Res Dev Med Educ, 2023, 12, 28
doi: 10.34172/rdme.2023.33161
https://rdme.tbzmed.ac.ir

Letter to the Editor

# Optimizing learning in cross-sectional anatomy: A synergistic approach using Gagne's model and modified Peyton's teaching methodology

**Jahira Banu T*, Dinesh Kumar, Rajasekhar.SSSN, Nikilesh Sankaran, Udit Narayan**

Department of Anatomy, JIPMER, Pondicherry, India – 605006

**Received:** November 25, 2023 **Accepted:** December 15, 2023 **epublished:** December 26, 2023

**To Editor,**

Imaging modalities such as computed tomography (CT) and magnetic resonance imaging (MRI) require visualization with a different perspective compared to that rendered by conventional anatomy. These modalities render cross-sectional images that effectively provide a sliced/cross-sectional perspective of the body. This method offers the distinct advantage of visualizing individual anatomical structures in isolation, eliminating the superimposition of other structures. To effectively interpret these cross-sectional images and distinguish between normal and abnormal structures, a solid foundation in anatomical knowledge is indispensable. Medical students are regularly exposed to various cross-sectional CT and MRI scans during their educational period, each offering distinct insights into patients' anatomy and diseases.

In our pursuit of comprehending the intricate anatomical details of the human body through a cross-sectional lens, we conducted an enlightening workshop centered around the concept of cross-sectional anatomy. The primary objective of this workshop is to equip participants with a profound understanding of cross-sectional anatomy, enabling them to discern and locate anatomical structures within cross-sectional images. To achieve this we used two different teaching methods. We wish to document the core principles inherent in each method and assess their effectiveness in facilitating the understanding of cross-sectional anatomy.

We chose Gagne's instructional approach to establish the theoretical basis and modified Peyton's method to deliver practical demonstrations effectively.[1,2] The audience was a diverse group of MBBS students, numbering approximately 25, spanning various academic years, ranging from first to fourth-year students. We commenced the session with an engaging introduction, emphasizing the significance of sectional anatomy and stating the desired outcomes of the workshop (verbal information 1st step in Gagne's events of instruction). Since the bulk of CT and MRI images predominantly feature varying shades of grey, black, and white, distinguishing anatomical structures within them necessitates a sound understanding of basic anatomy. To contemplate this, we displayed images conveying the significance of acquiring knowledge about anatomical structures, typically observed in cadaveric cross-sections, and then applying that knowledge to discern those same structures in the darker, more complex images produced by CT and MRI scans (1st event in 2nd step of Gagne's: visual stimulus of gaining knowledge). Then the specific learning objectives of the session were discussed with the participants (2nd event in 2nd step of Gagne's). The students were given an orientation on the structures of neuroanatomy and the abdomen at the start of the course. We evaluated students' prior knowledge of neuroanatomy and abdominal region anatomy by asking questions presented through images on the screen.

Following that, the core component of the session involved instructing students on how to delineate anatomical structures within the cross-sectional cadaveric images were presented. Subsequently, we presented MRI images corresponding to the cadaveric cross-sectional images and guided students in deciphering the anatomical structures within the MRI images (3rd and 4th event of Gagne's model: Stimulating recall of prerequisite learning and presenting the stimulus material). Then, we proceeded to identify the landmarks in each section of the MRI taken from a distinct plane, by establishing anatomical correlations between them. We assessed the students' capability to identify anatomical features by presenting random images from various planes and testing their recognition skills (5th and 6th event of Gagne's model: Providing learning guidance and

***Corresponding author:** Jahira Banu T, Email: drjahiraalhadi@gmail.com

eliciting the performance). Students were given rewards and appreciation for providing correct responses, while incorrect responses were addressed and corrected (7th step of Gagne's event). An assessment was carried out after the completion of the cross-sectional image session. It involved identifying anatomical structures within the cross-sectional images, and the responses of all participants were documented (8th event of Gagne's model: Assessing the performance). Towards the conclusion of the session, cadaveric cross-sectional image specimens were presented alongside a clay model, allowing students to independently identify the structures (9th event: Enhancing retention and transfer).[1]

For a demonstration of cross-sections of regions, we have utilized the modified Peyton's method of teaching to enhance equal learning.[2] We divided 25 students into five groups with a demonstrator in each group. We initiated the session by demonstrating cross-sections of cadaveric specimens in different planes, from anterior to posterior and superior to inferior directions (1st step of demonstration) Following this, we proceeded to demonstrate the structures within each section of the specimen, offering detailed explanations of their anatomical relationships (2nd step of deconstruction). In the next phase, the first student was tasked with demonstrating the anatomical structures within each cross-section of the cadaveric specimens to the instructor. The instructor then reciprocated by demonstrating the same structures within the specimen, with other students actively listening and observing (3rd step: Comprehension, Tutor's Performance, and Observation). In the subsequent step, the second student was assigned the responsibility of demonstrating the specimen to the first student. This was followed by the second student providing clear instructions to guide the first student in replicating the demonstration using the same specimen. This interactive approach further enhanced the learning experience and comprehension (4th step: Comprehension, Trainee's Performance, and Observation). After each demonstration, comprehensive feedback was provided to the students tasked with demonstrating. This feedback encompassed insights and constructive critiques from both the demonstrator and the peers who had attentively observed and listened during the process (5th step: Tutor and Peer Feedback). The cycle of demonstration and feedback was systematically repeated until it included all students, ensuring each one had a chance to actively engage and complete the process (6th step: Circulation) In the concluding phase, the final student was tasked with independently demonstrating all the structures without assistance or guidance from others (7th step: Completion and Conclusion).

Both teaching modalities involved collecting feedback from the participants. Participant feedback highlighted the effectiveness of our teaching methods, which offered a comprehensive approach to understanding sectional anatomy concepts. Remarkably, around 90% of the students expressed their ability to identify structures in isolation within CT/MRI cross-sectional images. They expressed that their spatial sense of anatomical structures had significantly developed, leading to greater confidence in their ability to identify these structures within sectional images. This feedback underscores the session's effectiveness in enhancing students' anatomical knowledge and proficiency in interpreting images. The effectiveness of the approach lies in its seamless integration of theoretical knowledge and practical hands-on demonstrations, particularly through the use of cadaveric specimens.

Gaining a profound understanding of anatomy using cadaveric specimens fosters enduring retention of structural knowledge, and this can be accomplished through the application of diverse teaching methodologies.[3] The insights derived from Srivastava and Singh's study underscore the direct and beneficial impact of refining anatomy teaching methods on overall learning outcomes in medical education.[4]

It was evident from the feedback that this innovative teaching method not only enhanced the learning experience but also fostered greater engagement when compared to traditional teaching approaches. Given its proven ability to simplify complex topics and facilitate a deeper understanding, this teaching method can be seamlessly integrated into medical education settings.


## Acknowledgments

We extend our sincere appreciation to our junior residents for their remarkable and meticulous efforts in contributing to the process.


## Authors' Contribution

**Conceptualization**: Jahira Banu T, Dinesh Kumar, Rajasekhar.SSSN.
**Data curation**: Nikilesh Sankaran, Udit Narayan.
**Investigation**: Jahira Banu T, Dinesh Kumar, Rajasekhar.SSSN.
**Methodology**: Jahira Banu T, Dinesh Kumar, Rajasekhar.SSSN.
**Project administration**: Jahira Banu T, Dinesh Kumar, Rajasekhar. SSSN.
**Resources**: Jahira Banu T, Dinesh Kumar, Rajasekhar.SSSN.
**Software**: Nikilesh Sankaran, Udit Narayan.
**Supervision**: Dinesh Kumar, Rajasekhar.SSSN.
**Writing–original draft**: Jahira Banu T.
**Writing–review & editing**: Dinesh Kumar, Rajasekhar.SSSN.

## Competing Interests

The authors declare no conflict of interest.

## Ethical Approval

The project has been approved by the institute ethics committee, Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry, India (Ethical committee code: JSAC/73/2019/357).


## Funding

The authors did not receive any particular funding for this study.


## References


1. Gagné RM, Wager WW, Golas KC, Keller JM. Principles of Instructional Design. 5th ed. Belmont, CA: Wadsworth

Publishing; 2005. p. 20-46.
2. Nikendei C, Huber J, Stiepak J, Huhn D, Lauter J, Herzog W, et al. Modification of Peyton›s four-step approach for small group teaching - a descriptive study. BMC Med Educ. 2014;14:68. doi: 10.1186/1472-6920-14-68.
3. Older J. Anatomy: a must for teaching the next generation. Surgeon. 2004;2(2):79-90. doi: 10.1016/s1479-666x(04)80050-7.
4. Srivastava A, Singh A. Perception and feedback of medical students about teaching methods in anatomy. Indian J Clin Anat Physiol. 2020;7(1):104-9. doi: 10.18231/j.ijcap.2020.022.