The Effectiveness of Concomitant Use of Cross-Sectional Anatomy and CT images in Teaching Anatomy to Medical Imaging Students

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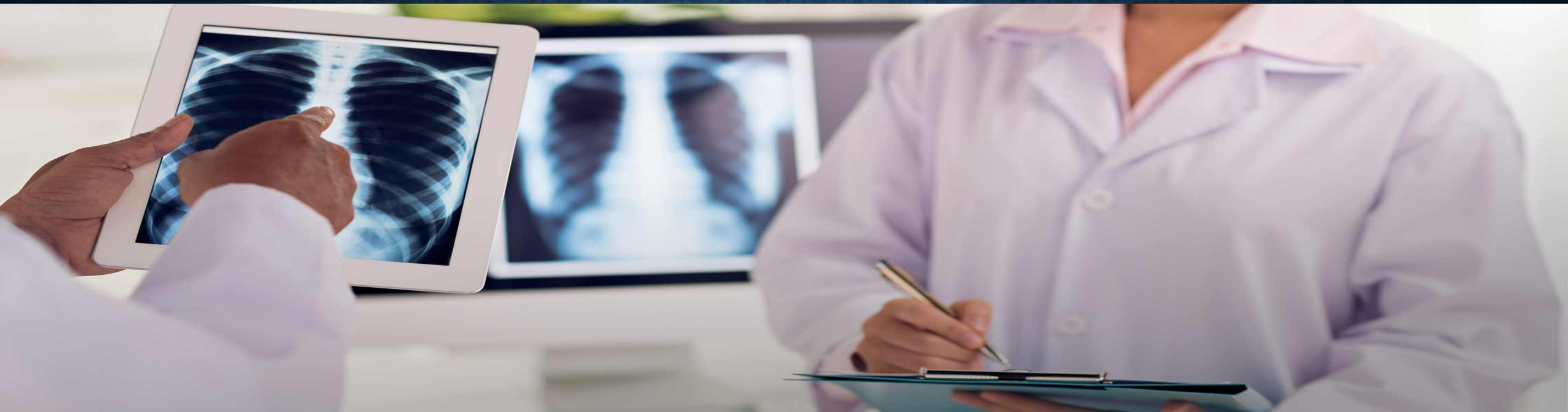
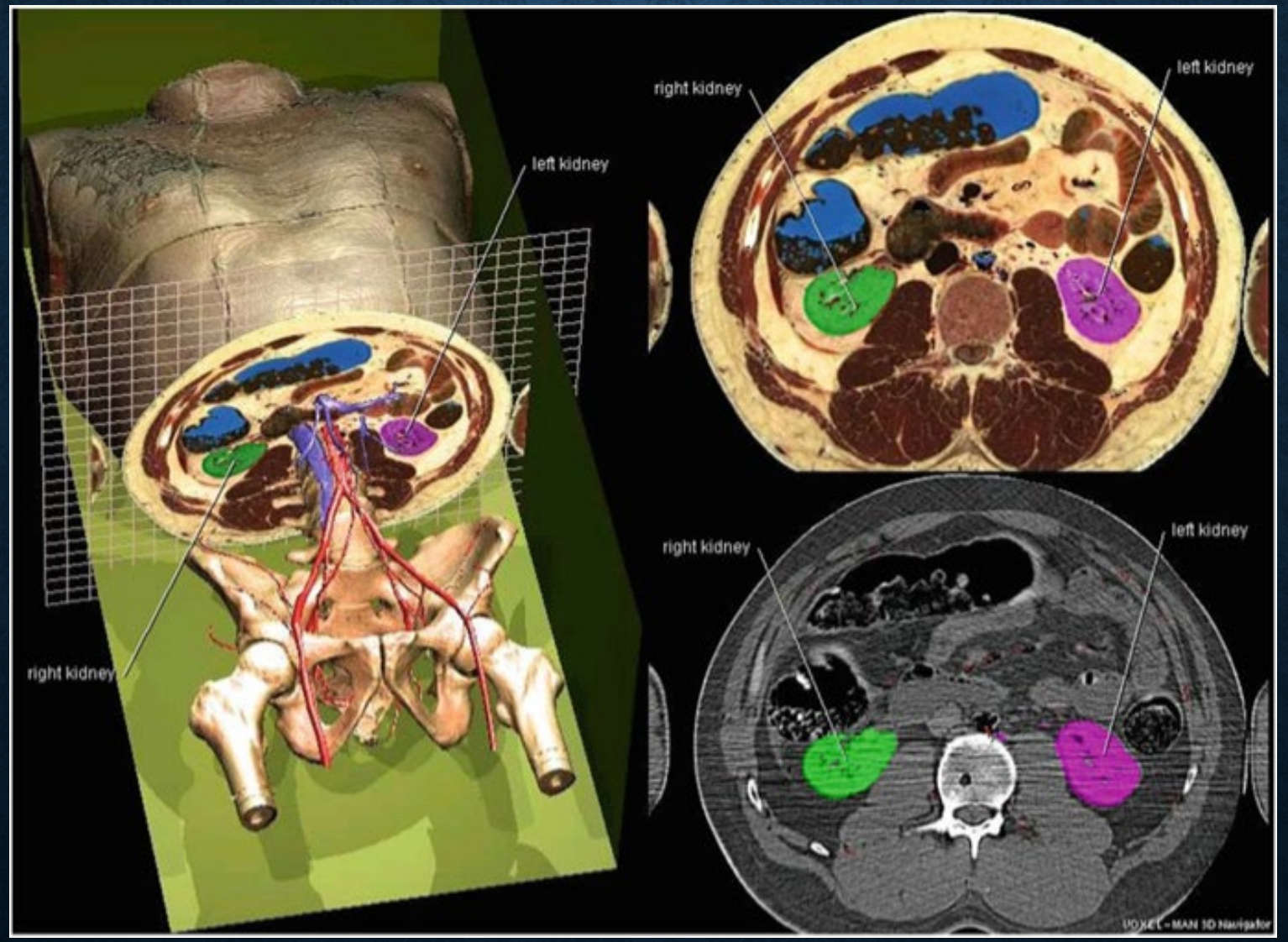
INTRODUCTION AND BACKGROUND

- The importance of good anatomical knowledge of the human body is fundamental in clinical practice particularly in the field of radiology and surgery. Meanwhile, learning human anatomy is an essential requirement for undergraduate health care students *(**Rafai N. et al., 2016**).*
- Medical imaging students (MIS) require the highest priority in learning anatomy among health care learners; as competent and efficient radiographers should have a comprehensive knowledge of anatomy.
- To increase their clinical capabilities, MIS must learn how to read, examine and comprehend CT and MRI images during their clinical blocks.

- The ability to act on radiological appearances requires basic knowledge of cross-section and radiologic anatomy (***Barros et al., 2001***). However, there are two questions still asked in the clinical block:
    1. *How much anatomical knowledge would MIS need to learn before they go to the clinical placements? And*
    2. *Which tool would be best used to teach them anatomy?*



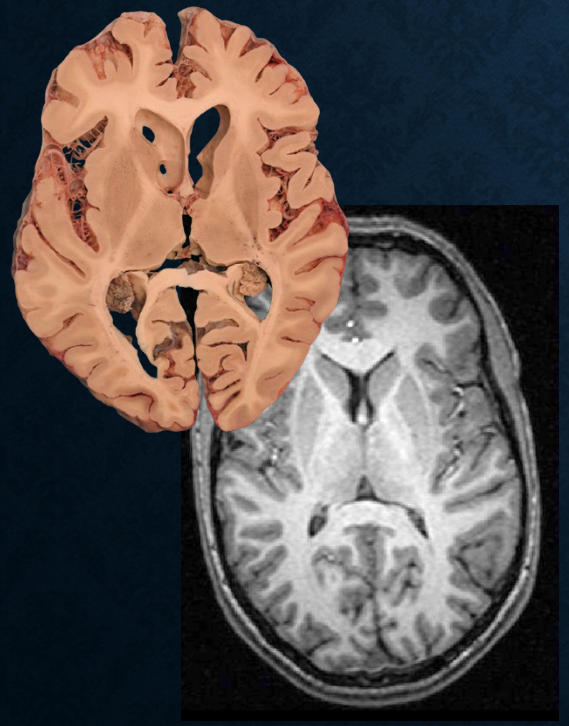
WHY CROSS SECTIONS ?

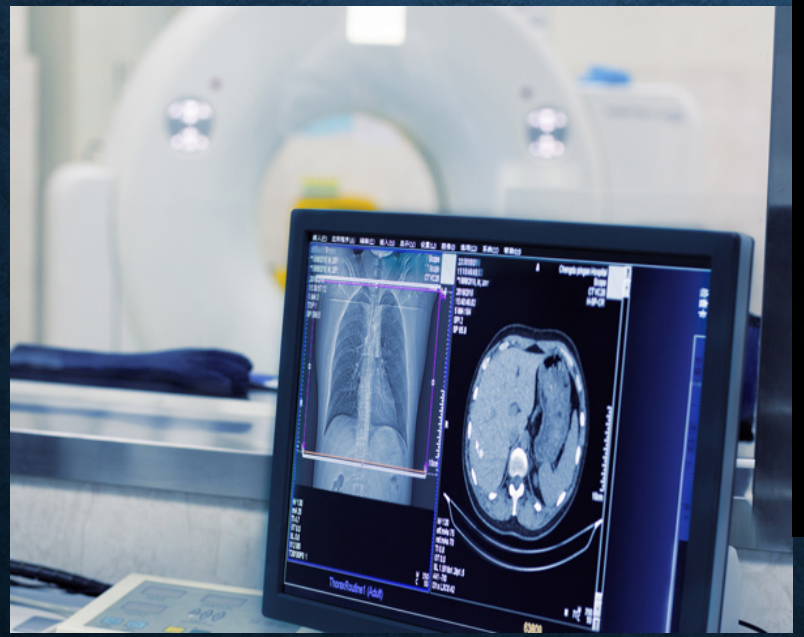


- Anatomical cross-sections provide a visual medium to facilitate understanding of the structural organization of the human body; this in turn supports an appreciation for the three-dimensional organization of the body ***(NetAnatomy 2018).***
- Cross sectional cadaveric images facilitate reading of CT imaging as this is typically performed in the cross-sectional plane. Therefore, students can easily correlate the structures of the cross sectional image to the CT scans *(**Kenhob 2018**).*

AIM

- To determine the effectiveness of concomitant use of cross-sectional anatomy and CT images in teaching anatomy to medical imaging students.
- To provide students with skills for the modern healthcare environment.
- We sought to familiarise students with the cross sections, demonstrate normal anatomical structures and discuss clinical applications.
- Overall, we hope this approach will increase students' confidence in understanding anatomy within the context of clinical practice.





http://www.netanatomy.com/CSAs/CSAabdos/CSAabdomen5si.html

MATERIALS AND METHODS

- Fifty eight students from the medical imaging programme at Unitec institute of Technology were included in this study.

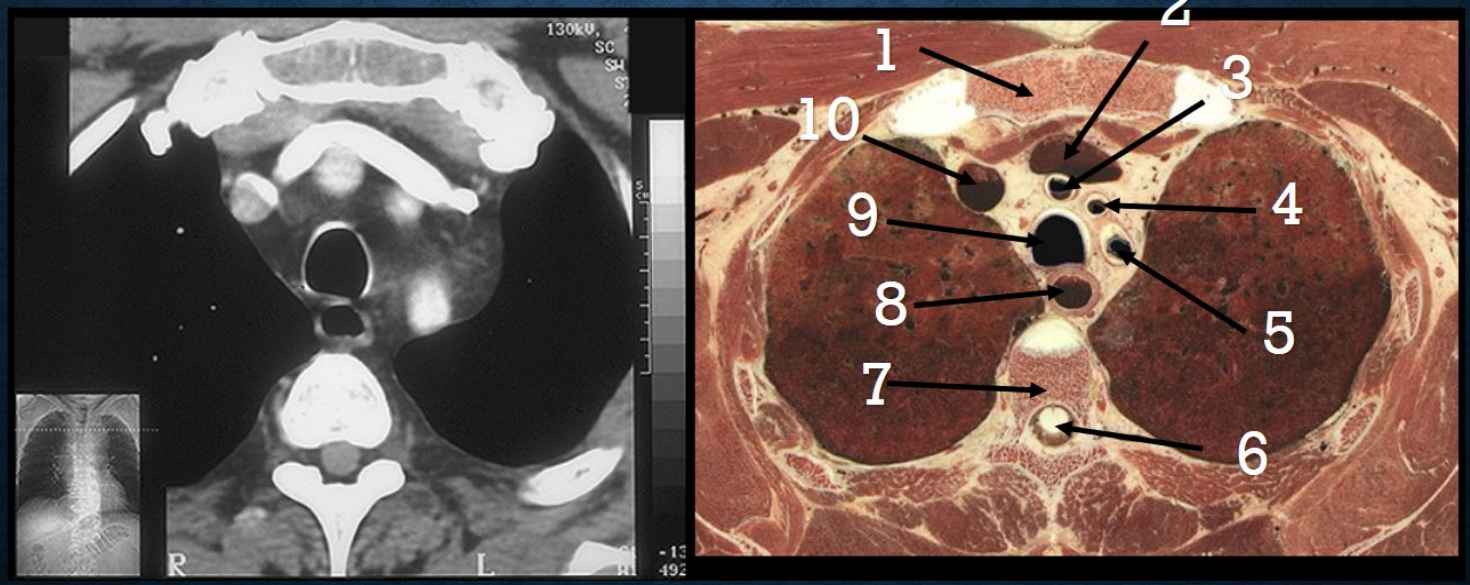
- The teaching methodology consisted of comparing two groups of MIS students studying anatomy HEAL 6250 in a block course i.e. 7 weeks academic + 7 weeks clinical, during the first semester of their academic year.

- Students were divided into two groups:

I. **Group I:** 29 students enrolled in the academic year 2017-2018, they studied anatomy using regional anatomy approach with help of lecturer notes and without concomitant use of CT images.

I. **Group II:** 29 students enrolled in the academic year 2018-2019, they self-studied sectional anatomy with concomitant use of CT images using online app (under licence) displaying both cross-sections and CT images concomitantly e.g. *VOX-MAN 3D Navigator or NetAnatomy* http://www.netanatomy.com/CSAs/CSAths/CSAthoraxmenusi.html

- In a computed based class, students were asked to identify ten anatomical structures on a plastinated cross section and correlate these structures to its corresponding structures on CT images, at the same anatomical level.
- The section used for the test was from NetAnatomy app. and at the level of the superior mediastinum [Fig:1 and Fig:2]. The level of the section was shown on the lower right corner of the CT image as a student guide [Fig:2].
- The test was15 minutes long as a MOCK test preparatory for the final exam.



[Fig:1]

[Fig:2]

RESULTS

- The number of the correct and incorrect answers for each anatomical structure were gathered and recorded in two tables.
- The mean of the correct, incorrect and blank answers were calculated as:

Correct	**Group I = 19.1**	**Group II = 26.7**
Incorrect	**Group I = 8.5**	**Group II = 2.1**
Blank	**Group I = 1.4**	**Group II = 0.2**

- The percentages of students in groups I and II who correctly identified the anatomical structures in the test were measured.

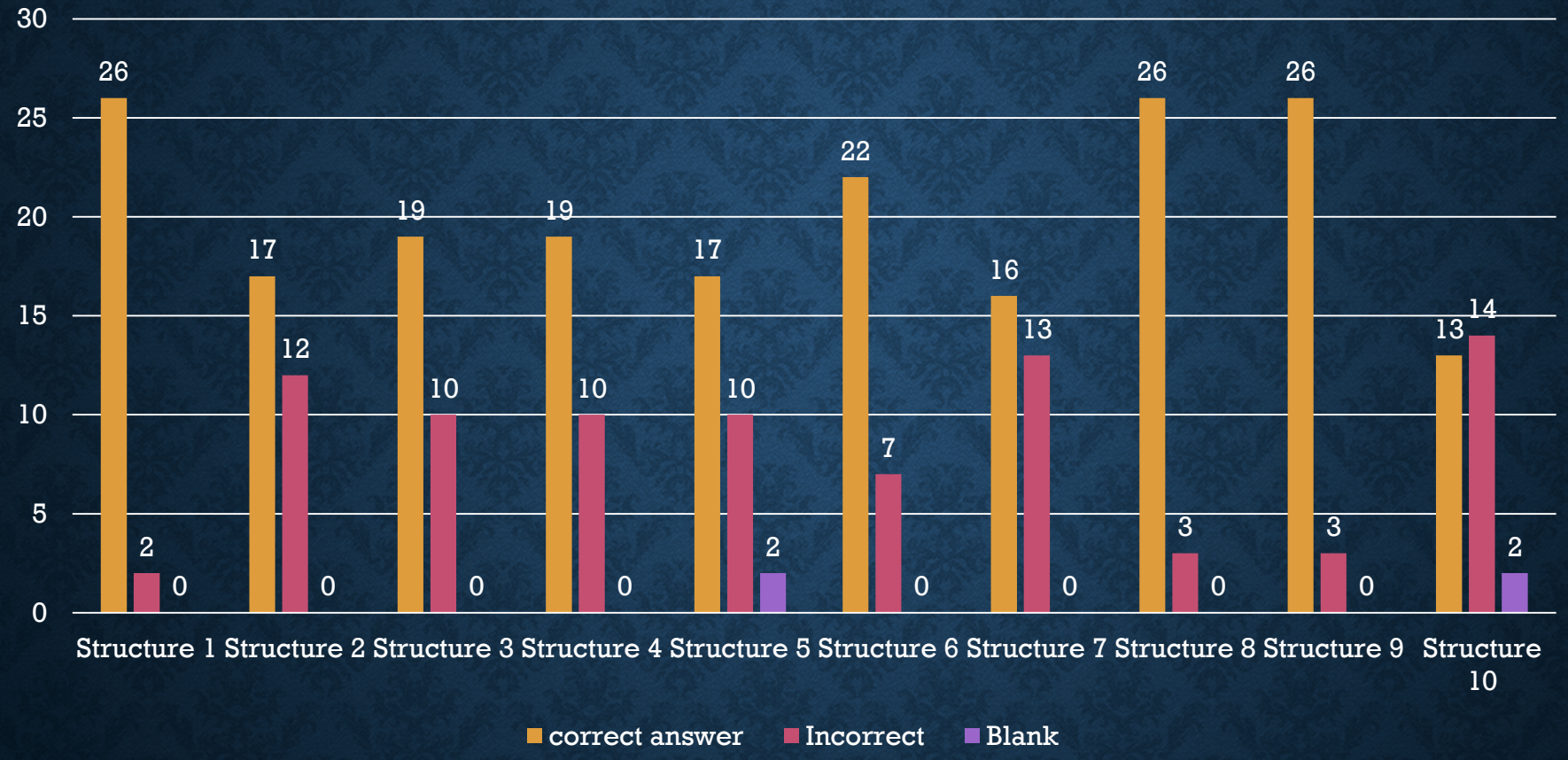
- The data analysis of the results revealed a significant difference in test scores, with scores of:

Group I 65.5% **Group II 89.7%**

GROUPS	MIS group I (2017-2018)			MIS group II (2018-2019)		
STRUCTURES	Correct Answer	Incorrect Answer	Leave Blank	Correct Answer	Incorrect Answer	Leave Blank
Manubrium of the sternum (1)	26	1	0	29	0	0
Left brachiocephalic vein (2)	17	12	0	27	2	0
Brachiocephalic artery (3)	19	10	0	26	3	0
Left CCA (4)	19	10	0	26	2	0
Left Subclavian (5)	17	10	2	26	1	0
Spinal Cord (6)	22	7	0	26	3	0
Vertebra T4 (7)	16	4	0	25	4	0
Oesophagus (8)	16	13	0	29	2	0
Trachea (9)	25	4	0	29	0	0
Right brachiocephalic vein (10)	13	14	2	24	4	1

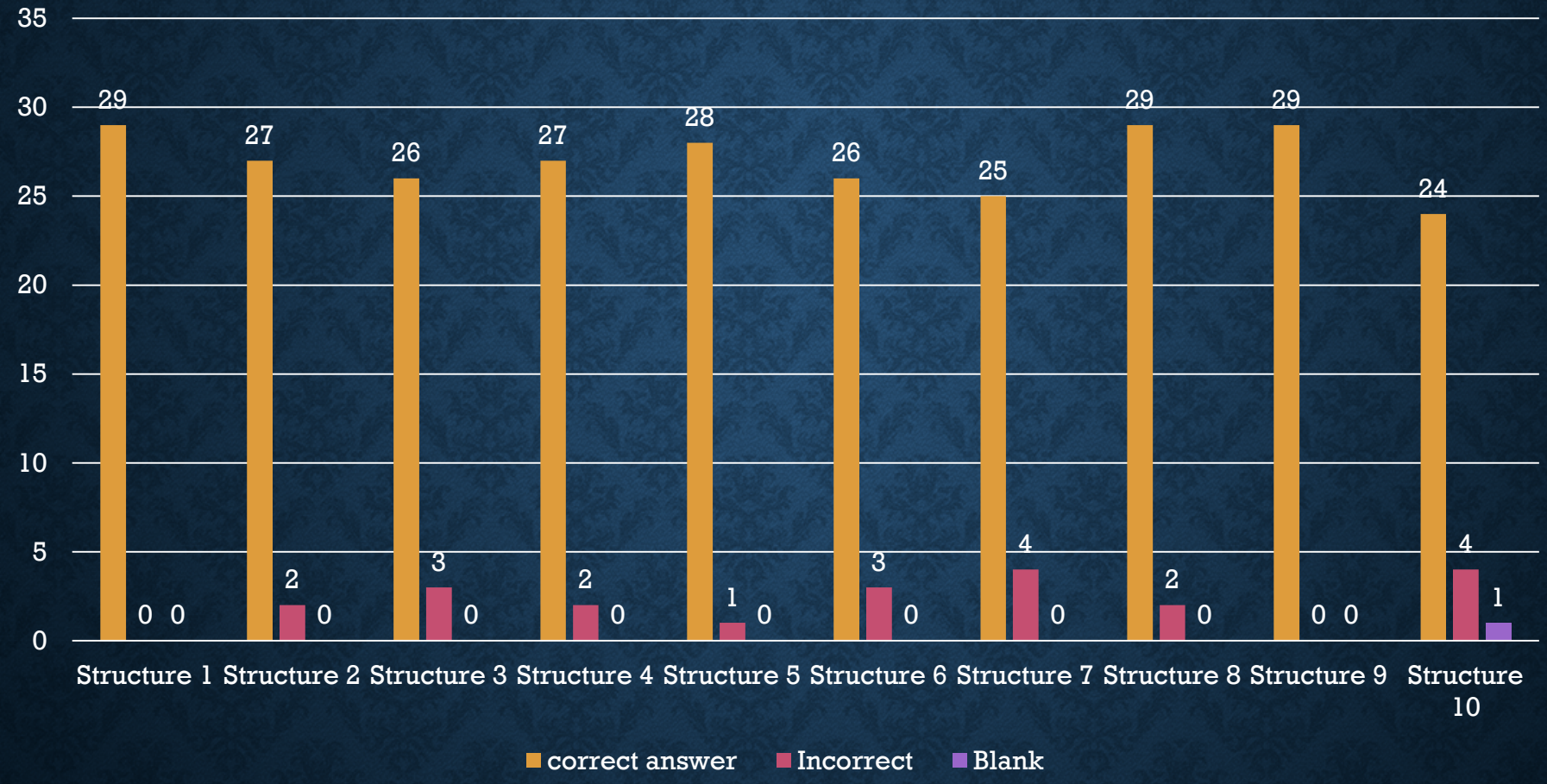
Table showing the number of the correct, incorrect and the blank answers in Group I and II

RESULTS of GROUP I (2017-2018)



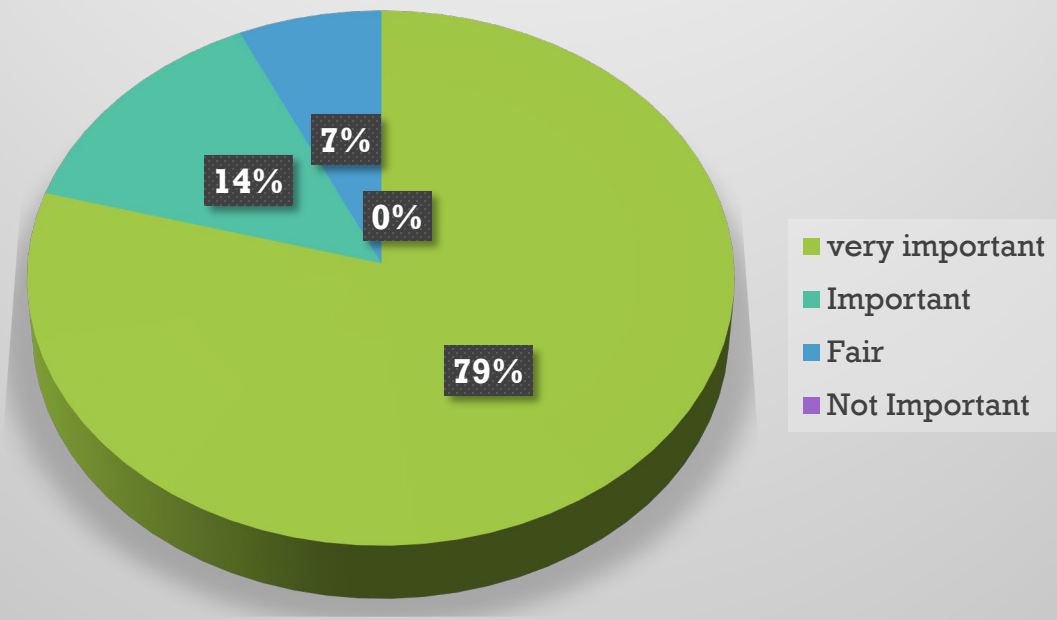
- **The mean of the students number who identified the correct answers Group I = 19.1**
- **The percentage of the students who identified the correct answers Group I = 65.5%**

RESULTS of GROUP II (2018-2019)



- **The mean of the students number who identified the correct answers Group II= 26.1**
- **The percentage of the students who identified the correct answers Group II = 89.7%**

IMPORTANCE OF STUDYING CROSS SECTIONAL ANATOMY TO MIS AT UNITEC



CONCLUSION

I. Lecturer Feedback

- There is the possibility of introducing a new teaching approach that creates a significant shift in the depth of understanding and ultimately students success i.e. improving the graduate outcomes.

- In my opinion, students preferred to learn cross sections side-by-side with the CT Image; thus making it easier to compare and contrast and further differentiate anatomical structures.

II. Students' Feedback

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- Students commented that the combination of cross sections and CT images is a robust learning tool; it is a form of repetition and a beneficial study tool which complimented traditional teaching methods.

- MIS felt strongly that this learning tool "reinforced knowledge of anatomical structures" and reported that this approach helped them visually relate to, and understand CT images during their clinical practice.

ACADEMIC ACTIONS

- Discuss *HEAL 6250* course evaluation with the MI Academic Quality Committee.
- Work with the MI Academic Manager, and Head of School to help in ordering plastinated cross-sectional specimens and/or plastic models for teaching anatomy to MIS.
- Building on the results of these findings, the MI committee have changed the HEAL 6250 from a one semester block course to a year-long paper. This will allow students the time to gain a deeper appreciation and understanding of key concepts prior to clinical practice.

Acknowledgement

YEAR 3 medical imaging students

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YEAR 2 medical imaging students

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