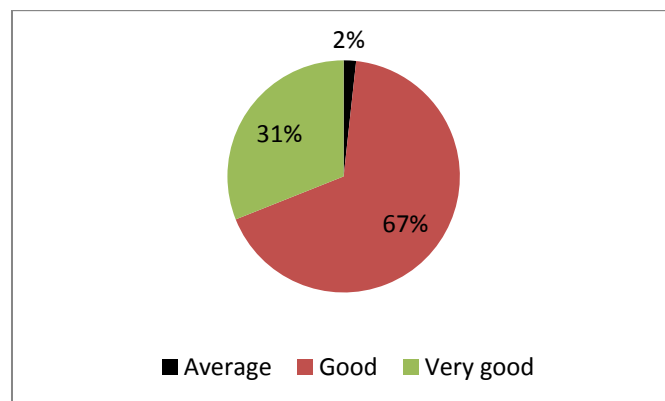

Fig 2 The pie chart showing the scores obtained after numerical analysis of the questionnaire

Discussion

The study at SGMCRF compared the effect of traditional lecture method with a blended teaching method in which lectures were complemented by e modules and the knowledge acquired and the student satisfaction was considered There was a significant difference in the mean marks before the intervention and after the intervention as obtained by the pre-test and post-test marks in the study groups in all the seven modules that were included in the study. Similarly in the intervention test group where the e modules were given there was significant difference in the mean marks obtained by the test and the control group highlighting that the intervention was effective. We also looked for the difference in the mean marks in between the different modules but there was no significant difference in the effectiveness of the intervention based on the topic of the e-module.

In a study by Royasadegi, Mohamed Mehdi et al published in journal of advanced medical education titled comparison of the effect of lecture

and blended teaching methods on the students learning and satisfaction, both lecture and blended methods significantly raised the students' knowledge and the student satisfaction was more with the blended method [9]. Hence they suggest that the learning should be used as complementary approach to theoretical teaching method.There were many studies that were done to compare traditional methods of teaching with those of active learning which is learner centric where there have been no significant differences between the two groups[10]

Jafari and Hugengholtz showed that both e learning and traditional methods are effective in improving the cognitive domain of the student equally again in the first year of medical education [11][12]

Some studies showed better results with e learning methods in comparison to traditional lectures [13][14]

Bahadorani et al. compared three online training, face to face and blended methods on medical students and showed the scores of the learners' knowledge and skills in blended teaching method were higher than those in the two other methods

The differences in the out- come of various studies may be due to the fact that differences in learners instructors curriculum design the e module design etc are different. Hence it is important to consider the circumstances resources training objectives of the educational program when looking for the effectiveness.

The study conducted rates e module having better student satisfaction. Similar studies have also shown that there is statistically significant satisfaction in learner centric complementary method than that of lecture alone.[8][15]

Advantage of e-modules is that novel instructional ideas can be introduced using the technological advancement making the module more authentic and student centric. Learning should be constructive, contextual collaborative and self-directed. These learning approaches can be included in the modules.

Conclusion

Lectures are effective method of teaching to impart knowledge. There is definite increase in knowledge after didactic lecture. Detailed e modules were prepared in 7 topics

The e-module complementing the lectures was effective in imparting knowledge more in comparison to lectures alone. There was no significant difference in the outcome with different topics.

The Use of additional e- learning module with lectures is beneficial and this gives hope for the development of more such modules

Conflict of interest

There is no conflict of interest

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Annexure

Questionnaire for Students

No	Questions	SD (1)	D (2)	D+A (0)	A (3)	SA (4)
1	Lecture classes are effective to impart knowledge					
2	There are lot of gap areas to be filled after a lecture					
3	Module obtained helped in reinforcing the topic discussed in the lecture					
4	Module of the topic made the understanding of the topic more easier					
5	The new learning method was more useful to clarify the doubts that occurred during the lecture					
6	The module can be used for later review					
7	The module obtained after the class helped to identify the gaps in lecture					
8	The technology ignorance was a hindrance in understanding the process					
9	The module send by mail was not useful as add on to T/L method					
10	The effectiveness of lecture classes are teacher dependant					

Any other suggestions