ORIGINAL ARTICLE

Preferred Areas of Self Directed Learning in Biochemistry Using Portable Electronic Devices: An Observational Study in the Phase 1 Curriculum of MBBS

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ABSTRACT

Introduction: In light of the changing medical curriculum proposed under Graduate Medical Education-Regulations(2019), self-directed learning (SDL) has become the preferred learning model. Mobile devices,such as smart phones and tablets are being increasingly used to assist SDL among medical students. Theintegration of mobile learning in the undergraduate curriculum requires careful planning, more so in thesubject of Biochemistry which requires in depth understanding of the three dimensional structures, reactionsteps and clinical correlation. So, maximum knowledge regarding the perception of medical students towardsthe use of mobile technology in their learning experience is essential. With this background,a cross-sectionalobservational study was designed to study the common practice and behaviours of the phase 1 M.B.B.S. students relating to use of mobile devices for learning of Biochemistry.

Methodology: Data was collected from 192 participants by a pre-designed and pre-validated questionnaire and was analysed by appropriate statistical tests.

Results: Mobile devices were universally being used for self-directed study in Biochemistry by the phase 1 M.B.B.S students. Students found mobile based SDL most effective for the study of competencies under Clinical and applied Biochemistry and Molecular Biology in the undergraduate Biochemistry curriculum. Mobile learning was mostly used by students for concept development and doubt clearance of the subject matter being taught in their classes.

Conclusion: The present work shows that mobile learning is largely rampant among the students and has delineated the preference of the topics and different domains of Biochemistry learning utilized by the phase 1 M.B.B.S students. This will help in formulating the process of mobile technology based SDL in Biochemistry for better utility among the students.

Keywords: Self-directed learning, mobile learning, e-learning, medical education, Biochemistry, medical students

INTRODUCTION

Biochemistry is considered as one of the most challenging subjects by medical students, particularly in the context of cognitive domain and so, extremely difficult to learn by didactic teaching mode.[1,2] In light of the changing medical curriculum proposed by MCI that stresses on the importance of self-directed learning(SDL) for better comprehension, its role in the teaching process of Biochemistry is becoming important day by day. Hence, SDL now has become the preferred learning model where the control of education gradually shifts from teacher to learner.[3,4] Due to growing activity and technological advancement in the communication system, portable electronic devices, such as smart phones and tablets are being increasingly used to assist SDL among medical students.[5] In the modern times, mobile phone has become ubiquitous and network is readily available enhancing the use of mobile learning (or m-learning) allowing students to study anywhere and at any time.[6]

As biochemistry is a conceptual subject and requires in depth understanding of the three dimensional structures, reaction steps and clinical correlation, the integration of mobile learning in the Biochemistry curriculum requires careful planning and maximum knowledge regarding the attitude , behaviour and perception of medical students towards the use of mobile technology in their learning experience. Both views regarding the advantages and limitations of mobile learning for SDL have been reported. While

Smeds et al (2016) and Boumgart et al (2017) reported that use of mobile devices amongst medical students has been linked with improved performance in exams ,[7,8] on the other hand Patil and colleagues demonstrated that despite students' positive attitudes towards m-learning, utilisation of learning materials provided on mobile devices was low.[9]Furthermore, reports are available that the presence of mobile devices lead to increased disruptions during teaching sessions and higher dependence on seniors for decision making .[10,11]

With this background and lacunae in the existing knowledge we hypothesized that the preference for mobile learning in different topics in Biochemistry may vary significantly. Accordingly, this study was designed to understand the preferred patterns of mobile technology use for SDL in the subject of Biochemistry by the students of phase 1 MBBS so that the outcome of this knowledge can be utilized for improving the success and implementation of SDL in them.

MATERIALS AND METHODS

A cross sectional study was conducted on a batch of 200 students enrolled for phase I MBBS course in a tertiary medical college of West Bengal. Study population was selected using the method of convenience i.e. all candidates enrolled were selected except those who did not give consent for the study (n=8). So, the total number of participants were 192. A predesigned and pre-validated questionnaire was prepared regarding the habit of usage of electronic devices used by the students for SDL. The questionnaire was handed to the students in the department of Biochemistry just after the students attended their final practical summative assessment examination at the end of their phase I curriculum. The study was approved by the Institutional Ethics Committee. Regarding confidentiality, the students were informed about the objectives and the anonymity of study information as per protocol.

After collection, the data were arranged in appropriate tables and were analysed using appropriate statistical techniques using IBM SPSS Statistics (version 20.0) for windows. Descriptive statistics was used to determine mean, median and percentages.

RESULTS

The data obtained from the questionnaire were tabulated in appropriate tables after statistical evaluation. Table No. 1 shows that 66% of the study participants were male and 34% female. It is also evident that the percentage of rural and urban candidates were nearly the same(46 % and 53% respectively). So this study reflects a uniformity in selection of rural and urban students for evaluation of SDL. 52% students attended medical college from hostels, some (28%) from their home while others resided as paying guests or rented house (20%) in nearby locality.

All of the 192 participants were in possession of a smart phone and 135 (70%) among them used a recently bought mobile device (within one year).100% participants reported that they used their mobile device for academic purpose.40% began using mobile technology for Biochemistry study from the beginning of the academic year, 40% after the First semes-

Table 1: Socio-demographic Characteristics of study participants (N= 192)

Characteristics	Participants (%)
Gender	
Male	126(65.6)
Female	66(34.4)
Permanent residence	
Rural	90(47)
Urban	102(53)
Present Residence	
Hostel	100(52.1)
Home	54(28.1)
Paying Guest	38(19.8)
Age of current device for self study	
One year	135(70.3)
Two year	36(18.8)
Three year	14(7.3)
>Four year	7(3.6)
Beginning of Mobile use for Academic purpose	
Beginning of session	77(40.1)
After First semester	77(40.1)
After second semester	20(10.4)
Before First MBBS Professional Exam	18(9.4)

Table 2: Use of mobile as a study tool for self-directed learning of different aspects of Biochemistry (N=192) (%)

Utility of mobile for Biochemistry SDL	Participants
Introduction to a topic of study	36 (18.8)
In depth study for concept development	110 (57.3)
Doubt clearance	146 (76)
Attending lecture videos online	69 (35.9)
Gathering extra points for better notes preparation	51 (26.6)
Watching animation of reaction steps	73 (38)
Three dimensional view of chemical structures	83 (43.2)
Clinical cases relevant to the topic	77 (40.1)
Preparing a question bank from the topic	12 (6.3)
MCQs related to the topic for Post Graduation Entrance preparations	27 (14.1)
Summarising at the end of the topic	38 (19.8)
Refreshing key points many days after study	34 (17.7)
Archiving for later use	22 (11.5)
Watching practical experiments online	65 (33.9)

ter while 20% and 18% after second semester and just before First professional MBBS examination.

The mean hours of self-reported total study duration per day was 4 hours, out of which around 1.67 hours were dedicated to Biochemistry learning. Among the 1.67 hours of Biochemistry study, around 0.63 hours were spent on SDL using electronic devices on a daily average basis.

Figure No.1 shows the extent of usefulness of mobile study for different topics of Biochemistry as perceived by students. Students found SDL with mobile device extremely useful for covering the topics in Clinical and applied Biochemistry(55%)and Molecular Biology (53%) whereas moderately useful for topics in Chemistry of biomolecules (50%),General metabolism(46%) and Practical biochemistry(42%).

Table No. 2 shows how the students used their device as a study tool for SDL of Biochemistry. 146 out of 192 (76%) participants said they resorted to mobile technology for clearing their doubts on certain topics of Biochemistry while 110 (57%) disclosed they used their devices for developing key concepts regarding a particular subject matter. Students also reported using mobile devices for viewing three dimensional structures of biomolecules(43%), exploring clinical cases relevant to the topic (40%),watching animations of complex biochemical reaction steps (38%) and attending better lecture videos online(35%).65 out of 192 also reported watching Biochemistry practical experiments online.

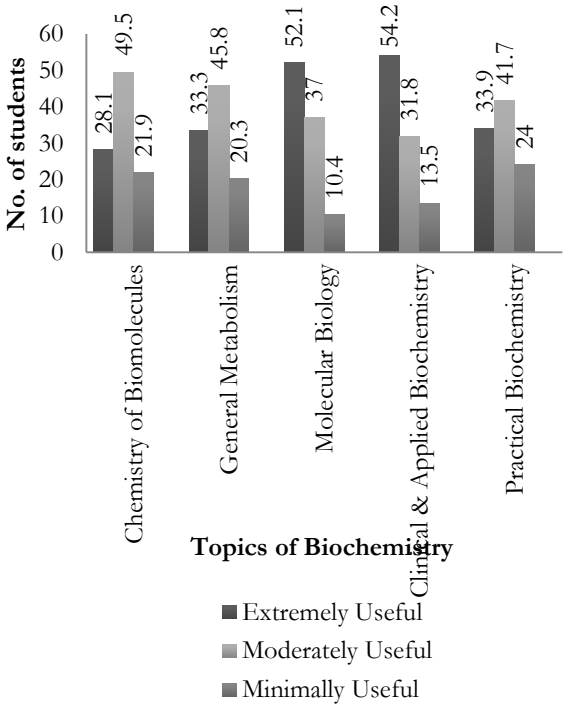

Figure 1: Bar diagram showing usefulness of mobile study for different topics of Biochemistry as perceived by students

DISCUSSION

Medical education in India is at a crucial juncture where competency based education is slowly replacing the traditional learning method. Self-directed learning has been assigned a major bulk of the course hours in contrast to classroom lectures in the Biochemistry curriculum as per GMR 2019.[12] Mobile learning, a derivative SDL is already quite common among the medical students because of their ability to provide quick and easily accessible information.[13-15]Moreover, students report that m-learning tools are as effective as traditional teaching in both clinical settings and formal learning environments.[16,17]

Previously, some reports suggested almost universal ownership of a tablet or smart phone by medical students.[18] This is similar to our finding that all the study participants possessed a smart phone and all of them regularly used their devices for SDL. It signifies their readiness for self-learning and justifies the shift of the focus of medical education from classroom lectures to adult learning, as proposed by the Competency Based Medical Education under GMR 2019.[12] Maximum number of students possessed the most recent devices (70%),a finding similar to a study by Subhash and Bapurao.[19] This reflected the better potentiality of these devices for acquiring the most updated resources for SDL.

We also found that students spent around 35 minutes on mobile learning out of a 100 minute Biochemistry study period, on a daily average basis, strongly suggesting that mobile learning is widely rampant among the students and plays a vital role in their preparation for the final examination even when time crunch is maximum.

Regarding the consciousness for SDL through mobile learning, the data revealed that majority of students (about 80%) started their approach either at the beginning of the course or just after the first semester examination. Comparatively lesser number (about 20%) initiated their SDL during the later half of their curriculum. Hence, it can be opined that most of the students are already cognizant of the use of their devices for SDL since the beginning of the course, justifying the potential success of the SDL endeavour in future.

Figure No. 1 describes the preference of SDL for different topics of Biochemistry among the students. It is evident from the figure that most students found SDL with mobile device extremely useful for covering the topics in Clinical and applied Biochemistry and Molecular Biology (55% and 53% respectively) whereas moderately useful for topics in Chemistry of biomolecules(50%), General metabolism(46%) and Practical biochemistry(42%). This provides an idea regarding the competencies in Biochemistry where mobile devices may fruitfully be

used as a study tool by the facilitators. Also, these topics may be the ones where the flipped classroom approach would be more applicable to the students.[20,21]

Table No. 2 describes the use of mobile technology based SDL specific to the subject of Biochemistry. It is revealed that a large percentage of students resorted to e-learning in Biochemistry for doubt clearance and in depth concept development. This is followed by the use of mobile devices for understanding the three dimensional structures of biological molecules, clinical case studies and watching animations of complex biochemical reaction steps. This implied that mobile based SDL helped the students address a higher cognitive domain on the Bloom's taxonomy pyramid and manifested their utility as a study tool not only for collection of the information but also for their comprehension, application and analysis ofthat information.[22] The findings also suggest strongly the important areas where the strength of SDL can be increased for better student learning. The practice of browsing through case studies online signifies the usefulness of m-learning as a mode for early clinical exposure. Moreover, the data in table no.2 indicates that few avenues like preparing MCQs for PG entrance, concluding remarks, reinforcement of key topics, preparing question banks etc .are not that much favorable using electronic devices.

Implications of the present study: Keeping in mind the paradigm shift in the GMR 2019 from teacher centric learning method to student-centric learning methods, the importance of self-directed learning has been given much more stress on the CBME. However, as the SDL is a self-learning procedure, motivation of students for their involvement in it, requires also their choice of topics and preference of conceptual development in the context of cognitive and skill development domain. The present work has delineated the preference of the topics and different domains of learning utilized by the 1st professional students that will help much in formulating the process of SDL for better utility among students.

Limitation

Our study might be limited by some recall bias as the students were asked to self-report their usage.

CONCLUSION

Mobile devices are universally being used for self-directed study in Biochemistry by the phase 1 MBBS students from the beginning of their course duration. Students found mobile based SDL most effective for the study of competencies under Clinical and applied Biochemistry and Molecular Biology in the undergraduate Biochemistry curriculum. E- learning was mostly used by students for concept development and doubt clearance of the subject matter being taught in their classes.

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