

## A COMPREHENSIVE STUDY ON MUSEUM BASED- ANATOMY LEARNING

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### ABSTRACT

Anatomy education has traditionally relied on cadaveric dissection and informative lectures. Although effective, these methods may be limited by ethical concerns, cost, availability of cadavers, and reduced interactivity. Museum-based learning (MBL) has emerged as an alternative and complementary educational strategy that integrates visual, tactile, and contextual experiences. Anatomy museums provide preserved specimens, models, charts, embryological and pathological samples that promote experiential learning. Unlike conventional classroom teaching, MBL encourages observation, analysis, comparison, and critical thinking, thereby improving clinical correlation and spatial understanding. This review explores the concept, historical development, components, and educational significance of museum-based learning in anatomy.

**KEYWORDS:** Anatomy museum, museum-based learning, medical education, anatomy teaching, experiential learning.

### INTRODUCTION

The word museum is derived from the Greek word mouseion, meaning the seat of the Muses, the patron divinities of arts and knowledge. Traditionally, a museum refers to a place where artistic importance are collected and displayed for education and public viewing. In medical education, an anatomy museum represents a structured collection of preserved human

specimens, models, and teaching aids that illustrate the structure and function of the human body.

Anatomy museums have played a dominant role in educating medical students and the public by demonstrating the complexity of human anatomy. The concept of the anatomy museum was first conceived by Edinburgh surgeons between 1700 and 1763 AD, where cabinets of curiosities containing anatomical specimens, books, and illustrations were displayed. Early anatomical models were prepared using materials such as wood, clay, wax, and ivory.

With the discovery of formalin by Alexander Mikhailovich Butlerov in 1859 and its later isolation by August Wilhelm von Hoffmann, anatomical preservation underwent a major transformation. Modern preservation techniques, such as the Pulvertaft-Kaiserling method, have enabled long-term specimen maintenance with minimal loss of color and structural integrity.

Museum-based learning (MBL) utilizes museum collections as an educational strategy. It integrates visual, tactile, and contextual experiences, transforming passive observation into active engagement. Anatomy museums contain wet specimens, skeletal remains, plastinated organs, embryological models, and pathological samples that help students understand spatial relationships and clinical correlations.

## **MATERIALS AND METHODS**

This study is a narrative literature review based on available descriptions of anatomy museums, museum-based learning strategies, and standard practices in specimen preparation and preservation. The content was derived from published literature on anatomy museums, preservation techniques, and educational methodologies.

### **Information regarding**

- Historical development of anatomy museums
- Specimen preparation and preservation
- Museum organization and maintenance
- Educational components of anatomy museums
- Role of museum-based learning in anatomy education
- was analyzed and synthesized to present a structured overview of MBL in anatomy.

## RESULTS

### 1. Structure and Components of Anatomy Museums

A well-organized anatomy museum typically includes the following sections:

#### a. Regional Gross Anatomy

- Specimens are arranged region-wise from head and neck to upper and lower limbs, thorax, abdomen, pelvis, and neuroanatomy.

#### b. Comparative Anatomy

- Displays comparing human anatomy with other species help students understand evolutionary relationships.

#### c. Embryology Section

- Models depicting stages of organ development made from materials such as plaster, clay, acrylic, or rubber.

#### d. Cross-Sectional Anatomy

- Specimens sectioned at different levels and compared with CT and MRI images to enhance clinical understanding.

#### e. Imaging and Radiology Section

- Display of normal and pathological radiographs, CT scans, and MRI images with explanatory notes.

#### f. Historical and Biographical Section

- Portraits and contributions of eminent anatomists, along with the evolution of dissection techniques.

#### g. Skill and Simulation Section

- Modern museums may include mannequins and skill labs for procedures such as intubation, catheterization, and ultrasound.

### 2. Specimen Preparation and Preservation

Proper specimen preparation requires

- Selection of fresh or well-embalmed specimens.
- Careful dissection with sharp instruments.

- Planning the size and orientation of the specimen.
- Fixation using standard protocols.
- Preservation techniques such as the Pulvertaft-Kaiserling method involve:
  - Fixation solution.
  - Color restoration solution.
  - Color maintenance solution.
- These techniques help maintain the specimens appearance over long periods.

### 3. Museum Maintenance

Effective museum maintenance ensures longevity and educational value. Key steps include:

- Regular checking of jar lids.
- Monitoring formalin levels.
- Preventing evaporation with Vaseline sealing.
- Replacing discolored or contaminated solutions.
- Inspecting specimens for damage or fungal growth.
- Replacing damaged labels.
- Transferring specimens from damaged jars.
- Cleaning jars, racks, and passages.
- Maintaining visitor discipline.
- Displaying museum rules.
- Preventing handling of specimens.
- Installing fire safety equipment.
- Monitoring through surveillance systems.

### 4. Educational Advantages of Museum-Based Learning

Museum-based learning offers several advantages:

- Provides first-hand visual experience.
- Enhances spatial and structural understanding.
- Encourages observation and critical thinking.
- Promotes self-directed learning.
- Improves clinical correlation.
- Integrates visual, tactile, and contextual learning.

- Unlike conventional lecture-based teaching, MBL transforms passive observation into active engagement.

## DISCUSSION

Anatomy education has traditionally depended on cadaveric dissection and lecture-based teaching. While dissection remains the gold standard, it is associated with several limitations such as high cost, ethical considerations, and limited cadaver availability.

Museum-based learning serves as a valuable supplement to traditional teaching methods. It allows students to repeatedly observe anatomical structures without the time constraints associated with dissection. The presence of pathological specimens and comparative models further enhances clinical understanding.

The integration of modern technology, such as virtual anatomy systems, 3-D holograms, and simulation mannequins, has transformed anatomy museums into dynamic learning environments. These innovations align with contemporary educational approaches that emphasize student-centered, experiential, and self-directed learning.

Moreover, museum-based learning encourages critical thinking by allowing students to observe, compare, and interpret anatomical structures. This approach is particularly useful in teaching applied anatomy and clinical correlations.

However, effective implementation of MBL requires

- Proper specimen preservation.
- Systematic organization of museum sections.

### Regular maintenance

- Adequate staffing and infrastructure.
- Integration with curriculum objectives.

## CONCLUSION

Museum-based learning is an effective and complementary approach to anatomy education. Anatomy museums provide a structured environment where students can observe preserved specimens, models, and imaging correlations, thereby enhancing their spatial understanding and clinical reasoning.

With the integration of modern technologies and structured educational strategies, anatomy museums can transform from passive display areas into active learning centers. Proper maintenance, organization, and curricular integration are essential to maximize their educational potential.

Museum-based learning represents a valuable tool for improving anatomy education, particularly in settings where cadaveric dissection opportunities are limited.

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