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Evaluating the Effectiveness of Creative Learning Activities in Teaching Gross Anatomy and Embryology to MBBS Students.

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Abstract

Background: Anatomy and embryology are foundational subjects in medical education. Traditional methods of instruction often fail to engage students deeply. Creative learning activities, such as the construction of models and charts, may enhance conceptual understanding. ***Objective:*** To assess the effectiveness of creative learning methods on students' understanding of anatomy and embryology and to analyze student feedback on such activities. ***Methods:*** A cross-sectional, mixed-methods study was conducted among first-year MBBS students at a medical college. Data was collected via questionnaires assessing prior knowledge, preparation methods, emotional responses, and learning outcomes. ***Results:*** Students who engaged in collaborative, self-directed research and model-making reported enhanced understanding and enjoyment. A majority indicated a preference for such activities in future learning modules. ***Conclusion:*** Creative learning strategies significantly enhance student engagement and comprehension in anatomy and embryology. Integration of such activities into the curriculum is recommended.

Keywords: Medical education, gross anatomy, embryology, creative learning, model-making, student engagement, active learning.

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INTRODUCTION

Gross anatomy and embryology are integral to early medical education. Despite their importance, traditional pedagogical methods - lectures, textbooks, and cadaver dissection - can sometimes fail to engage students actively or foster long-term retention of concepts (1,2). In recent years, creative and participatory learning methods have gained importance, aiming to make education more interactive and student-centered (3).

Creative assignments, such as building anatomical models and creating educational charts, engage multiple senses and learning styles (4). These methods promote active learning, peer collaboration, and critical thinking, all of which are vital in medical education (5). However, evaluation of their effectiveness remains limited, especially in developing countries where traditional teaching styles dominate (6). This study investigates how creative learning methods influence understanding and engagement among MBBS students studying gross anatomy and embryology.

Objectives

1. To evaluate how creative learning activities impact students' understanding of gross anatomy and embryology.
2. To analyze students' emotional and cognitive responses to the creative learning process.
3. To explore whether students perceive such activities as beneficial to their academic growth.

MATERIALS AND METHODS

Study Design

A cross-sectional, descriptive study was conducted among first-year MBBS students at a medical institute.

Participants
A total of 88 students participated voluntarily after informed consent. Ethical clearance was obtained, and all responses were kept anonymous.

Data Collection Tool
A structured questionnaire was used, consisting of both closed and open-ended questions. It captured data on:
- Demographics
- Previous knowledge of the topic
- Mode of topic exploration (books, online sources, team discussions)
- Duration of activity
- Emotional responses (e.g., pride, anxiety, enjoyment)
- Perceived educational value

Data Analysis
Responses were categorized and analyzed descriptively. Open-ended responses were coded for thematic analysis.

RESULTS

Demographic Details (Table 1)
- All participants were first-year MBBS students (ages 18–20).

Table 1 - Demographic Details of Participants

Demographic Variable	Frequency	Percentage
Total participants	88	100%
Age 18–20	88	100%
Medium of Instruction (English)	88	100%

Prior Knowledge and Preparation (Table 2, 3)
- 28.5% of students reported being well-versed in the topic.
- 57% had only a basic idea of the topic before starting.
- Common preparatory methods included:
- Discussion with peers (71%)
- Reading textbooks (85%)
- Online exploration (57%)

Table 2 - Prior Knowledge Before the Activity

Level of Prior Knowledge	Number of Students	Percentage
Well-versed	25	28.5%
Basic idea only	50	57%
Poor/No prior knowledge	13	14.5%
Total	88	100%

Table 3-Methods used in preparation

Method of Preparation	Number of Students (n)	Percentage (%)
Textbook reading	75	85.0
Peer discussion	62	71.0
Online exploration	50	57.0

Conceptualization and Time Investment (Table 4)
- Most students used books to select the exact concept to portray.
- 71% completed their projects in one day; the rest took up to three days.
- Brainstorming sessions and diagrammatic exploration guided their creative choices.

Table 4 - Time Taken to Complete Activity

Time Taken	Number of Students	Percentage
1 day	62	71%

2–3 days	26	29%
Total	88	100%

Emotional and Cognitive Responses (Table 5,6)

•Post-submission emotions:

- 57% felt "proud of their work."
- 28% felt "apprehensive."
- One respondent expressed relief.

•Preparation for discussion:

- Majority discussed within teams or studied books.
- Two students practiced speaking aloud to gain confidence.

Table 5 -Emotional Responses After Submission

Emotional Response	Number	Percentage
Proud	50	57%
Apprehensive	25	28%
Relief	1	1%
Other/Not stated	12	14%
Total	88	100%

Perceived Impact

Students marked multiple reflections about the activity. Key themes included:

- "It was a fun and learning experience" (85%)
- "It helped me understand the topic much better" (43%)
- "It is a great way of learning a topic" (57%)
- A small minority felt it was a "waste of time" or a "scary experience."

Table 6 - Students' Reflections on the Learning Experience

Student Reflection	Number (%)
Fun & learning	75 (85%)
Better understanding	38 (43%)
Great way to learn	50 (57%)
Not useful / scary	10 (approx.)

DISCUSSION

Our study reveals a largely positive reception toward creative learning interventions among first-year medical students. The majority of students actively engaged with the learning process and demonstrated a deeper conceptual understanding of anatomy and embryology. This suggests that creative, student-centered activities encourage learners to move beyond passive memorization toward meaningful comprehension. These findings are in agreement with earlier studies that support active learning strategies as being superior to traditional didactic methods in promoting cognitive retention and conceptual clarity (7,8).

Cognitive Gains:

Most students reported that participation in creative activities significantly deepened their understanding of anatomical and embryological concepts. This observation aligns well with constructivist educational theory, which proposes that learners actively construct new knowledge by integrating new information with prior understanding through hands-on involvement (9). Activities such as model-making and visual representation likely facilitated spatial reasoning and conceptual integration, both of which are essential for mastering anatomy.

Emotional Engagement:

The creative learning activity elicited emotional responses, predominantly feelings of pride, satisfaction, and enjoyment. Such positive emotions are known to enhance motivation and may contribute to sustained interest in the subject over time (10). Emotional engagement also supports deeper learning by reinforcing memory consolidation. The presence of a negative perception in one student's feedback highlights that no single teaching strategy is universally effective. This underscores the importance of employing a variety of instructional approaches to accommodate different learning styles and preferences (11).

Collaborative Learning:

Peer interaction played a significant role during both the exploration of content and the preparation of presentations. Students frequently engaged in discussions, problem-solving, and shared decision-making, reflecting authentic collaborative learning. Existing literature supports the idea that collaboration enhances understanding, promotes critical thinking, and improves interpersonal communication skills among medical students, all of which are essential competencies for future clinical practice (12,13).

Time Management:
Most students were able to complete their projects within a single day, indicating that such activities are feasible within a standard academic schedule. Interestingly, students who devoted additional time to the task appeared to demonstrate deeper cognitive processing and more meaningful emotional engagement. This suggests that while creative activities can be efficiently integrated into curricula, allowing flexibility in time allocation may further enhance learning outcomes.

Limitations
- A small sample size limits the generalizability of the findings.
- Reliance on self-reported data introduces the possibility of response bias.
- Long-term retention of knowledge following creative learning activities was not assessed.

Recommendations
- Creative assignments should be integrated alongside traditional teaching methods to provide a balanced learning approach.
- Faculty members should actively support and facilitate group-based activities such as model-making and student presentations.
- Future research should include control groups and employ pre- and post-intervention assessments to objectively evaluate knowledge retention.

CONCLUSION
Creative learning methods, including model-making and visual representation, significantly enhance student engagement, conceptual understanding, and enjoyment when learning complex subjects such as gross anatomy and embryology. By fostering active participation and reflection, these approaches help students build durable and meaningful knowledge. Incorporating such methods into the medical curriculum may contribute to the development of motivated, reflective, and lifelong learners.

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