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**Research Article**

# The Scope of Computer Based Learning Dissection Modalities in Today's Technological Era over the Conventional Anatomical Teaching

**Dr. Jayanta Sarkar***
*Assistant Professor, Department of Anatomy, Noida International Institute of Medical Sciences, Noida.
E-Mail: *drjayanta.13@gmail.com
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**ABSTRACT**
**Background:** Indian medical school has always used cadaveric dissection as a valuable learning method. Globally, via advancements in medical education and the implementation of innovative learning methods, the traditional practice of cadaveric dissection has been supplemented by alternative approaches including live anatomy and virtual anatomy.
**Aim:** To study Computer based learning Dissection Modalities in Today's Technological Era over the Conventional Anatomical Teaching.
**Materials and methods:** The current research comprised a total of 100 students. A self designed survey was used to evaluate the perspective of students and instructors about cadaveric dissection and alternate ways of teaching anatomy. Students had a pre-test assessment on the specific subject of dissection and were separated into two groups. One group was assigned to Conventional Based Learning [CNVL] whereas the other group was assigned to Computer Based Learning [CBL]. Subsequently, the groups were exchanged and assessed using a post-test assessment.
**Results:** The majority of the participants were female, accounting for 66%, while the remaining participants were male. The majority of participants were between the age categories of 25-30 years, comprising 39% of the total. The current research revealed that the Computer Based Learning (CBL) approach was determined to be more efficacious and favored by both the students (84%) and the teachers (86%). This was statistically connected using a chi-square test. The correlation coefficient r=0.77 indicates a positive correlation between the before and post scores, suggesting that there is an impact of the research. The findings demonstrated a significant rise from the pre-test (33%) to the post-test (68%), with a p-value of 0.05 indicating a significant impact.
**Conclusion:** Our findings indicate that the use of Computer Assisted Learning methods during Anatomy dissection yielded the most comprehensive understanding of anatomical concepts. Nevertheless, dissection is still regarded as the optimal method by several clinicians due to its significant contribution to the study of anatomy.

**Keywords:** Computer Based Learning, Conventional Based Learning, Anatomy Dissection.

## INTRODUCTION

Anatomy education has progressed from the traditional blackboard technique to more advanced teaching methods such as the overhead projector, PowerPoint presentations, 3D models, virtual dissectors, and now, online remote learning via 3D virtual dissection. Human Anatomy is a fundamental topic in medicine, as it provides the necessary knowledge to comprehend the intricacies of the human body. Acquiring a thorough grasp of human anatomy is essential for becoming a skilled clinician, and it is the responsibility of Anatomy professors to fulfill this role.[1] Contemporary educators not only provide knowledge to their pupils, but also foster the learning process among them by using diverse modern technology. The introduction of these contemporary instructional technologies is not entirely novel; these methods are already being used, but their significance has grown enormously in the present circumstances. Therefore, it is essential for anatomy instructors to stay abreast of cutting-edge innovations in the field of medical education. Concurrently, the study patterns of students have undergone significant changes, as they no longer depend on textbooks as their primary source of information acquisition. They possess a high level of technological proficiency and are adept at using various technologies to enhance their understanding of anatomy. They are now using YouTube videos, diverse learning applications, and

participating in online workshops to enhance their dissection abilities.[2] new features such as anatomy studio, virtual dissector, simulation laboratories, and radiography machine have been included to facilitate the learning of anatomy. Endoscopic anatomy is a cutting-edge trend that goes beyond traditional anatomical postures and provides students with a fresh view on the human body.[3] it is widely recognized that a thorough understanding of anatomy, which can only be acquired via the dissection of cadavers, is essential for practicing medicine or surgery effectively. The paradigm of medical education has transitioned to problem-based learning and integrated curriculum. As a consequence, the focus of study has shifted to core fundamental scientific disciplines, such as anatomy, only within the framework of clinical application, whereas the practice of dissecting cadavers has been discontinued. Alternative pedagogical approaches are being used in the teaching of gross anatomy.[4] this problem will increasingly occur as time goes on. The enduring controversy of whether or not to do dissections continues to be a subject of ongoing discussion. There is a current discussion on the most effective method of teaching anatomy within a student-centered, problem-based learning (PBL) framework. The literature indicates the presence of two viewpoints: traditionalists who support teaching through the dissection of human cadavers, and reformers who promote the use of various methods such as prosected specimens, plastinated specimens, computer-assisted software, and radiological imaging. These reformers consider cadaveric dissection as just one of many strategies to enhance student learning in anatomy.[5] Computer-based educational programs are now being used to aid the shift from a mostly lecture-based method of teaching to a primarily online one. The Complete 3D Anatomy training package from Elsevier was effectively used for teaching functional Anatomy throughout the epidemic. The voice recording capabilities enable us to produce videos by combining dynamic 3D representations and creations. Video lectures may be integrated into the learning management system (LMS) or directly shared with a group of learners via the program's platform.[6, 7]

## MATERIALS AND METHODS

The research used a quantitative cross-sectional self-report questionnaire to gather demographic information and assess the learning behavior linked to computer-based learning (CBL). The results were assessed among the anatomy students and faculty members. The duration of this research was 5 months, namely from May 2021 to Sep 2021. The current research comprised a total of 100 students. A self-designed survey was used to evaluate the perspective of students and instructors about cadaveric dissection and alternate ways of teaching anatomy. Students had a pre-test assessment on the specific subject of dissection and were separated into two groups. One group was assigned to Conventional Based Learning [CNVL] whereas the other group was assigned to Computer Based Learning [CBL]. Subsequently, the groups were exchanged and assessed using a post-test assessment. The current research also included the perspectives of the professors. The data was analyzed using SPSS version 25.0. The chi-square test was computed.

## RESULTS

Table 1. Format of Questionnaire for Student Questionnaire

| | |
|---|---|
| 1 | Straightforward to get |
| 2 | Reduced time for acquiring knowledge |
| 3 | The student's practical knowledge |
| 4 | Deep learning |
| 5 | Fascinating Collaborative education |
| 6 | Real-time efficiency |
| 7 | Offer comprehensive knowledge |
| 8 | More affordable |
| 9 | Acquire knowledge from any location |
| 10 | Acquire knowledge at every given moment |

Table 2. Format of Questionnaire for Faculty Questionnaire

| | |
|---|---|
| 1 | Straightforward approach to instruct |
| 2 | Well-suited for group instruction |
| 3 | Affordable |
| 4 | Real-time efficiency |
| 5 | Faculty preference |
| 6 | Scarce resources accessible |
| 7 | There is no need for a specific location. |
| 8 | Demonstrated proficient understanding |
| 9 | Simple to manage |
| 10 | Enhance one's knowledge |

Table 3 Gender and Age of the Participants

| | **Number** | **Percentage** | **P value** |
|---|---|---|---|
| Gender | | | 0.13 |
| Male | 34 | 34 | |
| Female | 66 | 66 | |
| Age | | | 0.17 |
| Below 20 | 16 | 16 | |
| 20-25 | 28 | 28 | |
| 25-30 | 39 | 39 | |
| 30-35 | 10 | 10 | |
| Above 35 | 7 | 7 | |

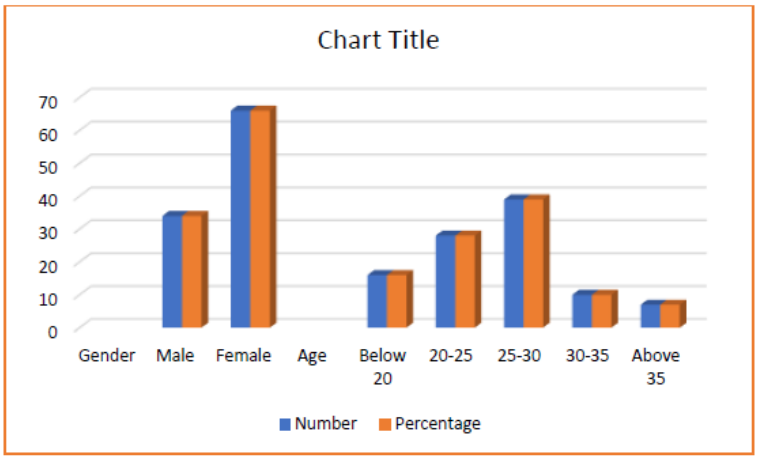


Figure 1. Gender and Age of the Participants

Table 3 indicates that the majority of the participants were female, accounting for 66%, while the remaining participants were male. The majority of participants were between the age categories of 25-30 years, comprising 39% of the total.

Table 4. Differences between Computer Based Learning and Conventional Based Learning in Students

| | **Computer Based Learning** | | **Conventional Based Learning** | | **P value** |
|---|---|---|---|---|---|
| | Number | Percentage | Number | Percentage | |

| | | | | | |
|---|---|---|---|---|---|
| Strongly Agree | 30 | 60 | 15 | 30 | 0.03 |
| Agree | 12 | 24 | 10 | 20 | |
| Disagree | 8 | 16 | 25 | 50 | |

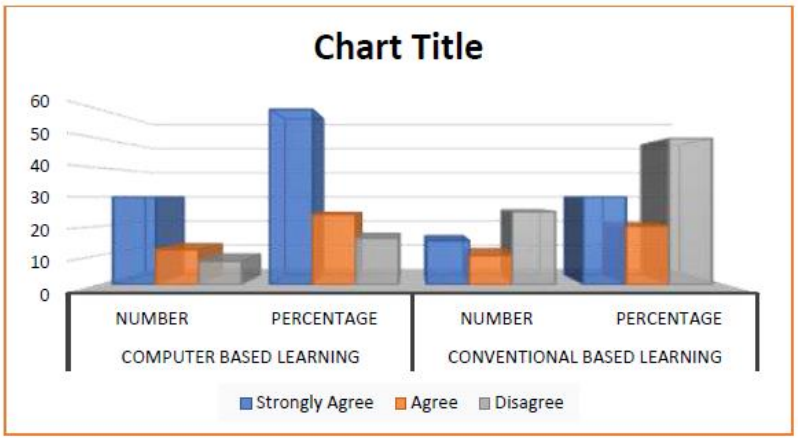


Figure 2. Differences between Computer Based Learning and Conventional Based Learning in Students

Table 5. Differences between Computer Based Learning and Conventional Based Learning in Faculty

| | **Computer Based Learning** | | **Conventional Based Learning** | | **P value** |
|---|---|---|---|---|---|
| | Number | Percentage | Number | Percentage | |
| Strongly Agree | 30 | 60 | 10 | 20 | 0.02 |
| Agree | 13 | 26 | 8 | 16 | |
| Disagree | 7 | 14 | 32 | 64 | |

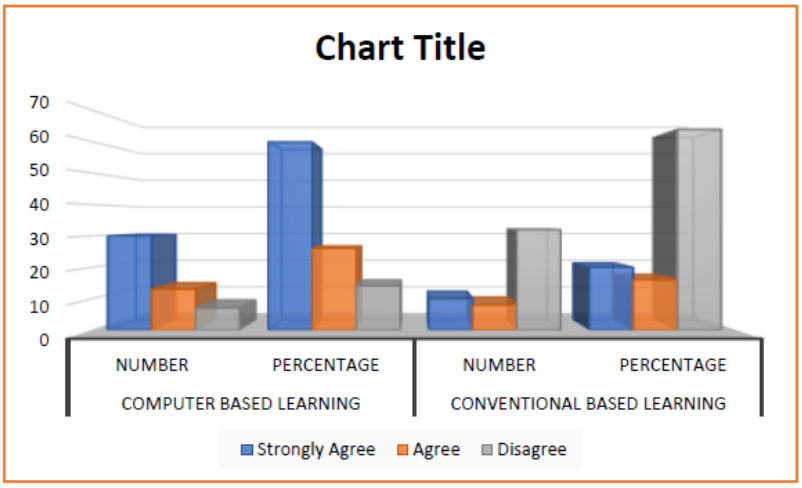


Figure 3. Differences between Computer Based Learning and Conventional Based Learning in Faculty

The current research revealed that the Computer Based Learning (CBL) approach was determined to be more efficacious and favored by both the students (84%) and the teachers (86%). The data is shown in tables 4 and 5. This was statistically connected using a chi-square test. The correlation coefficient r=0.77 indicates a positive correlation between the before and post scores, suggesting that there is an impact of the research. The findings demonstrated a significant rise from the pre-test (33%) to the post-test (68%), with a p-value of 0.05 indicating a significant impact. (Table 6)

Table 6. Per Teat and Post Test score

| | Pre Test | Post Test | R value | P value |
|---|---|---|---|---|
| Mean | 9.12±1.11 | 17.64±2.35 | 0.77 | 0.04 |
| Percentage | 33% | 68% | | 0.04 |

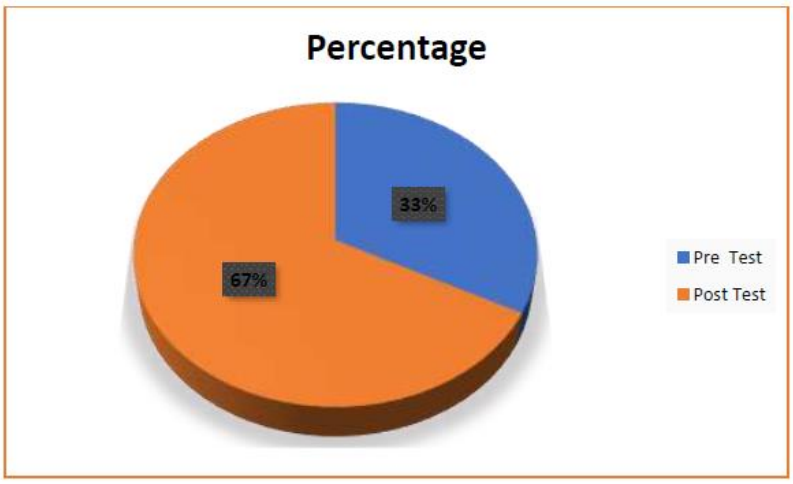


Figure 4. Per Teat and Post Test Score

## DISCUSSION

The majority of the survey questions showed little gender variance in their descriptive statistics, with the exception of empathy and positive conduct. Research conducted by Akpan and Andre discovered that there is no discernible disparity between genders in terms of the effects of dissection.[8] Further research investigated student perspectives and found that male students exhibited more motivation than female students in the context of cadaveric dissection.[9] Hancock et al. similarly found similar results, noting that females had higher rates of worry, stress, and other psychological problems.[10] Female individuals have a higher level of sensitivity compared to males in the dissection room.[11] The use of tactics such as visiting the dissection hall, engaging in discussions on cadaveric donation and dissection, and watching recordings of cadaveric dissections shown to be beneficial in addressing these difficulties.[12] The assistance of a student's adviser may contribute to the mitigation of fear and anxiety.[13] Medical education should include strategies to assist female students in managing their heightened vulnerability to stress during dissection sessions. In the late 20th century, dissection served as the fundamental foundation in medical school, and possessing sufficient anatomical knowledge is crucial for surgeons and those conducting invasive treatments on patients. Proficiency in anatomy is essential for conducting a thorough medical examination, accurately diagnosing patients, and effectively communicating with other professionals.[14] Currently, Africa and the USA are the primary regions where medical schools provide Cadaveric Dissection (CD). Across Africa, 90% of medical schools, as well as a significant majority of medical schools in North and South America, include CD (Clinical Decision-making) in their undergraduate curriculum. A study conducted among 65 medical schools in the United States revealed that dissection is included in the majority of anatomy education curricula. Several medical institutions in Canada have chosen to include compulsory dissection in their undergraduate medical curriculum. However, the University of Saskatchewan provides the option of dissection to students who are interested. Most medical colleges in Asia do not provide statistics on CD. Nevertheless, the research indicates that in India, Sri Lanka, Bangladesh, China, Korea, and Thailand, several medical schools still use CD assistance in teaching anatomy.[15] Tam MDBS states that the benefits of using dissection include understanding the complex nature of the human body, perception through touch, recognizing anatomical differences, developing practical dissection skills, and gaining awareness of ethical and moral concerns related to working with cadavers.[16] Bekele et al. reported that a number of medical colleges in the United Kingdom had completely eliminated the practice of dissection.[17] However, active

dissection projects continue to exist in the United States, Germany, and Africa. Research indicates that the decrease in anatomical instruction has significant implications, particularly in relation to the quality of patient care. Since the beginning of the contemporary medical curriculum, the teaching of anatomy and the dissection of cadavers has been reduced or redistributed in medical school. Various experts in the fields of anatomy, surgery, and medical education have expressed differing views on the position of CD.[15] Over time, the rise of several concerns, such as the formation of multiple new private medical institutes specializing in different fields, has led to an increasing demand for cadavers for dissection, while the availability of corpses for this purpose has become limited. Due to the presence of glycerin, ethyl alcohol, and phenol in the embalming fluid used on cadavers, direct contact between one's skin and clothes and the cadaver is now a significant health concern. According to our research, students who had the opportunity to utilize dissection found it to be less beneficial compared to computer-based dissection. Possible factors contributing to the issue include an inadequate ratio of students to cadavers (50:1), subpar ventilation and unpleasant odors in the dissection rooms, and variations in the learning speed of individual students. There is an ongoing discussion on the most effective method for teaching anatomy.

The Peninsula Medical School in the UK is instructing students in anatomy without the use of cadavers. They contend that physicians experience anatomy in clinical practice by means of live anatomy and medical imaging. Consequently, they feel it is logical to teach anatomy in these situations from the very beginning.[16]

Computer aided learning (CAL) allows undergraduate institutions without access to cadavers to provide a comprehensive course in human anatomy by simulating dissection of certain systems or regions. This resource provides a comparison of the structures using radiography and magnetic resonance imaging, as well as the histological appearance of the structure. The feature enables the user to magnify the structure and rotate the pictures among the four perspectives, namely anterior, posterior, medial, and lateral. The operator has the ability to designate a structure by its name and may acquire a highlighted perspective or request a distinctive label on the structure by projecting photos onto a sizable screen for the purpose of delivering a lecture. The computer software program has the capability to utilize pathological material as a visual aid when demonstrating regional anatomy. Additionally, it offers the option to include pre-existing teaching material in study guides, sample questions, as well as histological and radiographic material.[17,18] Our research found that both students and teachers identified several qualities of computer-assisted learning modalities in Anatomy dissection. One key benefit is that this kind of learning can be tailored to the individual's needs and can be accessed at the student's own speed, making it very convenient. The use of interactive computer resources, such as virtual dissections, animations, or decision making, has immense promise. Electronic resources have the capacity to reproduce adult learning by fostering curiosity and facilitating investigation, which are the foundational principles of this kind of learning. Alternatively, Computer-Assisted Learning (CAL) may be used as an additional tool to the existing teaching techniques. It can effectively provide educational content and is especially valuable in illustrating complicated concepts that may be difficult to comprehend using traditional resources such as textbooks or cadavers. [16]

## CONCLUSION

Our findings indicate that the use of Computer Assisted Learning methods during Anatomy dissection yielded the most comprehensive understanding of anatomical concepts. Nevertheless, dissection is still regarded as the optimal method by several clinicians due to its significant contribution to the study of anatomy.

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