



ORIGINAL RESEARCH PAPER

Biochemistry

EFFECTIVENESS OF INTRODUCING INTEGRATED ONLINE LEARNING MODULES AMONG PHASE 2 MBBS STUDENTS

KEY WORDS: Lectures; integrated learning; CBME; online learning

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ABSTRACT

Introduction: Online learning has gained acceptance following the implementation of Competency based medical Education (CBME). CBME stresses on integrated learning also which helps in simplifying concepts.
Methods: Four topics suitable for integration with Biochemistry and Pharmacology were covered as both lectures and online learning modules among 69 Phase 2 MBBS students after dividing them into two groups.
Results and Discussion: The mean±SD of the marks obtained after covering lectures and online modules of the four topics were found to be different and statistically significant- Topic 1 (Gout) lecture 3.91± 1.44; online module 6.35 ± 0.91, Topic 2 (Hypolipidemic drugs) lecture 3.80± 1.32; online module 6.17± 0.71, Topic 3 (Vit D) lecture 4.22± 1.41; online module 7.73± 1.69, Topic 4 (Iron) lecture 4.25± 1.83; online module 7.82± 1.19. In this study we observed that integrated online learning was an efficient method for undergraduate teaching.

INTRODUCTION

Medical education in India has undergone a major revolutionary change in implementing competency based medical education (CBME) in the new curriculum of the undergraduate medical students. The purpose of this drastic change is to change the current method of teaching which is mostly teacher centered to learner centered¹. It lays prime focus on imparting effective communication skills, ethical values and professionalism to the students which was lacking in the earlier system².

Lectures are one of the traditional methods of teaching followed all over the world. The advantages of lectures are that it helps to cover a large number of topics in a rapid manner. At the same time it has been observed that the participation of the students is often very minimal in these sessions. Hence it is important that faculty should adopt other teaching modalities also.³ According to the Medical Council of India (MCI) one of the competencies that should be attained by an Indian Medical Graduate (IMG) is that he should be a life long learner whereby he is expected to continuously update his skills and knowledge. Online learning is a platform through which this can be attained. The terms e-learning and online

learning are often used as synonyms even though differences exists. The definition of e-learning was given by Ellaway & Masters way back in 2008 as an “educational approach that generally aspires to be flexible, engaging and learner-centered; one that encourages interaction (staff-staff, staff-student, student-student) and collaboration and communication, often asynchronously (but not exclusively)”¹. E-learning is a broad term which includes the usage of any electronic materials ranging from internet to devices like pen drive or CD disk for learning whereas online learning involves the utilization of internet for teaching learning purposes. Factors that influence online learning are the type of device used, synchronicity and the presence or absence of direct interaction. Online learning can be divided into two broad categories- 'complete learning' where there is complete dependence of technology and 'blended learning' where few of the e-modalities are added on to the traditional learning methods^{1,4}.

A major introduction to CBME is the incorporation of integrated teaching in the undergraduate curriculum. Integration is the teaching of one or more subjects simultaneously in a coordinated manner in order to impart a

better idea of concepts to the learner⁵. In medical education it can be referred to as the interdisciplinary approach whereby the students get an overall concept of the topic by linking basic sciences with other subjects. Basic science subjects like Biochemistry is often not favored by students as they do not understand the relevance of learning it. They are unable to correlate it with diseases and clinical conditions later on as the teaching methods do not lay emphasis on these aspects.

Lack of proper understanding of the molecular processes results in poor understanding of the mechanism of action of drugs which are taught in Pharmacology during the second phase of MBBS. Integration of Biochemistry with Pharmacology can help the students to understand the basic mechanism of action of drugs with ease and thus prevent rote memorizing⁶.

The purpose of this study was to understand the effectiveness of online learning over conventional teaching methods and the utility of incorporating integrated teaching among undergraduate MBBS students. Hence we integrated a few important Biochemistry and Pharmacology topics and formed specific online learning modules of the same.

METHODS

This was a quasi experimental study conducted in the Department of Pharmacology from May 2019 to August 2019 for a period of 4 months. Ethical clearance was obtained from the Institutional Ethical Committee. All Phase 2 MBBS students who were willing to participate in the study were included after obtaining their written informed consent. Those students who were not willing to participate and who are absent on the day of study were excluded.

The modality chosen to administer online learning was via google groups. The online module was first administered amongst the faculty and validated. Gmail ID of all willing students were obtained. Four topics suitable for integration by Biochemistry and Pharmacology Departments and of equal weightage were chosen- Gout, Hypolipidemic drugs, Vitamin D, Iron. The students were then divided into two groups- A (35 students) and B (34) after obtaining their informed consent.

Topic 1 (Gout) was covered as conventional lecture for group A and Group B was exposed to online learning module of the same topic on the same day. A test was conducted following a gap of 2 weeks after informing the students. In the next session, group A was exposed to online learning of topic 2 (Hypolipidemic drugs) and group B was given a traditional lecture on the same topic. Test was conducted following a gap of 2 weeks after informing the students. Remaining topics were also covered in this manner. Students were given special instructions as to not to share information.

The post test mainly consisted of MCQs. The post test scores of the students were tabulated and analyzed statistically in IBM SPSS 20 software. Unpaired t test was used to compare the mean marks following post test. p value < 0.05 was considered to be statistically significant. A questionnaire was administered at the end to know the perception of the students about the activity to which they were exposed.

RESULTS

A total of 69 students participated in the study of whom 29 were males and 40 were females.

Table: 1 Mean± SD of the marks obtained in post test

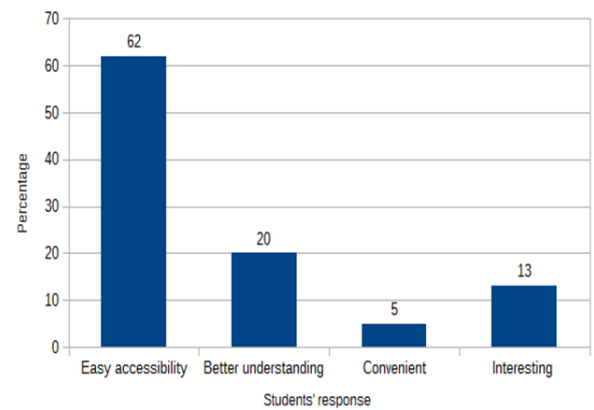
	N (69)	Mean	SD	Confidence interval	p value
G-L*	35	3.91	1.44	95%	<0.001
G-o*	34	6.35	0.91		<0.001
	N (69)				

H-L†	35	3.80	1.32	95%	<0.001
H-o†	34	6.17	0.71		<0.001
	N (69)				
D-L‡	35	4.22	1.41	95%	<0.001
D-o‡	34	7.33	1.69		<0.001
	N (69)				
I-L§	35	4.25	1.83	95%	<0.001
I-o§	34	7.82	1.19		<0.001

* G-L= Gout lecture, * G-o = Gout online module, † H-L = Hypolipidemic drugs lecture, † H-o =Hypolipidemic drugs online module, ‡ D-L = Vit D lecture, ‡ D-o = Vit D online module,§ I-L= Iron lecture,§ I-o = Iron online module

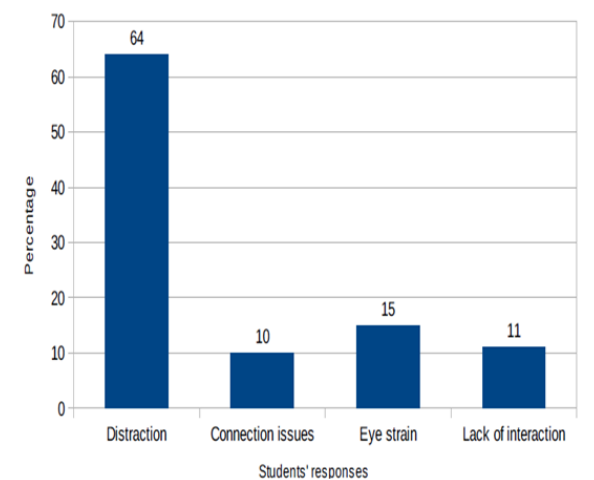
The mean and SD obtained after exposure to online modules were significantly higher than after covering lectures.

Fig: 1 Factors that students liked about online learning



62 % felt that there is easy accessibility to the topic via online learning, 20% felt that they could understand the topic better by this method as it helped in better clearance of doubts, 5% felt that it was a convenient platform as they can learn at their own pace. 13% found the whole concept of online learning as interesting.

Fig: 2 Factors that students disliked about online learning



64% opined that they tend to get distracted with other apps and entertainment while accessing the online classes, 10% had connectivity issues, 15% complained about eye strain and 11% opined that there was lack of direct interaction with the faculty which they found difficult.

DISCUSSION

One of the purposes of online learning is to update oneself continuously in medical field considering the magnitude of the subject. Apart from this, it is a promising method of Self Directed Learning (SDL) which has been given much

importance in the new curriculum. The incorporation of online learning in the teaching learning systems also encourages the concept of adult learning⁷. SDL is an integral part of adult learning and has been explained by Knowles et al⁸ as a method in which students take their own initiative in identifying their learning needs and obtaining learning resources. The other main advantages of online learning are that the materials can be accessed at any point of time thus enabling one to step up to the learner-centric instruction mode.

In our study we observed a significant increase in the post test scores following online learning. (Table 1). The students who were exposed to online learning were not given any formal lecture on the topics. The concept behind this was to prevent 'spoon feeding' and encourage them to take responsibility of their learning which is the main hallmark of SDL. In our study we adopted the method of 'directed SDL' suggested by Kadirvelu et al⁹ wherein faculty gives a certain amount of guidance to the students during SDL. On the other hand, the group who were given conventional lecture also had equal time gap for further learning which they did not utilize. This can be attributed to be due to the lack of motivation and guidance unlike the other group.

Our findings go in hand with those done by Shenoy et al¹⁰ and Bhatti I et al¹¹ where the post test scores were better than conventional lectures. We observed that the students felt that online learning was more 'interesting in that they get access to additional links and information of the topic' during these sessions. They also felt that online learning encouraged them to become 'independent adult learners' as they have the convenience to learn at their own pace. (Fig: 1) Students suggested that in addition to the routine classes it would be good if seminars and assessments were also conducted via this mode. Few of the drawbacks that were pointed definitely has to be addressed for the proper utilization of the method. (Fig: 2) One of the main disadvantages of online learning is that direct interaction does not take place. But with the advent of new online applications this issue can also be tackled.

Until now online learning was considered mostly to be an adjunct to traditional teaching learning methods. But the recent few months have witnessed the sudden surge of utilizing online learning platforms not only in medical schools but also in kindergartens due to the emergence of the Covid-19 pandemic. A lot of online applications are being used on a daily basis so as to create a class room like effect for the students. Situations have proved that online learning can be utilized to even conduct examinations and hence can be used a replacement in stringent conditions.

Shoemaker considered integrated learning as a method that breaks the barriers between individual subjects¹². Until the implementation of CBME, 'horizontal' and 'vertical' integrations were the ones commonly carried out in medical schools. And vertical integration usually involved association of basic science subjects with clinical subjects. These are usually held at course level where multiple disciplines are involved. But studies show that integration conducted at the level of small sessions could be more effective¹³. This view can be supported by the perceptions that we received regarding integrated learning. Students felt that this type of learning 'makes concepts clear' and 'improved thinking skills'. It appeared more effective in that 'monotony of studying a single subject without understanding the relevance' could be avoided. Students generally had the opinion that integrated teaching 'pushes one out of their comfort zone' thus forcing them to probe for the applications of what has been taught. We suggest inclusion of more Problem Based Learning topics than lectures during these sessions so as to make integration more interesting.

It might not be possible to completely do away with lectures

and similar discussions as these modalities also have their own advantages. Hence it is advisable to adapt a blended form of learning where both traditional and novel methods go hand in hand. Blended learning enables the combination of synchronous (traditional lectures) and asynchronous learning (online learning) thus creating a balance between the two.

This study is not without any limitations. We had tested the possibility of integration with two subjects alone and hence more studies involving integration of basic science subjects with other para clinical and clinical subjects should be conducted. Moreover since the study was done among a small group of participants we plan to conduct one involving a larger group with more number of topics. We also plan to use modalities other than google groups for such studies so as to widen the scope of online learning.

CONCLUSION

E-learning has definitely paved way for changing the concept of learning in India. If used efficiently it can be very well utilized for the improvisation of the cognitive, psycho motor and affective domains⁴ which we have now recently witnessed during the times of pandemic. Attitude and motivation of faculty and students are also an important factor for the implementation of e-learning. Faculty should take initiative for developing suitable integrated teaching learning methods which can be adapted in small day to day sessions. This proves to be more useful in the effective understanding of concepts.

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Declaration of Interest

The authors declare no conflicts of interest

REFERENCES

1. Ellaway, R., & Masters, K. (2008). AMEE Guide 32: E-learning in Medical Education Part I: Learning, teaching and assessment. *Medical Teacher*, 30, 455-73.
2. Chacko, TV. (2014). Moving toward competency-based education: Challenges and the way forward. *Archives of Medicine and Health Sciences*, 2, 247-53.
3. Varghese, J., Faith, M., & Jacob, M. (2012). Impact of e-resources on learning in biochemistry: first-year medical students' perceptions. *BioMedCentral Medical Education*, 12, 1-9.
4. Dhir, KS, Verma, D., Batta, M., & Mishra, D. (2017). E-learning in Medical Education in India. *Indian Pediatrics*, 54, 871-77.
5. Khullar, S. Integrated teaching in medical education in India. *International Journal of Basic and Applied Physiology*. 2016, 5(1), 6-14.
6. Vittal, BC., & Jaweed, SA. (2015). Biochemistry teaching: It's time to prepare for multidisciplinary integration. *International Journal of Medical Research and Health Sciences*, 4(1), 84-89.
7. Ghaseemi, N., Falsafi, P., Aminabadi NA., Negahdari R., Bahramian A., Khodadoust K., & Khyavi RK. (2016). E-Learning in Medical Sciences Education: A Comprehensive Literature Review. *Indian Journal of Research*, 5(1), 107-09.
8. Knowles M. (1977). Self-directed learning: a guide for learners and teachers. *Group and Organization Management*, 2(2), 256-57.
9. Kadirvelu, A., & Gurthu, S. (2015). Integrated Learning in Medical Education: Are Our Students Ready?. *Medical Science Educator*, 25, 549-51.
10. Shenoy, SJ., & Kuriakose, C. (2016). Effects of E-learning as a teaching learning method in Medical Education. *Journal of Evolution of Medical and Dental Sciences*, 5(99), 7272-75.
11. Bhatti, I., Jones, K., Richardson, L., Foreman, D., Lund, J., & Tierney, G. (2011) E-learning vs lecture: Which is the best approach to surgical teaching? *Colorectal Disease*, 13(4), 459-62.
12. Shoemaker, BJE. (1989). Integrative Education: A Curriculum for the Twenty-First Century. *OSSC Bulletin*, 33(2), n2.
13. Quintero, GA., Vergel, J., Arredondo, M., Ariza, MC., Gomez, P., & Barrios AM. (2016). Integrated Medical Curriculum: Advantages and Disadvantages. *Journal of Medical Education and Curricular Development*, 3, 133-37.