

**EXPLORING TRADITIONAL AND ACTIVE METHODS FOR
TEACHING AND LEARNING EMBRYOLOGY****Sahar Youssef***

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ABSTRACT

Human embryology is a complex topic of study that forms one of the most important basic medical sciences and has a fundamental role of medical education that is relevant to all health care specialties. Students must receive a proper and sufficient training in the embryology education. Teaching of embryology states some challenges such as decline in the time allocated, teachers, student-teacher percentage, availability of teaching area, and educational materials. The aim of this review article to discuss knowledge available about traditional, active teaching and learning embryology that will assist educators when constructing and implementing curriculum including outcomes, activities, and assessments.

KEYWORDS: Embryology, Animation, Models, PBL, TBL, blended learning.

INTRODUCTION

Embryology is considered a sub- discipline of anatomy and forms an integral part of the preclinical basic science teaching in medical curriculum. It has been an essential for understanding the development and congenital malformation. Embryos are susceptible during the embryonic stages to teratogens that can cause congenital malformations such as maternal drugs, infections, and nutritional deficiencies. Embryology has significant practical and assists as the perfect link between basic sciences and clinical specializations applications in many specialties such as general surgery, ear–nose–throat, craniofacial surgery, pediatrics, and obstetrics.^[1,2,3]

The teaching of the embryology can be different from institution to other institutions including topics, general or special system, time allocated, and course specification.^[4] A significant number of medical schools assign inadequate time to embryology education, resulting in ill-prepared students to relate embryological principles in clinical sites. Previously, researchers suggested that some medical schools have independent embryology teaching course. Other schools, embryology is incorporated into the gross anatomy or histology teaching course but still few schools, embryology does not occupy a recognized part of the curriculum.^[5] Most medical institutions within United states and Australia, are steadily transferring from the classroom-based study of embryology, choosing to impart the knowledge during the student's clinical years.^[6] Importantly, the time assigned for anatomy teaching has diminished significantly with embryology. Few medical schools around the world have excluded embryology from their new curriculum.^[7] Researchers documented that teaching of embryology varies between countries and from different universities within the same country.^[8]

Traditional Teaching

Traditional teaching policies in the academic medical training characterized by submissive transmission of content by the teacher. Most of the students used textbooks to study embryology in addition to the traditional lectures. Educators used chalk and board, diagrams and 2D models.^[9] The traditional didactic lecture is an effective for showing information and preparing explanations but insufficient when the instructional targets contain the application of knowledge.^[10]

Active Teaching and Learning

Active teaching approaches are instructional method that involves students in the learning practice. Moreover, the opportunity to develop visual information is an essential to understand embryonic development. Multimedia methods are created diverse teaching tools to improve interactivity and visualization including wax models, animation, films, videos, computer-assisted learning, and blended learning methods.^[11,12,13] These approaches can create easily mental image visualization through 3D and dynamic diagrams. However, most commercially existing digital embryology models are expensive, making them less approachable for some universities to use.^[14]

Constructing Models

Using models in human embryology courses is characterized by several advantages to aid learning, since the students can see and touch the models. Various materials for constructing models such as clay, paper, or playdough are used.^[15] Modelling clay can be easily implemented and has impact on student learning and a very low cost.

ANIMATION

Animation is a series of images or drawings such as hand-drawing, painting, scratching, and computer graphics.^[16] Importantly, access to embryology animation tools aid long and short-term retention of information.^[17] Students assumed animated PowerPoint (PPT™, Microsoft®) presentations during lectures to be a beneficial supplement to the course.^[18] Animations developed throughout the years to show fertilization, folding, intestinal rotation, and heart septation. The development of gastrulation and neurulation animated learning tools permit for a more retaining learning practice. No broad scope for standard animation is due to the cost and complexities.^[19]

Blended Learning

Blended learning is the integration of face-to-face classroom learning with small online course improves active learning and academic performance of embryology (**Figure 1**).^[20] Flipped class students obtain basic information through study materials such as lecture PPTs, short videos, web links, and handouts for related topics before class by the concerned faculty member.^[21] The flipped class method stimulates a deeper learning practice for theoretical embryology topics. This approach accelerates in becoming a 'self-directed adult learner' because the students come trained for cooperating teaching session.^[22] Students are engaged in the new active teaching-learning policies such as Problem-Based Learning (PBL): Case-Based Learning (CBL): Team-Based Learning (TBL): and Process-Oriented Guided Inquiry Learning (POGIL).^[23] PBL in which students engaging in discussions centered around a specific topic or case study under teachers' supervision. The teacher's role shift from being sole of knowledge to be a mentor guiding the learning process facilitating self-directed. Application of PBL teaching method of congenital malformation showed improvement of student's teamwork skills, promotes their thinking, and develops their awareness in learning.^[24] Studies suggested that integrating flipped classrooms with PBL created a vigorous educational model that combines the strengths of both methods.^[25] The quality of the material information, timing should be cautiously reviewed by a team of teachers,

students' feedback on learning material, formative assessments and other activities for self-evaluation should be consistent and regular.^[26] TBL in general embryology to students of 2nd year faculty of Medicine (KSA) from 2015-2019 is applied. It is composed of pre-class self-study, assessment tests individually followed by assessment tests in the team and peer feed evaluation, the student results confirmed a high percentage of attendance, high marks in the team assessment tests compared to individually and traditional examination.^[27]

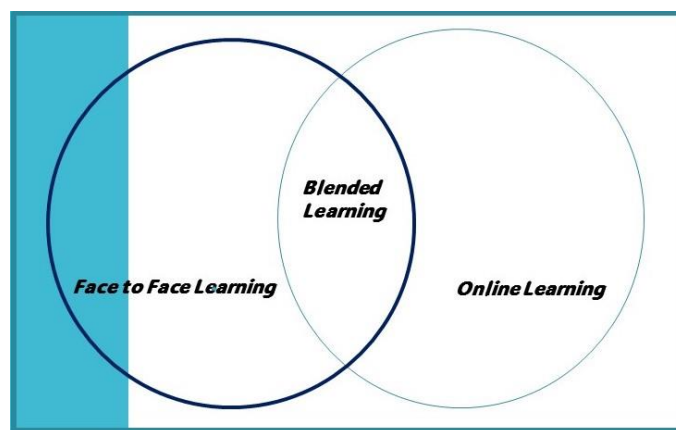


Figure 1: Diagram showing integration of online learning with traditional face to face classroom in the blended learning of human embryology.

Online Learning Platform

Modern Medical curriculum shifting embryology from a teacher centered classroom to student centered and self-directed learning with increasing use of technology, such as an online learning platform for teaching, learning and assessment. Engaging modern and different approaches in medical education has become crucial element.^[28] Online Embryology teaching using learning management systems seemed to be an effective additional learning tool among group of Egyptian medical students.^[29] social media allow for online communication have created virtual communities and have a positive effect on student learning such as Facebook and Twitter.^[30]

Mobile apps for teaching human embryology, Premal's 3 D Embryology is designed with ultimate interactive features such as 3D models that increase the educational practice for medical students.^[31]

CONCLUSION

Active teaching- learning approaches of embryology assist students to understand and create easily mental image visualization by using new learning techniques. Careful planning and

concern between traditional and active teaching are essential to confirm effective learning outcomes.

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