

ORIGINAL ARTICLE

Medical Students' Perception of Anatomy Education Environment in Universiti Putra Malaysia

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ABSTRACT

Introduction: Measuring students' perception of anatomy education environment provides important information for quality assurance and improvement in anatomy education. This study evaluated medical students' perception of anatomy education environment in Universiti Putra Malaysia by using a validated tool, the Anatomy Education Environment Measurement Inventory (AEEMI). **Methods:** A cross-sectional study was conducted in the Faculty of Medicine and Health Sciences, Universiti Putra Malaysia between August and September 2020. Stratified random sampling was used to ensure balance sampling of two sociodemographic parameters: gender and study phase. The AEEMI was distributed online to 384 consenting students who rate their perceptions on the six factors of AEEMI: anatomy teachers and instructor, importance of anatomy knowledge, intrinsic interest in learning anatomy, anatomy learning resources, students' effort to learn anatomy and quality of histology learning facilities, using a five-point Likert scale. The average score of each factor was calculated and compared between male and female respondents, and between preclinical and clinical ones, using SPSS version 25. **Results:** All factors was rated to be positive with scores > 4.00, except for histology practical facilities that was perceived as an area for improvement (score 3 – 4.99). There was no significant difference of the scores between male and female respondents, and between preclinical and clinical ones. The scores were found to be consistent across gender and study phase. **Conclusion:** Anatomy education environment in UPM are positive and caters for the differences in gender and study phase. Nevertheless, the histology practical facilities may require further attention for improvement.

Keywords: Anatomy education environment, Medical students, AEEMI, Gender, Study phase

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INTRODUCTION

One of the fundamental subject in medical study is anatomy that involves gross anatomy, histology and embryology which provide the knowledge of the structure of the human body (1). Anatomy helps students to understand pathology and clinical problems later on (2). Due to inadequate allocated times and insufficient cadavers, the practical anatomy has been improvised from cadaveric dissection to several alternatives: plastination model, prosected model, computer-assisted learning and problem-based learning.

Histology is the study of natural tissue morphology in the medical curriculum and is a central component of anatomical science (3). Conventional microscopy (CM) has been and still is the conventional technique in histology education. However, there are a few disadvantages with the CM technique. CM does not allow students access apart from the allocated time, is a waste of resources as slides require continuous replacement and maintenance, takes up space in laboratories, is not efficient when there is a lack of experienced instructors, and the variabilities of slides mean students do not have the same opportunities in observing quality slides. Therefore, many medical schools are leaning towards using virtual microscopy (VM) (4).

In 2017, in a study to gauge medical students' knowledge of anatomy education importance, there was

a significant difference in what the students felt was the most successful way to teach anatomy (5). Students in the preclinical phase chose lectures given by educationists to be the most useful; however, students in the clinical phase chose theory taught along with important clinical anatomy to be the most useful. The study also found that in terms of reason for studying anatomy, preclinical students were more interested in doing well for their examinations whereas clinical students wanted to refine their clinical skills.

Unexpectedly, a study has reported that anatomy education is gradually being shaved away from the medical curriculum due to the subject's rigidity (6). In another study conducted in the Netherlands, a comparison was made between the anatomy knowledge of medical students with the expectation levels of several professionals (7). They concluded that there was a significant difference between the two, wherein the students scored lower than expected, leading to public worry. Therefore, a few interventions in anatomy education were suggested (6). Anatomy education must incorporate the ever-changing waves of technology while the importance of traditional teaching methods are emphasized. Instead of comparing superiority, traditional and modern methods should exist in harmony to ensure the best of anatomy education delivery for medical students.

A study in Pakistan on the assessment of the preclinical students' satisfaction regarding anatomy curriculum at Kust Institute of Medical Sciences in Kohat revealed that most of them were pleased with the quality of the course, the internal assessment framework and the performance of teachers (8). Furthermore, a group of local researchers emphasized the students' perception assessment of specific areas of interest such as anatomy which has an impact on the success of the feedback process (9). Their perception may provide useful information on potential deficiencies in anatomical education and would also mitigate the inconsistencies between the current and the desired understandings or their performances.

Undoubtedly anatomy educators play an important role in providing comprehensive anatomy knowledge for the students. The number of educators in the anatomy department in the medical institution is of high importance. There was a rise in the number of medical schools and students, but unparalleled number of anatomy educators. Educators in the Anatomy Department were overworked, resulting in a negative effect on anatomy education (10).

A previous study listed several learning resources normally used in anatomy education, which are the traditional method, dissection method, and ultrasound imaging method (11). According to that study, the traditional method, which is incorporated during

lectures, involves the use of chalk and blackboard. This method is widely being replaced by presentation software such as PowerPoint which is more convenient. Ultrasound is an up and coming non-invasive method applied to assist in anatomy education in certain medical schools.

Anatomy is one of the most challenging medical subjects in view of its memory retention requirement as well as the focusing needed. The difficulties of medical students in learning the subject and also to maintain the knowledge for future practice were observed, hence reflecting the possible flaws in anatomical education (9). The perception of students of anatomical teaching and learning has been identified as a pre-emptive measure needed by educators to achieve an ideal anatomical education environment and bridge the gaps in education. As a result, Universiti Sains Malaysia (USM) has developed the Anatomy Education Environment Measurement Inventory (AEEMI) as a valid inventory tool to specifically measure the quality of anatomy education environment (9).

AEEMI is a 25-item inventory that measures medical students' perceptions on six factors in anatomy education environment, namely anatomy teachers, importance of anatomy knowledge, anatomy subject, anatomy learning resources, students' effort to learn anatomy, and quality of histology learning facilities. The factors and items of AEEMI were comprehensively constructed using the Delphi technique method involving nine anatomists and five medical educationists (12). The inventory underwent extensive validation process, namely content validity, response process validity and internal structure validity studies, explored the relevancy of items towards the factor, clarity of language and comprehensibility of the sentences, and dimensionality as well as item-factor relationship. Through these validation studies, AEEMI was found to have good content, response process and construct validity with acceptable to high composite reliability (12). The inventory utilizes five-point Likert scale, which are (1) Strongly disagree, (2) Disagree, (3) Not sure, (4) Agree, (5) Strongly agree. The mean score for each factor is interpreted as 'area of concern' (score 1 to 2.99), 'area for improvement' (score 3 to 3.99) and 'positive area' (score 4 to 5). The result would be able to provide a reflection of the quality of anatomy education environment in each institution, and thus provide a meaningful feedback for quality assurance and management (13).

Hence, this study utilised the tool for evaluating the medical students' perception on the anatomy education environment in Universiti Putra Malaysia (UPM). We also compared the differences between the mean scores of the six factors in AEEMI with the socio-demographic factors, namely gender and the phase of the medical study.

MATERIALS AND METHODS

The cross-sectional analysis was conducted between August and September 2020 in the Faculty of Medicine and Health Sciences (FMHS), Universiti Putra Malaysia (UPM). The study population was all UPM medical students, from Year 1 to Year 5 who are at different phases of the medical study – preclinical and clinical phase. Stratified random sampling was used for students recruitment, whereby two parameters, which are gender and phase of the medical study, were stratified. Stratification was done by getting a complete name list of the students and their names were stratified according to the gender (i.e. female and male) and phase of medical study (i.e. preclinical and clinical phases). For the ‘phase of the medical study’ parameter, the sampling was done in one-to-one ratio, while for gender parameter, the sampling was in two-to-one ratio considering that there are more female than male medical students in the cohort.

The approximate sample size was determined using a documented formula with consideration of adjustment of 10% non-response rate (14). This gave 384 respondents as a minimum sample size from Year 1 to Year 5 medical students as shown in Table I. Medical students who were illiterate in English and has poor internet connection were excluded from this research.

This study utilizes the Anatomy Education Environment Measurement Inventory (AEEMI) as a study tool that measures the students’ perception of anatomy education environment. The inventory was available in English language and it has been demonstrated to have good construct and internal structure validity with six factors and 25 items (13). The inventory was distributed online to all consenting students via the Google Form platform. The first section of the inventory captures the respondent’s personal information, while the second section assesses the respondent’s perception of anatomy education environment in the faculty, namely on anatomy teachers and instructors, anatomy knowledge, students’ intrinsic interest in learning anatomy, anatomy learning resources, students’ efforts on learning anatomy and histology practical facilities.

The collected data were analysed using SPSS version 25. Descriptive analysis of mean, median, mode and variance, standard deviation and range were determined for the socio-demographic characteristics. The mean score of each factor was calculated and the differences of these scores between the subgroups in gender and phases of medical studies were compared. Prior to running the statistical test, assumption for the independent t-test was checked and the level of significance (α) was set at 0.05 with a confidence interval of 95%. Since the data was not normally distributed, Mann Whitney test was used to calculate the mean score differences of the six factors between the subgroups.

Ethical approval to conduct the study was obtained from the Research Ethics Committee involving Human Subject of the Universiti Putra Malaysia (JKEUPM 2020-236).

RESULTS

Out of the 384 consenting students, 356 completed the inventory, thus giving a response rate of 92.71%. Despite the 8% drop out rate, the respondent distribution was found to be equivalent with the ratio estimated during the stratified random sampling. There is an almost equal number of preclinical and clinical year respondents, and the female to male ratio is two to one. The demographic data is presented in Table I.

Table I: Number of Samples needed for respective year of medical students (Year 1 - Year 5)

| Phase of Clinical Study | Year of Study | Number |
|-------------------------------------|------------------------|------------|
| Preclinical phase (171 students) | Year 1 (113/511) X 384 | 85 |
| | Year 2 (114/511) X 384 | 86 |
| | Year 3 (100/511) X 384 | 75 |
| Clinical phase (213 students) | Year 4 (100/511) X 384 | 75 |
| | Year 5 (84/511) X 384 | 63 |
| Total Number of Participants | | 384 |

Our analysis revealed that majority of the respondents perceived all factors of anatomy education environment in UPM as positive except for the histological practical facilities, which was mainly perceived as ‘area of concern’ and ‘area for improvement’. Nevertheless, there is a significant percentage of respondents who perceived factor 3, factor 4 and factor 5 as ‘areas for improvement’, despite more than 50% of them rated these areas as ‘positive area’. As for factor 6, the percentage of respondents who rated it as ‘area of concern’ and ‘area for improvement’ are almost equivalent. These results are summarized in Table II.

Statistical comparisons were made to investigate the differences of these scores between male and female respondents, and preclinical and clinical year respondents. The analyses revealed no significant difference of all scores between subgroups of these two comparisons. The results of comparison between gender and phases of medical study revealed positive perception of the respondents in all factors of anatomy education environment in UPM except for factor 6 (i.e. histological practical facilities), which was noted to be an ‘area for improvement’. The results are illustrated in Fig. 1 and Fig. 2.

Table II: Frequency of mean score on students’ perception of the six factors (N=356)

| Factor | Factor | Area of concern n (%) | Area for improvement n (%) | Positive area n (%) |
|--------|---|-----------------------|----------------------------|---------------------|
| 1 | Students’ perception of anatomy teachers and instructors | 3(0.8) | 30(8.4) | 323(90.7) |
| 2 | Students’ perception of the importance of anatomy knowledge | 6(1.7) | 68(19.1) | 282(79.2) |
| 3 | Students’ intrinsic interest in learning anatomy | 50(14.0) | 103(28.9) | 203(57.0) |
| 4 | Students’ perception of anatomy learning resources | 19(5.3) | 104(29.2) | 233(65.4) |
| 5 | Students’ efforts on learning anatomy | 36(10.1) | 115(32.3) | 205(57.6) |
| 6 | Students’ perception histology practical facilities. | 123(34.6) | 141(39.6) | 92(25.8) |

Score for area of concern=1.00 to 2.99; Score for area for improvement= 3.00 to 3.99; Score for positive area= 4.00 to 5.00

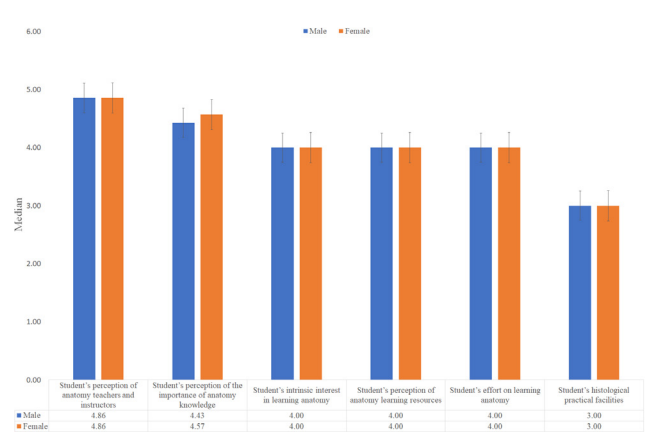


Figure 1: Comparison between gender and medical students’ perception of Anatomy Education Environment. There is no significant difference between gender and Anatomy Education Environment in UPM ($p > 0.05$) of which five out of six items indicated “Positive Area” (score > 4) whereas only student’s histological practical facilities showed “Area for Improvement” (score 3 to 3.99). Mann Whitney test was performed. *P-value < 0.05 at 95% confidence interval.

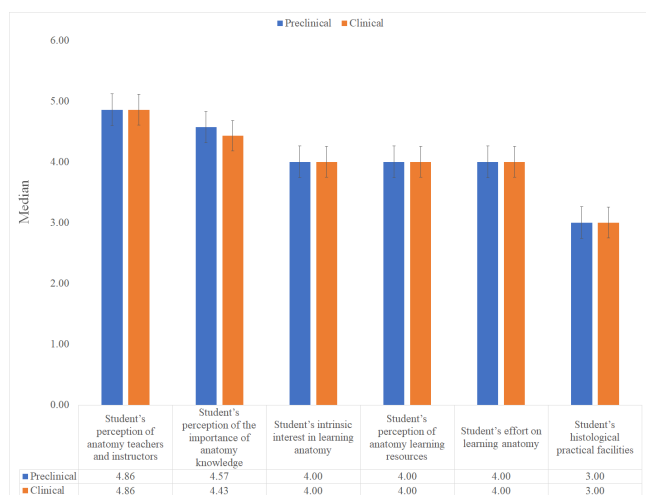


Figure 2: Comparison between the phase of medical study and medical students’ perception of Anatomy Education Environment. There is no significant difference between preclinical and clinical students on their Anatomy Education Environment in UPM ($p > 0.05$) of which five out of six items indicated “Positive Area” (score > 4) whereas only student’s histological practical facilities showed “Area for Improvement” (score 3 to 3.99). Mann Whitney test was performed. *P-value < 0.05 at 95% confidence interval.

DISCUSSION

This study provides an insight on how UPM medical students perceived the anatomy education environment in this institution. It is evident from the analyses that all factors of anatomy education environment in UPM were positively perceived by the respondents except for the histology practical facilities, which may require further improvement. Despite our attempts to prove the existence of spectrum in the respondents’ perceptions with regards to gender and phase of medical studies, the results revealed no significant difference of the scores between the subgroups. Nevertheless, significant differences were observed between the Year 1 and Year 2 preclinical year respondents in six factors of anatomy education environment.

The insignificant difference of the scores for all six factors of AEEMI between male and female, as well as preclinical and clinical year respondents indicate that the anatomy education environment in UPM caters the needs for all students. For instance, both male and female respondents were aware that anatomy knowledge is very important for their future career as medical practitioner as they need the knowledge for the development of clinical skills (i.e. clinical examination and procedural skills). This finding is aligned with the finding of a previous study that explored medical students’ perception of the importance of anatomy in a cadaveric hands-on dissection class at Seoul National University (15). In that study, both genders agreed that anatomy knowledge is important for the students to appreciate the human body (15).

Similarly, our study revealed no significant difference in the respondents’ perception of the importance of anatomy knowledge across different phases of medical studies, indicating that novice medical students in the preclinical phase could already appreciate anatomy as the cornerstone subject in medicine – despite they have not been exposed to the clinical learning environment. This finding contradicts the finding of a previous study conducted in 2019 that concluded senior medical students were more appreciative towards the importance and relevance of anatomy knowledge (16).

Our findings strengthened the facts that anatomy

education environment in UPM is able to promote students' appreciation of value in learning anatomy. In UPM, the students are given equal opportunity to be involved in all learning activities and have equal access to the anatomy resources regardless of their gender. The preclinical and clinical year students in UPM are always taught that wholesome anatomy knowledge is pertinent for safe clinical practice. Although the preclinical year students have minimal exposure to clinical attachment, the students were involved in the early clinical experience (ECE) classes where physical examinations relevant to clinical practice are taught. This involvement gives early insight to the students on the importance of anatomy knowledge and helps them to develop their clinical skills. Besides, the student's exposure to problem-based learning (PBL) could have strengthened their insight on the importance of anatomy knowledge for clinical practice.

UPM medical students perceived anatomy lecturers in UPM as knowledgeable, approachable, helpful, friendly, enthusiastic, and well-prepared for their classes, regardless of the students' gender and phases of study. The lecturers were perceived as role models for them to learn anatomy. These assumptions were made based on the high scores rated by both genders and cohorts in different phases of medical study; for each item under 'anatomy teachers and instructors' factor. Interestingly, this finding contradicts a previous study, which compared students' perception of teachers between academic achiever and non-achiever, whereby the male students perceived their teachers as being considerably less angry in the class (17). Even though there might be some differences in terms of how male and female students perceived their teachers, this difference might be very trivial and was not captured in our study. It is postulated that the willingness of anatomy lecturers in UPM to improve their teaching skills could have contributed to the high rating score of this factor by the respondents. All anatomist in UPM are experts in cadaveric dissection which is a preferred teaching method by the preclinical year students, and the anatomists are easily approachable by the clinical year students when they require consultations.

In terms of the student's intrinsic interest and effort in learning anatomy, there were no significant differences of the scores for these two factors between male and female respondents, as well as between preclinical and clinical year ones. Despite these insignificant finding, the female respondents were noted to have more intrinsic interest and invested more effort in learning anatomy evidenced by their higher scores for these two factors. While the preclinical year respondents were noted to have higher intrinsic but lower effort in learning anatomy compared to the clinical year ones, the insignificant difference may also indicate that both male and female respondents, and preclinical and clinical year ones, have equal intrinsic interest and put equivalent effort on learning

anatomy. Hence, we postulated that UPM medical students acknowledge anatomy as an important subject, which needs immense effort for deep understanding and strong memorization.

A previous study reported that successful anatomy learning depends on the students' effort to memorize, understand and visualize anatomical structures (18). In fact, a previous study conducted in UPM setting showed that the deep approach was the preferred learning approach for medical students in our faculty (19). It is also well-documented that medical students adopt deep learning approach throughout their learning process (20). Both strategic and deep learning approaches require students to invest more effort during their learning process. The findings of our study are aligned with a study that reported no gender-related differences in the students' interest and effort to learning medicine (21). Likewise, our findings support another previous study which also found no significant difference of medical students self-perceived learning score (22). Nevertheless the author reported that the clinical year students were noted to be less confident in learning anatomy, which is measured under the self-perceived learning construct (22). Interestingly, in our study, the clinical year respondents obtained lower score for a similar item (i.e. Item 8: Anatomy examinations help me to identify my weaknesses about Anatomy knowledge) compared to preclinical respondents. It is postulated that the examination for clinical year students are more horizontally integrated (i.e. assessment of clinical knowledge with less emphasis on the anatomy knowledge), therefore the assessment of anatomy knowledge is less explicit. To improve on this score, anatomy teaching in UPM can be revisited during the clinical years through several anatomy refresher classes.

With regards to anatomy learning resources, both male and female, as well as preclinical and clinical year respondents were satisfied with the learning resources as evidenced by the high rating scores to this factor. There was no gender-related difference of this factor and the score was found to be almost similar across the phases of medical studies. A study conducted in 2008 using the DREEM (The Dundee Ready Educational Environment Measure) inventory showed that the difference in the mean score of students perception of their learning atmosphere between the preclinical and clinical year students was not significantly different either (22). Our results indicate that all UPM medical students utilized and made full use of anatomy learning resources that are provided in the faculty. The faculty provides a multimodality teaching approaches in anatomy, such as cadaveric-based teaching in anatomy dissection hall, model-oriented teaching at the anatomy museum, simulation software and also lecture sessions through slideshow presentations in the lecture hall. Furthermore, the learning facilities in UPM are easily accessed by the preclinical and clinical year medical students, thus

resulted in the insignificant findings between the two cohorts.

The multimodality form of teaching resources in UPM could have catered for the experience- and gender-related preferences in learning styles, and thus contributed to the insignificant findings in this study. Studies have shown that students are more receptive towards multimodality teaching approaches that offer various forms of learning resources as these approaches could cater for students' diversity in their learning styles (23). In fact, it is well accepted that anatomy teaching should include multiple pedagogical resources as there is no single teaching method or tool that has been found to be effective in achieving the learning outcomes (24). Hence, although the method used to show the satisfactory level of a student on anatomy learning resources is different, both genders may show the same positive feedback whether the anatomy learning resources are fulfilling their satisfactory level or not.

Likewise, this study revealed no significant differences in the respondents' perception of histological practical facilities between male and female, as well as preclinical and clinical year respondents. This factor was identified as an area that requires further improvement by the faculty. Histology practical session in UPM is conducted either traditionally (viewing the histology slides through microscopes) or by using software. According to a previous research, female students rated a higher percentage for learning technology compared to male students that contribute to student satisfaction (25). Our study did not show any significant difference that could be due to similar exposure to the same classroom experience and facilities. Low-quality histology slides and poor connectivity between the instructor's microscope and the main monitor probably affected medical student's perception towards anatomy education environment. This finding is in concordance with a study which reported lower students' perceived competence in learning histology using the conventional microscopy compared to virtual microscopy; and the authors postulated that the finding was due to the low quality of histology slides (3). Likewise, another group of authors conducted a study regarding students' perception of existing histology teaching methods; the authors found that 5.15% of the students reported of not being able to achieve better scores due to poor slide quality (26). In our study, a majority of respondents answered "Not sure" for item 8 (Poor quality of histology slides). Since the survey was conducted during the COVID-19 pandemic, whereby the students had minimal exposure to histology practical using histology slides, we postulated that the result for this item could be inconclusive and further evaluation should be conducted in the future to verify this study.

The findings in this study are subject to three limitations. Firstly, the generalisability of these findings is limited

to UPM context and could not be inferred to other institutions. However, since AEEMI is a validated inventory, the results can be used to benchmark the anatomy education environment with other institution provided that the same tool is used (27). Secondly, this study was conducted during the COVID-19 pandemic, therefore the questionnaires were distributed online, which could have contributed to the almost 10% dropout rate. We assumed that the students could have ignored or were not aware about the online questionnaires as most of them were at home. Thirdly, our data collection was conducted during the examination season for some of the resitting medical students in UPM. Thus, many students may feel reluctant to answer our questionnaires.

CONCLUSION

In conclusion, this study found that there is no association between UPM's medical students' perception of their anatomy education environment and the socio-demographic parameters: gender and phase of a clinical study. Overall finding reflect that the students were satisfied with the anatomy education environment in UPM as almost all factors of the anatomy education environment were perceived positively, regardless of the gender or phase of a clinical study. The study also provides an insightful feedback from the students that the histology practical facilities in UPM may need to be improved as it is the only factor identified as the 'area for improvement.'

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