The Effect of E-Learning and Traditional Teaching Done Hand-in-Hand for First-Year M.B.B.S. Students

Chanemougavally J., Department of Anatomy, A.C.S Medical College and Hospital, Dr. M.G. R Educational and Research Institute (Deemed to be University), Velappanchavadi, India*

Shruthy K. M., Department of Anatomy, A.C.S. Medical College and Hospital, Dr. M.G.R Educational and Research Institute (Deemed to be University), Velappanchavadi, India

Selvaraj Sudhakar, Faculty of Physiotherapy, Dr. M.G.R. Educational and Research Institute (Deemed to be University), Maduravoyal, India

M. Sasirekha, Department of Anatomy, A.C.S Medical College and Hospital, Dr. M.G. R Educational and Research Institute (Deemed to be University), Velappanchavadi, India

ABSTRACT

Medical education is experimenting with different tools to make teaching-learning more compatible with the medical curriculum. One such addition is blended learning, which combines traditional teaching with e-learning. The study aims to assess the effectiveness of combining e-learning and traditional face-to-face gross anatomy teaching in undergraduate medical students. This collaborative study was done in the Department of Anatomy, A.C.S Medical College and Hospital, Dr. M.G.R. Educational and Research Institute (Deemed to be University). One hundred fourteen students volunteered to participate in the study. Six topics from the gross anatomy of the abdomen were chosen for the study. An overall pre-test questionnaire was delivered with the didactic lectures. Another pre-test questionnaire was given about the selected topic before sharing the online learning materials. A post-test questionnaire in Google form was collected at the end of the day. Feedback was collected from all study participants.

KEYWORDS

Blended Learning, e-Learning, Face-to-Face Teaching, Teaching-Learning Methodology, Traditional Teaching

INTRODUCTION

Education is believed to be effective in developing knowledge in students. It is a fundamental factor in knowledge development. Learning is a lifelong process in which students have to achieve expertise and skill. It is considered to be a fundamental pillar contributing to the changes in society. Self-directed learning is the most effective process of learning (Thejeswar et al., 2015). Students constantly require to be challenged with unique educational learning methods. One such tool is technology. The usage of technology has been on the rise among the student population. Hence online teaching methods

*Corresponding Author

have been commonly used in recent days keeping in mind that the environment to which the medical students are exposed is vastly different from that was provided 20 years ago (Ani et al., 2008).

Educational institutions across the globe have incorporated and implemented e-learning in their curriculum. Medical schools worldwide use e-learning platforms such as audio-visual clips and virtual models (Rupashri et al., 2015). The advantages of e-learning platforms are that materials can be updated in time and delivery of content to the students is relatively fast. Future medical students will undoubtedly have considerable resources from web platforms. With this change in learning, the role of a teacher is now recognized as a facilitator (Arkorful et al., 2015). Even though most medical students find e-learning exciting and practical, they still opt to continue with traditional teaching methods. E-learning has been used to foster independent learning. It allows students in the medical sciences to have extensive control over their learning process. Students now have access to learning materials and assessments, irrespective of the time and place they are in, enabling them to receive personalized feedback and work on self-improvement (Al-Adwan et al., 2012).

Several studies have been done by comparing e-learning and traditional teaching. But very little literature is available on the outcomes when e-learning and traditional education are done hand in hand for undergraduate medical students. This study focuses on the benefits the students perceived when e-learning is supplemented by the traditional teaching methods in teaching anatomy, physiology and biochemistry in M.B.B.S students of first-year.

MATERIALS AND METHODS

This Collaborative Study was done in the Department of Anatomy, Physiology, and Biochemistry, A.C.S Medical College and Hospital, Dr. M.G.R. Educational and Research Institute (Deemed to be university). The study's duration was a month. It commenced after obtaining Institutional Ethical clearance and written consent from 114 first-year M.B.B.S. students who volunteered to participate in the study. Six topics were selected in Anatomy, Physiology and Biochemistry (Table No.1), for which an overall Pre-test Questionnaire with 30 questions was given. The students were exposed to regular didactic lectures. Another pre-test Questionnaire was given about the selected topic before sharing the online learning materials with the study participants. The materials included PowerPoints, Journals, Videos, etc. A post-test questionnaire was given. The questionnaires for the pre and post-test were given through google forms each comprised ten objective-based questions. Answers were discussed after the post-test questionnaire over google meet sessions. After completing the six topics, a comprehensive post-test questionnaire with 30 questions was given. The study was concluded with self-constructed feedback with ten questions regarding the study methodology through google forms.

Table 1. Topics selected for the study from anatomy, physiology, and biochemistry

Topics selected for the study from Gross anatomy of Abdomen and Pelvis			
S.no	**Anatomy Topic**	**Physiology Topic**	**Biochemistry Topics**
1	Peritoneum	Peritoneum	Enzymes
2	Stomach	Stomach	Vitamins
3	Kidney	Kidney	Carbohydrate Metabolism
4	Uterus	Uterus	Lipid Metabolism
5	Rectum and Anal canal	Rectum and Anal canal	Protein Metabolism
6	Urinary Bladder	Urinary Bladder	Genetics

DATA ANALYSIS

The collected data were tabulated and analyzed using both descriptive and inferential statistics. All the parameters were assessed using the statistical package for social science (S.P.S.S.), version 24. T-statistics was adopted to find the statistical difference within the groups (Table 2, Figure 1- Anatomy, Table 3, Figure 2- Physiology, Table 4 and Figure 3- Biochemistry).

The above table reveals the mean, standard deviation (S.D), t-value and p-value between the pre-test and post-test within the group.

In anatomy, there is a highly significant difference between the pre-test and post-test mean values in the peritoneum, stomach & uterus within the group at $p \leq 0.001$ and urinary bladder within the group at $p \leq 0.05$. That shows a significant amount of knowledge has been gained in these topics. However, there is no significant difference between the pre-test and post-test mean values in the kidney, rectum & anal canal within the group at $p > 0.05$, thus indicating that the knowledge gained was not as significant as the previous four topics.

Overall performance in anatomy shows a statistically significant difference between the pre-test and post-test within the group at $p \leq 0.001$, which signifies that the broad knowledge gained by the students at the end of the study was highly significant.

In physiology, there is a highly significant difference between the pre-test and post-test mean values in the peritoneum & stomach within the group at $p \leq 0.001$ and urinary bladder within the

Table 2. Comparison of dependent variables within the group between pre and post-test values in anatomy

VARIABLES	PRE-TEST		POST-TEST		t - TEST	SIGNIFICANCE
	MEAN	S.D	MEAN	S.D		
PERITONEUM	7.06	1.46	6.01	1.50	5.49	.000***
STOMACH	6.89	1.45	4.41	1.68	11.47	.000***
KIDNEY	7.30	1.89	7.03	1.56	1.17	.244*
UTERUS	6.02	2.09	4.83	1.67	4.70	.000***
RECTUM & ANAL CANAL	6.47	2.16	6.73	2.07	-.914	.363*
URINARY BLADDER	6.57	2.03	5.92	1.43	2.80	.006**
OVERALL	8.88	2.38	11.62	3.30	-6.98	.000***

Figure 1. Comparison of dependent variables within group
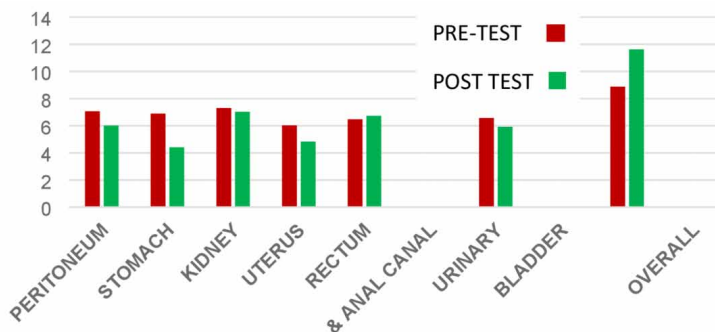
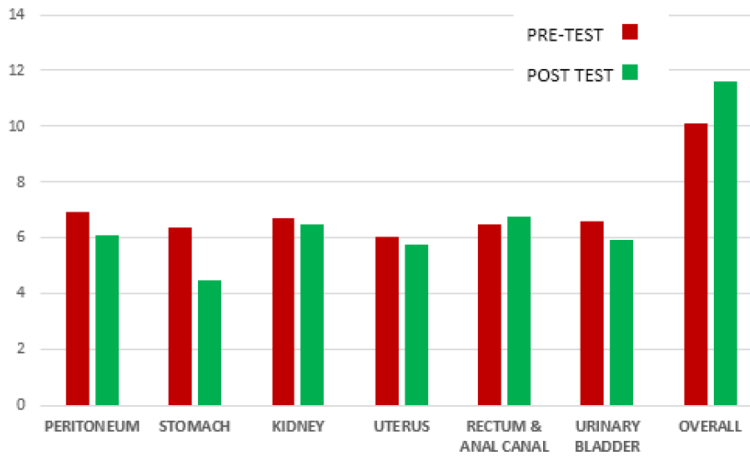**Figure 2. Comparison of dependent variables within the group for Physiology**

Table 3. Comparison of dependent variables within the group between pre & post-test values in physiology

| VARIABLES	PRE-TEST		POST TEST		t-TEST	SIGNIFICANCE
	MEAN	S.D	MEAN	S.D		
PERITONEUM	6.92	1.48	6.11	1.56	4.01	.000
STOMACH	6.37	1.62	4.47	1.71	8.66	.000
KIDNEY	6.68	1.70	6.48	1.90	0.81	.418
UTERUS	6.03	2.09	5.73	2.28	1.09	.279
RECTUM & ANAL CANAL	6.50	2.12	6.75	1.83	-0.93	.354
URINARY BLADDER	6.58	2.03	5.93	1.43	2.81	.006
OVERALL	10.08	2.11	11.62	3.31	-4.59	.000

group at $p £ 0.05$. That shows a significant amount of knowledge gained in these topics. However,

Table 4. Comparison of dependent variables within the group between pre & post-test values in biochemistry

VARIABLES	PRE-TEST		POST TEST		t-TEST	SIGNIFICANCE
	MEAN	S.D	MEAN	S.D		
Enzymes	6.70	2.53	6.48	1.59	.864	.389
Vitamins	6.90	1.45	4.64	1.82	10.118	.000
Carbohydrate Metabolism	6.99	1.48	7.00	1.77	-.039	.969
Lipid Metabolism	6.00	2.08	5.30	2.03	2.620	.010
Protein Metabolism	6.00	2.14	6.61	1.95	-2.117	.036
Genetics	6.22	1.82	5.81	1.78	1.724	.087
OVERALL	8.28	2.28	11.20	3.33	-9.147	.000

Figure 3. Comparison of dependent variables within the group for biochemistry
*p> 0.05, **p£ 0.05, ***- p £ 0.001
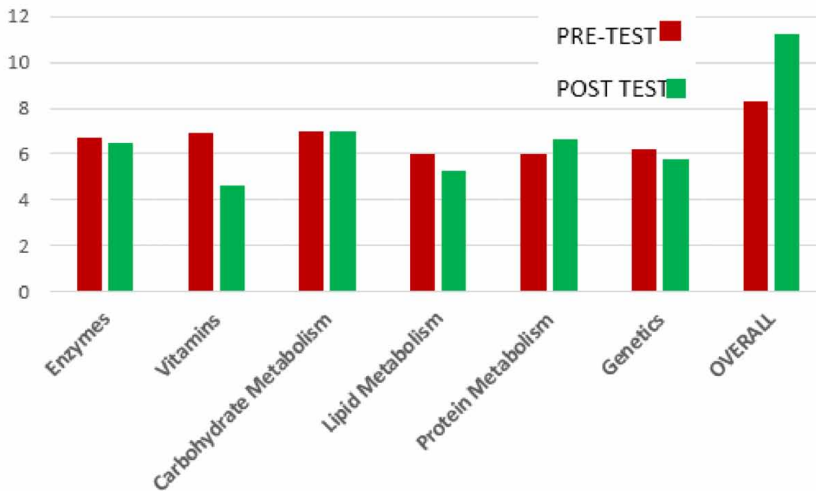
there is no significant difference between the pre-test and post-test mean values in the kidney, uterus and, rectum & anal canal within the group at p > 0.05, thus indicating that the knowledge gained was not as significant as the previous three topics.

Overall performance in physiology shows a statistically significant difference between the pre-test and post-test within the group at p £ 0.001, which signifies that the broad knowledge gained by the students at the end of the study was highly significant.

In biochemistry, there is a significant difference between the pre-test and post-test mean values in vitamins within the group at p £ 0.001 and lipid metabolism, protein metabolism and genetics within the group at p < p £ 0.05. That shows a significant amount of knowledge gained in these topics. However, there is no significant difference between the group's pre-test and post-test mean values in carbohydrate metabolism at p > 0.05, thus indicating that the knowledge gained was not as substantial as the previous topic.

Overall performance in biochemistry shows a statistically significant difference between the pre-test and post-test within the group at p £ 0.001, which signifies that the broad knowledge gained by the students at the end of the study was highly significant.

When we took feedback from the students, only 22% had previous exposure to e-learning, and 25% agreed with that awareness of the e-learning concept. 92% agreed that they had benefitted from this type of blended learning, and 88% agreed that it triggered interest in learning anatomy. Peer interaction was more during the study's duration, and 98% of the students wanted this Teaching learning materials to be continued in the future (Table No 5).

DISCUSSION

From the current study, we were able to assess that e-learning enhanced undergraduate students' academic performance when blended with traditional teaching methods. The traditional teaching method has been followed as it is more feasible to cover many students and is believed to impart better education to the learners[1]. On the other hand, e-learning is widely known for its quick delivery of the learning material and a significant reduction in the teaching-learning time compared to the traditional teaching-learning methodology. Several studies have reported students in the higher educational

Table 5. Feedback

S No	Questions	yes	no
1	Have you taken part in E-learning Program Before?	22.3%	77.7%
2	Do you have Previous Knowledge of E-Learning?	25%	75%
3	Was this Method of Blended learning Beneficial for learning anatomy	92%	08%
4	Were the contents provided trigger interest in learning Anatomy?	88%	12%
5	Was the material provided relevant?	97%	03%
6	Did you interact with peers to understand the materials provided from the web sources?	88%	12%
7	Did you answer the pre-test and post-test questionnaires sincerely?	85%	15%
8	Would you like to have this type of blended learning in the future?	98%	02%

institution, when engaged in e-learning, have a better performance than traditional teaching (Alias et al., 2005; Thurmond et al., 2003).

Virtual learning has become popular in the recent Covid -19 era (Borstorff et al., 2007). E-learning has brought about a positive effect on learning outcomes, especially in the education of health professions (Stevens et al., 2019). The results from a study conducted by support the present study by proving that combining traditional teaching with e-learning helped the students to perform better in assessments (Sheikhaboumasoudi et al., 2018). In a survey by mixed formal learning methods with e-learning improved the outcome in the clinical skills of nurses (Makhdoom et al., 2013). A study by also supports our study that students' perception of learning and learning outcomes are good when blending traditional teaching with e-learning (Boye et al., 2012). In their research, achieved better learning outcomes in the candidates linked with the use of online materials (Lewin et al., 2009). In his study, says blended learning has brought about excellent results in teaching and learning (Ellaway et al., 2008). Ellaway (2008), in his research on learning teaching and assessment, says that when online resources and pedagogy were combined, it facilitated a learner-centered teaching environment (Chumley-Jones et al., 2002).

Our study's results agree with Chummy (Shaffer et al., 2004), (Lee Gordon et al., 2005; Ruiz et al., 2006; Fordis et al., 2005; Gormley et al., 2009; Hsu et al., 2011), which emphasizes the benefits of e-learning in blended learning. Student engagement in education has increased, and the perception of blended learning complemented this (Hsu et al., 2011; Ford et al., 2009). In their study, 21 reported that students appeared to have learned well and performed well in assessments following exposure to blended learning.

Medical education has started to use blended learning in many areas. Studies by reported that combining traditional face-to-face teaching and learning from online resources helped self-development and metacognitive development. The responsibility in the teaching-learning methodology in blended learning is shared by both the teacher and the student (Ford et al., 2009).

Blended learning has its own set of advantages and disadvantages. Blended learning changes student perception of the learning environment. It increases critical thinking and decision-making skills. And the knowledge gained by the student is more significant than that obtained with a traditional teaching methodology. In our study, students' feedback was that in blended learning, the low academic achievers took advantage of this teaching-learning methodology as they had the material for reference and clarified their doubts without having to trouble the teacher to repeat information. Another advantage of e-learning, as a part of Teaching Learning Methodology, is that interaction among peers to obtain clarity during self-directed learning was improved. Research has proved that when medical courses are associated with an online component, the academic outcomes are better (Rowe et al., 2012).

A known disadvantage of e-learning is that it does not allow student-teacher interaction. This gap can be bridged when e-learning combines traditional teaching methods. A slight change in the curriculum design is necessary to facilitate blended learning. That helps to take advantage of sources available on the web (Link et al., 2006). Before introducing blended learning to the curriculum, the institutions must construct an environment supporting this teaching-learning methodology for teachers and students. A balance between the weight given to e-learning and face-to-face education depends on the student's needs and the institution's feasibility (Suresh et al., 2018).

CONCLUSION

Based on the findings of our study, medical students are young adults who are open to adopting new learning methodologies. This study shows that the blending of traditional face-to-face teaching and e-learning provided an effective method for teaching anatomy, physiology and biochemistry to first-year M.B.B.S students.

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J. Chanemougavally is currently working as an Assistant Professor of Anatomy at A.C.S Medical College and Hospital, Dr. M.G.R Educational and Research Institute (Deemed to be University), Velappanchavadi, Chennai - 600 077, Tamilnadu, India.

Shruthy. K.M. is currently working as a Associate Professor of Anatomy at A.C.S Medical College and Hospital, Dr. M.G.R Educational and Research Institute (Deemed to be University), Velappanchavadi, Chennai - 600 077, Tamil Nadu, India.

Selvaraj Sudhakar is currently working as Associate Professor, Faculty of Physiotherapy, Dr. M.G.R. Educational and Research Institute (Deemed to be University), Maduravoyal, Chennai - 600 095, Tamil Nadu, India.

M. Sasirekha is currently working as Professor in the Department of Anatomy, A.C.S Medical College and Hospital, Dr. M.G. R Educational and Research Institute (Deemed to be University), Velappanchavadi, Chennai - 600077, Tamil Nadu, India.