Students' preference of learning tools for gross anatomy in an integrated curriculum

Htar Htar Aung[1], Nilar Shwe[2], Tin Tin Myint[3], Tin Moe Nwe[4]

Introduction: It is still a challenge that the dissecting room has a place in learning gross anatomy. Understanding the students' preference of learning tools is important to devise alternative teaching aids for improvement in learning anatomy. This study was conducted to assess student's preference of learning tools available in the anatomy laboratory of an integrated curriculum.

Methods: A cross-sectional comparative study was carried out for 4 weeks among 741 medical and dental students of International Islamic University Malaysia (IIUM), Universiti Teknologi MARA (UiTM), University Sabah Malaysia (UMS) and University Malaysia Sarawak (UNIMAS). Pre-tested, semi-structured, self-administrated questionnaires including open-ended questions were distributed. The data were analyzed by using SPSS 17.

Results: Most of the participants were Malays (86%) and female (67%). The students from IIUM, UiTM, UMS and UNIMAS preferred the plastic model in terms of handability and application in examination (OSPE). It was statistically significant ($p<0.05$). In terms of understanding and information, the students of IIUM, UiTM and UMS preferred the plastic model while UNIMAS students preferred the prosected wet specimen over the plastic models. In terms of overall preference, students of IIUM and UiTM preferred the plastic model (85.8% and 44.1% respectively). In UNIMAS, their preference for the prosected wet specimen (90.7%) was slightly higher than for the plastic model (87.8%). UMS students preferred both cadaver (51.9%) and plastic model (50%).

Conclusion: Most of the students preferred the plastic model as the best learning tool in studying gross anatomy. This study suggests that plastic model may hold a role in enhancing students' learning of gross anatomy in an integrated curriculum.

IeJSME 2018 12(1): 11-17

Keywords: Cadaver; learning tool; plastic model; prosected wet specimen; students' preference

Introduction

Human anatomy is the most prominent of the biological sciences of the 19th and early 20th centuries. Methods of teaching anatomy begin with the examination of animals through dissection of cadavers to multimedia resources such as three-dimensional animations or simulated videos.[1] For the medical practitioner to successfully treat the problem presented by the patient, a sound knowledge of anatomy is essential.[2] Profound basic knowledge of anatomy will continue as an essential component of academic medical and health sciences curricula.[3] There is a decline in terms of time and resources allocated for anatomy even though it is one of the fundamentals of medical curriculum.[4] Most of the first year preclinical medical students of Ambrose Alli University agreed that dissection is ethically acceptable and is the best method for learning anatomy. Their thinking skill was also improved by dissecting the cadaver. This is why a Nigerian medical school approved that the cadaver dissection plays an important role in the study of human anatomy.[5] Learning anatomy constantly gives rise to great debates and surveys concerning what exactly should be taught and how.[6,7,8] Prosected cadavers and imaging reinforce the introduction of anatomical information in a case-directed anatomy programme in the Cleveland Clinic Lerner College of Medicine of Case Western Reserve University. The second year students can also improve their dissection experience by preparing the prosections for their junior fellows.[9] In practical sessions of gross anatomy, the students preferred the peer-teaching programme with the volunteer second-year medical students as it improved their communication skills. In addition, it reduces the student-cadaver ratio and saves the dissection time.[10] The curriculum design which explores additional mechanisms of study by reducing the students' dissection time while increasing their time spent in actual study, should be encouraged in a medical school.[11] According to Yammine,[12] the models offer a promising tool for teaching gross anatomy in 3D representation. More educational research should be done to get a scientifically sound conclusion about the best way of learning gross anatomy as anatomical knowledge is very important to future doctors.[13] It is a

[1]Division of Human Biology, School of Medicine, International Medical University, MALAYSIA
[2]Discipline of Anatomy, Faculty of Medicine, Universiti Teknologi MARA, MALAYSIA
[3]Biomedical Sciences and Therapeutics Department, School of Medicine, Universiti Malaysia Sabah, MALAYSIA
[4]Department of Basic Medical Sciences, Faculty of Medicine and Health Sciences, Universiti Malaysia Sarawak, MALAYSIA

Address for Correspondence:

Dr. Htar Htar Aung, Senior Lecturer, Division of Human Biology, International Medical University, 126, Jalan Jalil Perkasa 19, 57000 Bukit Jalil, Kuala Lumpur, MALAYSIA

Tel: +603 2731 7509   Email: HtarHtarAung@imu.edu.my

challenge that the dissecting room still has a place in teaching gross anatomy. Understanding the students' perceptions on learning tools and experiences of learning anatomy are important to devise alternative teaching aids to improve the learning of anatomy in medical schools. This study was conducted to assess student's preference of learning tools available in the anatomy laboratory in learning anatomy in an integrated curriculum.

Methods

A cross–sectional comparative study was carried out for 4 weeks among years 1 and 2 medical and dental students who were exposed to cadavers, prosected wet specimens and plastic models in learning gross anatomy. A total of 741 students; 185 from International Islamic University Malaysia (IIUM), 256 from Universiti Teknologi MARA (UiTM), 160 from University Sabah Malaysia (UMS) and 140 from University Malaysia Sarawak (UNIMAS), participated in the study. All individuals who were not willing to provide the informed written consent to participate in this study were excluded. The questionnaires were focused on students' preference of learning tools in terms of handability, understanding of gross anatomy, information acquired from different learning tools, application in examination (Objective Structured Practical Examination "OSPE") and the overall preference. First of all, the questionnaires were distributed to 25 students and 5 lecturers from each University. They all were satisfied and agreed that the questionnaires were structured. After that, it was distributed to all participants. In order to maintain anonymity, a random code number was issued to each participant of this study. Informed written consent was obtained from every participant prior to the inception of the study.

The data analysis was carried out with the help of statistical software SPSS version 17. Statistical analysis was done by using chi-square test at "α" 0.05.

Results

In the present study, the majority of the students were Malays (86%) and the rest were Chinese (7%), Indians (1%) and others (Indonesia, Iran, etc.) (6%) (Table 1). Most of the participants were female (67%) (Table 2).

In terms of handability, the students from IIUM, UiTM, UMS preferred the plastic model followed by the prosected wet specimen and cadaver. The results were statistically significant ($p<0.05$) (Table 3). The UNIMAS students also chose the plastic model in terms of handability (Figure 1).

In terms of understanding of gross anatomy, the students from IIUM, UiTM and UMS chose the plastic model (Table 4) as the best learning tool in studying gross anatomy, followed by the prosected wet specimen and cadaver. The differences among the three universities were statistically significant ($p<0.05$) and the intra-varsity variation on the favourable learning tool was also statistically significant ($p<0.05$). UNIMAS students preferred the prosected wet specimen (75.7%) as compared to the plastic model (72.9%) (Figure 1) but the difference was not statistically significant ($p>0.05$).

In terms of information acquired from different learning tools of gross anatomy, the plastic models also scored highest among the students of IIUM, UiTM and UMS. The differences among the three universities were statistically significant ($p<0.05$). The intra-varsity variation was significant in IIUM and UiTM (Table 5). On the other hand, UNIMAS students scored highest on the prosected wet specimen (74.3%) followed by the plastic model (70%) (Figure 1). However, the difference was not statistically significant.

In terms of application of learning tools in examination (OSPE), most of the students from all four Universities preferred the plastic model as the best learning tool (Figures 1 and 2).

The overall preference for students of IIUM and UiTM was the plastic model (85.8% and 44.1% respectively) (Figure 3). The students also stated that the plastic models were portable, easy to handle and closely simulate the living organs in texture and colour. UNIMAS students preferred the prosected wet specimen (90.7%) relatively higher than the plastic model (87.8%) (Figure 1) because they perceived that

the prosected wet specimen is real, well-preserved and useful for clinical posting. UMS students preferred both cadaver (51.9%) and plastic model (50%) (Figure 3) because the cadaver is realistic and, enabled them to see the anatomy of the human body as a whole. Moreover, it's easier to identify the structures properly. These inter-varsity differences were statistically significant (p<0.05).

Discussion

In the University Sains Malaysia, the wet specimens scored the highest in terms of being informative and they still have a place in teaching gross anatomy. The prosected wet specimens are realistic, soft and the student can easily identify the structures by following their course. [14] It was supported by the present study in which the students of UNIMAS scored relatively high on prosected wet specimen in terms of understanding of gross anatomy, information acquired from different learning tools and the overall preference of learning tools for gross anatomy. Nnodim also revealed that the students who learned with prosected wet specimens performed better than the dissecting students in their test. Learning human anatomy from prosections is a very effective way and it is also recommended for departments facing an unfavorable student: cadaver ratio. [15] The recall ability of the non-dissecting students scored higher than the dissecting students in a test which was held 5 years after a practical learning experience in gross anatomy. In addition, the duration of the programme of study from prosections was nearly three quarters of the dissection course. [16]

According to Evans,[17] the cadaver dissection was the most powerful teaching aid in Brighton and Sussex Medical Schools, and also improved the communication and teamwork skills of the students. For research and teaching purposes, clinical relevance is provided by the use of cadavers.[18] In the present study, although UMS students scored highest on plastic model in terms of handability, understanding, information acquired and application in OSPE examination, they chose both cadaver and plastic model as their overall preference

of learning tools for gross anatomy. In addition, Azer[19] revealed that dissection deepens the understanding of the human anatomy by providing a three-dimensional structure. On the other hand, in the practical exam the students who dissected a particular structure did not score significantly better than the students who had not dissected it.[20] On top of that, the handling of cadavers has a risk of infection hazards.[21] Moreover, the possible arguments against the use of cadavers include the costs, hazards and practicality. The programme of teaching anatomy without cadavers is described in a new medical school of United Kingdom.[22]

As an alternative learning tools for gross anatomy, Greenfield reported that the models are likely to facilitate the training of the students in various medical and veterinarian practices.[23] It was strengthened by the final year dental students of an integrated curriculum who scored highest on the plastic model in terms of its usefulness in learning clinical anatomy.[24] Similarly in our study, most of the students from all four universities preferred the plastic model as the best learning tool in studying gross anatomy. In learning imaging anatomy, Preece et al[25] also reported that the physical models have a significant advantage over textbook and 3D computer models. In addition, most of Iranian medical students (years 2 and 3) who were exposed to the traditional dissection laboratory exercise, preferred to use plastic models compared to the other learning resources such as cadavers, prosections and radiological images.[26]

The students' preference of learning tools and, the adequacy of the learning resources that are appropriate to the needs of the students are essential in order to get a more evidence-based approach to the continuous improvement in teaching/learning anatomy. It may bring up the learners' level of gross anatomy knowledge.

Conclusion

Most of the students preferred the plastic model as the best learning tool in studying gross anatomy. This study suggests that the plastic model may hold a role in enhancing students' learning of gross anatomy in an

integrated curriculum. Further studies are recommended to determine the effectiveness of each learning tool on students' performance in the examination.

Acknowledgements

REFERENCES

1. Rahman HS. History of Anatomy. Second revised edition. 2009.

2. Older J. Anatomy: A must for teaching the next generation. Surgeon 2004; 2: 79-90.

3. Rizzolo LJ, Stewart WB. "Should we continue teaching anatomy by dissection when…?" Anat Rec. Part B, New Anatomist 2006; 289: 215–8.

4. Gogalniceanu P, Madani H, Paraskeva PA, Darzi A. A minimally invasive approach to undergraduate anatomy teaching. Anat Sci Educ 2008; 1: 46-7.

5. Izunya AM, Oaikhena GA, Nwaopara AO. Attitudes to Cadaver Dissection in a Nigerian Medical School. Asian J Med Sci 2010; 2: 89-94.

6. Cahill DR, Leonard RJ, Marks SC Jr. A comment on recent teaching of human anatomy in the United States. Surg Radiol Anat 2000; 22: 69-71.

7. Heylings DJ. The curriculum, who teaches it and how? J Med Educ 2002; 36: 702-10.

8. Miller SA, Perrotti W, Silverthorn DU, et al. From college to clinic: reasoning overmemorization is key for understanding anatomy. Anat Rec 2002; 269: 69-80.

9. Drake RL. A unique, innovative, and clinically oriented approach to anatomy education. Acad Med 2007; 82: 475-8.

10. Nnodim JO. A controlled trial of peer-teaching in practical gross anatomy. Clin Anat 1997; 10: 112-7.

11. Jones LS, Paulman LE, Thadani MS, Terracio L. Medical student dissection of cadavers improves performance on practical exams but not on NBME anatomy subject exam. Med Educ 2001; 6: 2.

12. Yammine K, Violato C. The effectiveness of physical models in teaching anatomy: a meta-analysis of comparative studies. Adv in Health Sci Educ 2015; 21: 883-95.

13. Winkelmann A. Anatomical Dissection as a teaching method in medical school: a review of the evidence. Med Educ.2007; 41: 15-22.

14. Othman M. Use of plastinated specimen in a medical school with a fully integrated curriculum. JISP 1996; 11: 16-7.

15. Nnodim JO. Learning human anatomy: by dissection or from prosections? J Med Educ 1990; 24: 389-95.

16. Nnodim JO, Ohanaka EC, Osuji CU. A follow-up comparative study of two modes of learning human anatomy: by dissection and from prosections. Clin Anat 1996; 9: 258-62.

17. Evans DJ, Watt DJ. Provision of anatomical teaching in a new British medical school: getting the right mix. Anat Rec B New Anat 2005; 284: 22-7.

18. Cornwall J, Stringer MD. The wider importance of cadavers: Educational research diversity from a body bequest program. Anat Sci Edu 2009; 2: 234-7.

19. Azer SA, Eizenberg N. Do we need dissection in an integrated problem-based learning medical course? Perceptions of first- and second-year students. Surg Radiol Anat 2007; 29: 173-80.

20. Granger NA, Calleson D. The impact of alternating dissection on student performance in a medical anatomy course: are dissection videos an effective substitute for actual dissection? Clin Anat 2007; 20: 315-21.

21. Healing TD; Hoffman PN; Young SE. The infection hazards of human cadavers. Commun Dis Rep CDR Rev 1995; 5: R61-8.

22. McLachlan JC, Bligh J, Bradley P, et al. Teaching Anatomy without Cadavers. Med Educ 2004; 38: 418-24.

23. Greenfield, Cathy L., Johnson, Ann L. Anatomically correct artificial organ replicas for use as teaching aids. 1996.

24. Htar Htar Aung, Barua A, Sivakumar A, et al. Application of anatomical knowledge by final year dental students of integrated curriculum: A pilot study. J Med Sci Clin Res 2016; 4: 13827-33.

25. Preece D, Williams SB, Larn R, Weller R. "Let's get physical": Advantages of a physical model over 3D computer models and textbooks in learning imaging anatomy. Anat Sci Educ. 2013; 6: 216-24.

26. Atlasi MA, Moravveji A, Nikzad H, et al. Learning styles and strategies preferences of Iranian medical students in gross anatomy courses and their correlations with gender. Anat Cell Biol. 2017; 50: 255-60.

Table 1: Race distribution of the students

University	Malay	Chinese	India	Others	Total
UIA	182	0	0	3	185
U Sabah Malaysia	72	52	7	29	160
U Malaysia Sarawak	138	0	0	2	140
UiTM	245	0	0	11	256
Total	637 (86%)	52 (7%)	7 (1%)	45 (6%)	741 (100%)

Table 2: Gender distribution of the students

University	Male	Female	Total
UIA	72	113	185
U Sabah Malaysia	69	91	160
U Malaysia Sarawak	52	88	140
UiTM	51	205	256
Total	244 (33%)	497 (67%)	741 (100%)

Table 3: Students' preference of learning tools in handability

University	Cadaver	Wet Specimen	Plastic Model	"P" value (within University)
IIUM (n= 185)	41.6%	45.4%	71.9%	0.00
UMS (n= 160)	65%	78.7%	85%	0.00
UiTM (n= 256)	15.6%	19.5%	64.9%	0.00
X^2 = 185.14 "p" = 0.00 (among 3 Universities)				

Table 4: Students' preference of learning tools in understanding of gross anatomy

University	Cadaver	Wet Specimen	Plastic Model	"P" value (within University)
IIUM (n= 185)	52.5%	54.6%	78.4%	0.00
UMS(n= 160)	65.6%	77.5%	85.7%	0.00
UiTM(n= 256)	25.8%	19.9%	54.3%	0.00
X^2 = 20.94 "p" = 0.00 (among 3 Universities)				

Table 5: Students' preference for information acquired from different learning tools

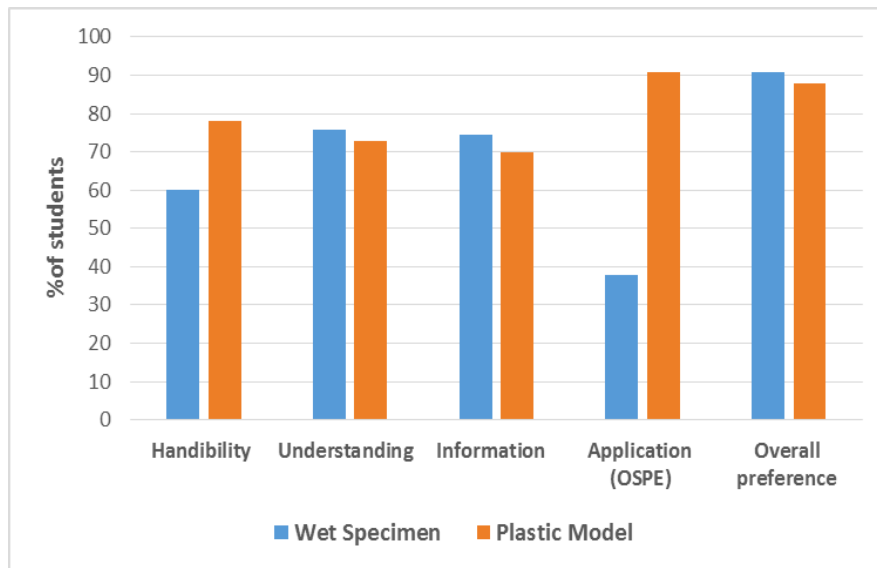| University	Cadaver	Wet Specimen	Plastic Model	"P" value (within University)
IIUM(n= 185)	59.5%	59%	74.6%	0.00
UMS(n= 160)	75%	78.8%	85%	0.08
UiTM(n= 256)	27.3%	16.4%	56.3%	0.00
X^2 = 34.55 "p"= 0.00 (among 3 Universities)				

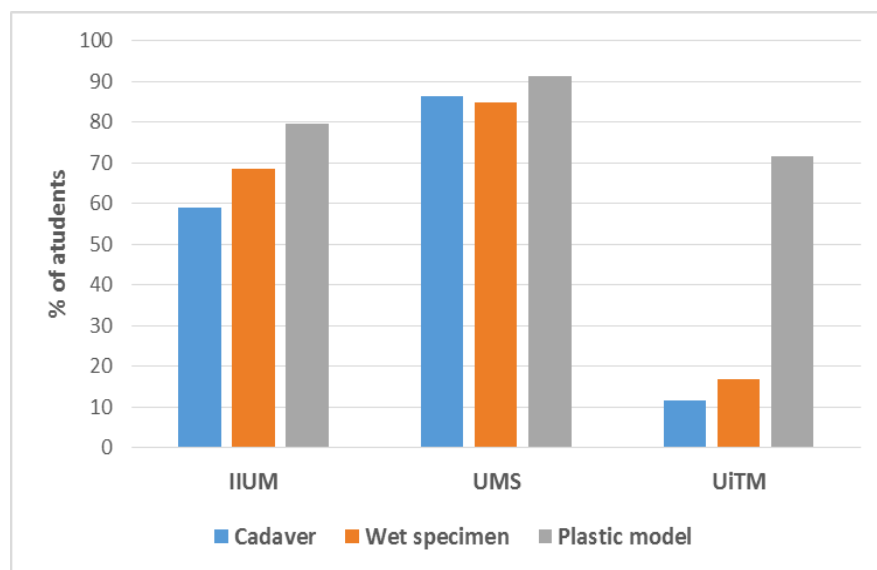**Figure 1:** Students' preference of gross anatomy learning tools in UNIMAS (n = 140)

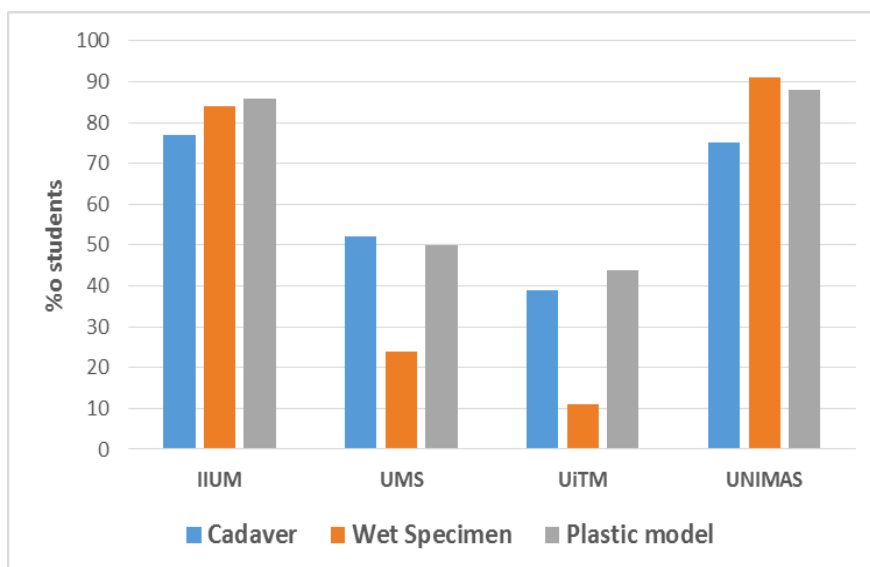**Figure 2:** Students' preference on application of learning tools in OSPE

Figure 3: Students' overall preference of learning tools for gross anatomy