

**ORIGINAL ARTICLE****A Comparison of Computer Assisted Learning Teaching Method and Traditional Teaching Method in Amphibian Physiology Practical for First Year MBBS Students****Archana Dogra Chauhan<sup>1</sup>, Arun Chauhan<sup>2</sup>, Monia Rathore<sup>3</sup>****Authors' Affiliation:** <sup>1</sup>Assistant Professor, Dept of Physiology, Dr. Yashwant Singh Parmar Government Medical College, Nahan; <sup>2</sup>Associate Professor, Dept. of Surgery, IGMC, Shimla; <sup>3</sup>Associate Professor, Dept. of Physiology, Dr. Yashwant Singh Parmar Government Medical College, Nahan**Correspondence:** Dr. Archana Dogra Chauhan, Email: archanadogra06@gmail.com, Mob no.: 9418011362**ABSTRACT****Background:** The study aimed to compare Computer Assisted Learning (CAL) with Lecture-Demonstration in 1st Prof MBBS students.**Methodology:** First year MBBS students were taught Amphibian physiology by CAL method and lecture demonstrations method in two separate practical sessions. In First Practical Session, 50 students (Group I) were taught using lecture demonstrations and the 50 students (Group II) were taught by CAL. After two weeks, in Second Practical Session a crossover was done. Both the groups were evaluated for the knowledge gained using the validated Post Test. The analysis was done using SPSS statistical software.**Result:** The Post Test score was significantly better in the group taught with CAL. The scores of slow learners in the study group I showed a significant improvement after CAL.**Conclusion:** CAL is an interactive, active learning method which can be used to substitute and supplement the lecture demonstration method to teach Amphibian Physiology in 1st Prof MBBS Physiology curriculum. CAL also offers a self paced learning which is particularly useful to the slow learners.**Key words:** Physiology Amphibian Practical, Computer Assisted Learning, Lecture Demonstration Methods, First Year MBBS Students**INTRODUCTION**

In the recent era, there has been lot of changes in the teaching methodologies in the field of medical education. The focus has now shifted from the "teacher centric" approach of traditional lecturing to "Student centric" concept with active learning. The practical sessions in Physiology laboratories allow the students to understand the fundamental concepts of Physiology by ensuring psychomotor skill development by animal dissections. Lecture and demonstrations on live tissues has been regarded as a gold standard method of teaching in Amphibian physiology which has witnessed a noticeable decline over the past few decades which may be attributed to the stringent laws imposed by animal ethical bodies and other issues.<sup>1,2,3</sup>

A computer assisted learning (CAL) is a low cost, computer-based instructional system used as an alternative learning tool for non animal laboratory session. CAL may be particularly appropriate where the running cost of animal lab is high or where they are difficulties in availability of technical expertise for animal experimentation.<sup>4,5</sup>

Medical Council of India (MCI) has recently advocated the use of CAL as an effective teaching learning method. However, a shift from the traditional teaching to CAL involves many difficulties in acceptance of change due to various academic, administrative, financial reasons.<sup>6</sup> In India, not many studies are available to assess the CAL as teaching learning method in medical curricula. Therefore, before the implementation of the recommendations from MCI for experimental physiology, we wanted to know the effectiveness of CAL on the knowledge gained by students in the Department of Physiology in our institute. We aimed to compare CAL with a traditional lecture-demonstration methodology in experimental physiology teaching in 1st Prof MBBS students.

**MATERIAL AND METHODS**

An interventional, prospective study was done in the Department of Physiology with prior approval from the institutional ethical committee. We included in the study a total of 100 first Prof MBBS students

who were not previously exposed to amphibian experimental physiology by demonstration or CAL /Animal Simulation program.

Informed consent was obtained from all the participating students and the resource faculty for the study. CAL teaching was done by Animal Simulator (Reed Elsevier India Pvt. Ltd, product@animalsimulator.com). Validated Pre & validated Post Test Question Paper containing 20 MCQs and 5 open ended questions were prepared for the topics of amphibian physiology to determine the effectiveness of the different teaching methodologies.

The class of 100 first year medical students was divided into two practical groups of 50 students each. The groups were selected by Systematic Random Sampling .Teaching methodologies used for the study were by lecture demonstration and CAL method.

Four topics were chosen from the amphibian experimental physiology to be taught to both the groups by two different teaching methods in first and second practical sessions.

The following topic relating to the amphibian physiology chosen were:

1. Dissection and nerve muscle preparation of frog.
2. Recording of a Simple muscle twitch.
3. Dissection and frog heart preparation.
4. Recording of normal cardiogram of Frog.

At the start of the study, a Pre-Test was conducted using validated Questionnaire on all 100 participants of 1st Prof. MBBS students. A post test was conducted at the end of the each practical session. The study population was subdivided into two group based on the Post Test scores in First Practical Session into slow learners (SL) with < 50 % score and good learners(GL) $\geq$ 50% score.

For the First Practical Session, Group I was selected for Lecture-demonstration group and Group II for teaching by CAL Program. Group 1 was given Lecture demonstrations in a three hour interactive practical session by skilled resource faculty. In each lecture demonstration practical session the students asked questions and clarified doubts wherever they existed. While Group II attended three hour CAL interactive session for the same topics covered by the skilled resource faculty. They were encouraged to learn at their own pace using CAL.

At the end of the session a validated Post Test comprising of 20 multiple choice questions (MCQs) and 5 open ended questions was given to all 100 students of both the groups to assess the skill and knowledge acquired after First Practical Session.

After 2 weeks in a Second Practical Session, a cross-over of teaching methodologies was done for the study groups. Group I, who were earlier taught by lecture demonstration were given Second Practical Session by CAL and Group II who were taught by CAL in First Practical Session were taught in Second Practical Session by lecture-demonstration.

At the end of the session, the students of both the groups attempted the Post Test with 20 MCQ and 5 open ended question to assess the knowledge acquired at the end of the session after the Second Practical Session.

**Statistical Analysis:** Statistical analysis was done using SPSS version 18, statistical software (SPSS, Inc., Chicago, USA) . Comparisons between means were carried out by parametric (two-tailed t-test) ( $P<0.05$  indicated statistical significance).

## RESULTS:

A comparison of marks obtained in the test by the two groups were analysed and the test results of p value less than 0.05 was taken as significant. The Post Test marks of group II were better than group I students and there was statistically significant difference ( $p<0.05$ ) (Table 1)

On analysis, of the post test marks of both the groups, it was observed that there were greater number of slow learners by lecture demonstration method compared to those who were taught by CAL program .It was found that students of Group I improved in the scores after Second Practical Session by CAL. There was statistical significant gain in the score by Slow Learners after second practical session by CAL (Table 2).

We found no statistical significant difference between Slow Learners and Good Learners on the marks gained in post test after second practical session (CAL) by lecture demonstration (traditional Teaching) in group II. (Table 3)

**Table 1-**The comparison Post Test scores on first practical session of group I (lecture demonstration) and group II (CAL)

Groups	Students(n)	Post-Test score (First Practical Session) (Maximum Marks =25) Mean $\pm$ SD
Group I	50	14.78 $\pm$ 2.01
Group II	50	18.81 $\pm$ 1.65

Group I= Lecture demonstration method; Group II=CAL method; \*P 0.045(significant) :CAL-computer assisted learning

**Table 2: Comparison of Post Test Score of Slow Learners and Good Learners of group I after second practical session (CAL method)**

Group I	n	Post test score (Max marks = 25) (Mean±SD)		p value
		First Practical Session (lecture demonstration)	Second Practical Session (CAL)	
Slow learners-SL (scored <50%)	32	8.48±1.4	14.22±2.0	0.0001**
Good learners-GL (scored ≥ 50%)	18	14.64±4.44	18.22±2.24	0.002*

Data are presented as means ± SD ; \*P <0.05:CAL-computer assisted learning

**Table 3: Comparison of Post Test Score of Slow Learners and Good Learners of group II after Second Practical Session (Lecture demonstration)**

Group II	n	Post test score (Max marks = 25) (Mean±SD)		P value
		First Practical Session (lecture demonstration)	Second Practical Session (CAL)	
Slow learners-SL (scored <50%)	21	10.52±2.82	12.42±3.88	0.062
Good learners-GL (scored ≥50%)	29	16.58±3.56	18.86±4.88	0.07

Data are presented as means ± SD ; \*P <0.05:CAL-computer assisted learning

## DISCUSSION

The concept of active learning has introduced new dimension to medical education. The recent researches in medical education have proved that learning and participation are inseparable. A paradigm shift to student-centred learning over a strictly lecture approach has increased student participation and learning.<sup>7</sup>

Educationists are excited about the potential of so called third generation distance education technologies to provide a "rich environment for active learning"<sup>8</sup> There is a transformed view of the nature of knowledge itself as dynamic, open ended, multidimensional, and public rather than static, finite, linear, and private.<sup>7</sup>

A number of studies<sup>2,3,9</sup> have compared traditional animal dissection with various alternatives. However, these studies are not directly comparable because of different setting, sample sizes and methodologies used.

Studies on the use of digital technologies in health professions' education in general have reported advantages over traditional learning. There is an improved diagnostic reasoning skills, interpersonal and professional competencies, long-term knowledge retention, problem-solving skills, self-direct/lifelong learning skills, higher order thinking skills, self-perception and confidence.<sup>10,11,12</sup>

In the present study, we found that the CAL had more effectiveness in the acquisition of knowledge compared to the Traditional Lecture- Demonstration in the study population. The students of the study population had scored better after CAL sessions compared to the lecture demonstration practical sessions. It was also observed that the number of slow learners was more after lecture demonstration than after CAL. This may be due to the reason that

CAL simulates a visual environment which helps a student to conceptualise visually intensive and detail oriented processes relating to experimental physiology.

In previous studies,<sup>13-15</sup> it was found that the students had shown a better performance with CAL. This was attributed to more flexibility and an improved ability to accommodate individual learning styles with CAL.

Richa<sup>13</sup> concluded from the study on 50 MBBS first professional students that the students easily gain learning objectives and achieve better scores by CAL in some topics of nerve muscle physiology. They also concluded from their study that CAL can actively involve students even in large classes as it provides an effective alternative to animal demonstrations in teaching experimental neuromuscular physiology.

CAL programmes have been widely adopted because of its standardized content, integration with traditional teaching material, ease in updating the content and ease of teaching with wide range of learning activities. Active learning involves use of various teaching learning methods that are able to guide the progress of students from level of knowing to higher level of learning by being able to interpret and analyse. CAL methodology focuses on the cognitive domain rather than just psychomotor skill acquisition.<sup>15</sup>

Although computer simulations are considered effective in helping students acquire basic physiological concepts, there are evidences that the students acquire a more thorough understanding of the material through the more advanced and challenging experience of an animal laboratory.<sup>16</sup> Cross<sup>17</sup> compared the virtual and actual dissections and found the importance of experiential components of learning. Sanhita Mukherjee<sup>14</sup> observed that Simulation Based Teaching cannot provide acquisition of lab

skills, but they clearly stated that it can replace animal demonstrations on live tissues. While, Balcome<sup>18</sup> concluded by evaluating twenty studies that CAL or alternative methods are pedagogically equivalent to animal dissections.

In current scenario of Medical education, we need to find alternatives to animal dissection. CAL provides an interactive and personalized learning experience of “virtual” cases that may reduce the need to use animal or human tissue in learning.<sup>6</sup>

In our study, we also found that the slow learners of Group I showed a significant improvement in the scores after second practical session with CAL. This observation probably points out, to one of the most potential important advantage of teaching by CAL is its benefit to the slow learner students. Since CAL offers self-paced learning, it puts students in control of their learning resources which is especially helpful for slow paced learners.<sup>19</sup> CAL allows the students to pause and grasp what they've learned and then resume, allowing them to customize.<sup>20</sup> CAL provide the learners with a flexible learning module and every student gets an opportunity to progress at his or her preferred pace.

However, there are studies<sup>21, 22</sup> that observed this self paced learning may not be advantageous to some other students. They observed that the flexibility in the timing of learning lead to the lack of interaction with other learners and the instructor which may lead to social isolation and discouragement of team work. Whereas, the traditional lectures allow students to directly interact with the instructor and suggesting that CAL may be not a perfect tool for replacing in-class lectures.

It will be incorrect to assert that CAL represents a complete educational replacement for animal laboratories. CAL help to strengthen the understanding of the class lectures and supplements the learning experience. Hence, the laboratory exercises should always be designed to help fulfil learning objectives such as those defined in the Medical Physiology Learning Objectives.<sup>23</sup>

## CONCLUSION & RECOMMENDATIONS

In our study we found that CAL was highly effective in large group teaching and is also helpful in situations with limitation of time and resources. The slow learners were benefitted by CAL as it enabled them to learn better at their own pace.

In order to effectively implement CAL in the medical curriculum a planned, phased and coordinated integration into the present methodologies of teaching and learning is a requisite. CAL may only be able to deliver the important educational advantages to the students after it is made user friendly. This can

be achieved by the effective basic technical skill acquisition training for staff and students so that they develop competence in online learning.

Students can gain maximally by CAL teaching methodology when they are guided along the course by a student-oriented learning module. A student oriented module can facilitate their self directed and self paced active learning.

Further, an information technology staff would be required to develop and update the content of the software to meet the need based institutional level based learning objectives from time to time.

## LIMITATION

The study conducted is a short duration, single institution based study. It is recommended that further studies using multiple centres with a large sample size on the current topic would be useful.

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