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EVALUATION OF ANATOMY ASSESSMENTS METHODS IN PROFESSIONAL MEDICAL EXAMINATIONS AND ITS LONG-TERM IMPACT ON LEARNING

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Abstract: Background/Objective: Student's learning habits are improved by regular and frequent evaluation, which also motivates them to learn and increases their competency. The purpose of this study was to examine and assess how students perceived the use of anatomical evaluation techniques and how it affects their ability to learn. **Methodology**: For this study, a representative sample of 61 Edo State University, Uzairue, medical students was used. Structured questionnaires were distributed to the students, the subjects were all medicine and surgery students offering Anatomy at pre-clinical levels and exclusion of first year students. The questionnaire was designed by the authors and reviewed by experts in a random sampling technique administrated among 20% of the population and validated using the Cronbach statistics. The questionnaire capture three sections, which include demographic, perception assessment and impact assessment. The data were obtained, arranged in Microsoft Excel® spreadsheets, and analyzed using the Windows version 22.0 of the Statistical Package for the Social Sciences (SPSS) Inc. P <0.05 was used as the threshold for significance. **Result:** About 54% of the respondents were female and majority were between the age 16-20 years, 73% of the subjects find gross anatomy as the most appreciating as regards to ease of understanding, learning and assimilation. 44.3% of the students preferred microscopic slide viewing as their best mode of assessment, 50.8% of the students choose anatomical models as their best method of practical examination and majority preferred practical assessment on models than cadavers and soft tissues. However a vast majority of the students finds steeple chase practical assessment as exciting, interesting method in learning anatomy. Many of the students have the perception that multiple choice questions improves knowledge and it is an encompassing assessment method. **Conclusion:** In conclusion, students' perception to assessment pattern varies and student's performance depends largely on active participation, preparation. This study shown that for more efficient clinically oriented learning and appreciation, a cooperative effort between classroom theoretical learning, practical application, and stimulatory activities is required.

KEYWORDS: Anatomy, assessment methods, impact, learning, medical education, students' perception.

Introduction

Anatomy is a discipline with an integral component required for professional examinations and its teaching and learning is essential to medicine (Patel and Moxham 2006; Moxham and Plaisant 2007; Fitzgerald et al., 2008).

Medical education has undergone tremendous changes over the years, education researchers are continuously trying to review learning styles and new instructional methods that would have a long-term impact in training medical students (Chakravarty et al., 2005).

Regular and periodical assessment of students not only improves learning habits but drives the students learning and enhance the competence of the students. Assessing medical students should help them focus their learning

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during their course, identify individual strength and weakness, highlight deficiencies in the content or delivery of medical course and ultimately protect the public against incompetent medical personnel.

An important aspect of education is learning how to learn; that's why in training of medical students, different methods or approach are employed to transfer and enhance learning process.

Assessment is an integral part of learning for re-evaluating learning objectives through grading, verifying competences and supporting better, adapted, reviewed learning preferences. Assessment of students in medical field is a very vital and essential part in their training. It is seen as the strongest determinant of what students actually learn as opposes to what they are taught (Lowry, 1993). Crooks (1988) see assessments as educational tools that assist teachers in evaluating students' intellectual capability, how successfully he is presenting the material he/she has taught as well as serve to motivate students' structure their academic efforts. The role of assessment extends beyond examining students' performance, it also facilitate their continuous learning through appropriate feedback with prospect of improvement (Archer, 2010). As Saago et al., (2020) noted anatomy assessments and examinations are designed typically to test factual and/or applied anatomy knowledge with or without the inclusion of visual resources. This is important as this knowledge tested will be necessary for physical examination, establishing a clear prognosis and diagnosis, carrying out clinical and surgical procedures and interpreting medical reports (Dettmer et al., 2013; Orsbon et al., 2014; Vorstenbosch et al., 2016). The perception of students on the various assessment methods will reflect the long term impact of the goal of objective learning and thus an influence on students' approach to learning (Struyven et al., 2005; Sander et al., 2000).

Generally, first professional medical examinations involves multiple-choice questions (MCQs), essays, viva, practical in assessing students' performance (Epstein, 2007; Des Marchais and Vu, 1996; Dakum et al., 2009; McKeachie, 1986; Muzzin, 1995). The varied components for anatomy assessments include written theoretical/essay assessments (long and short answers), practical steeple chase, oral/viva assessments, 3D animated device (Anatomage table), histological/microscopic slide viewing assessments, computer based-multiple choice/extended blended questions. These various assessment methods unique to Anatomy in most instances are said to be widely accepted for the reason that multiple representations of information can complement or support learning according to Ainsworth, (1999). The Assessment of medical students using multiple strategies will not reflect much gains unless with reference to certain utility indices such as validity, reliability, cost implications, general acceptability and educational impact (Van der Vleuten and Schuwirth, 2005; Samarasekera et al., 2015) as well as objectivity.

The aim of this research is to investigate the students' perception of the utility index of anatomy assessments and the impact on their studies. The objectives is to answer the following research question: What is the perception of students in terms of preparation to each of the different anatomy assessment types and resultant effect on success. The study hypothesized that a given assessment type may determine the preparation hence the outcome and ultimate the purpose of learning and assessment.

MATERIALS AND METHODS

Study design

This is a population study of cross-sectional survey with student population of a University within the College of medical sciences using questionnaire as a means of data collection.

Population:

The research was carried out among students offering anatomy at College of Medical Sciences, Edo State University, Uzairue, Nigeria (formerly called Edo University). A total number of 61 students volunteered and responded to the distributed questionnaires as students studying anatomy courses in the department of Medicine

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and Surgery out of 75 admitted students of the two level medical programme.

Exclusion criteria includes first year students who have not been taught any anatomy course, second year students who have not written all the components of anatomy assessments.

Instrumentation and Procedure: A closed ended questionnaire designed on a five point quantitative Likert scale to measure satisfaction was administered. The questionnaire captured three sections, namely the demographic parts on age, sex, level and specialty with multiple choice questions attached as sub-parts on preferred modes of assessment, preferred practical modes and most appreciating branch of anatomy course, the perception assessment part and the impact assessment part. Participants were requested to put a tick in one of the 5-point Likert scale boxes for the statement that most appropriately described their views (where 1, Strongly disagree; 2, Disagree; 3, Neutral; 4, Agree; and 5, Strongly agree). The questionnaire was based on recently used summative assessment methods of professional medical examinations as applied in Edo State University Uzairue, their long-lasting effect on students learning, and their objectivity, ease/difficulty, content, duration and flexibility.

Data Collection and Administration of Instrument

The questionnaire was converted into an online google form and the link sent to targeted study population class groups and platforms for responses. Reminders were sent periodically to participants and after one month a total of 61 responses were received. The purpose of the study and pattern of questionnaire design was explained for clear and candid responses before sending out.

Validation and Reliability Test of Instrument

The questionnaire was designed by the authors and reviewed by Experts in a random sampling technique administrated among 20% of the population and validated using the Cronbach statistics

Data analysis

The data were downloaded and organized in Microsoft Excel® spreadsheets and analysed using Statistical Package for the Social Sciences (SPSS) Inc., Chicago, version 22.0 for Windows. Data were analysed using descriptive of mean and mode values and inferential statistic methods. The level of significance was taken to be $P < 0.05$.

Ethical consideration:

The ethical consideration for questionnaire administered research was followed such that no specific identifier of the respondents were taken nor any identification apart from emails to gain access and follow up as reminder as all responses were treated based on confidentiality. Permission was obtained from the Faculty research and ethics committee of the institution.

RESULTS

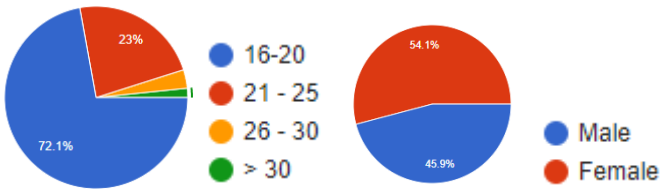

Figure 1: Chart showing age (in years) and gender of respondents

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Table 1: Chart showing branch of Anatomy most appreciating to learn towards examinations

General Multiple choice questions for respondents	Different assessment patterns and courses in Anatomy	Percentage
What branch of Anatomy do you find most appreciating and effective learning towards exams?	Gross Anatomy	73%
	Clinical Anatomy	9.8%
	Histology	3.3%
	Embryology	4.9%
	Neuroanatomy	6.6%
Which modes of anatomy assessment is most cherished in exams?	Oral/viva	4.9%
	Steeple chase	14.8%
	Anatomage table viewing	4.9%
	Microscope slide viewing	3.3%
	CBT based	27.9%
	Essay writing	44.3%
What should be criteria for allowing students to sit in examination?	Attendance	19.7%
	Performance at internal assessment	18%
	Both	24.6%
	No idea	37.7%
Best assessment technique for practical examination.	Viva on soft part	33.9%
	Viva on hard part	15.3%
	Viva on models	50.8%

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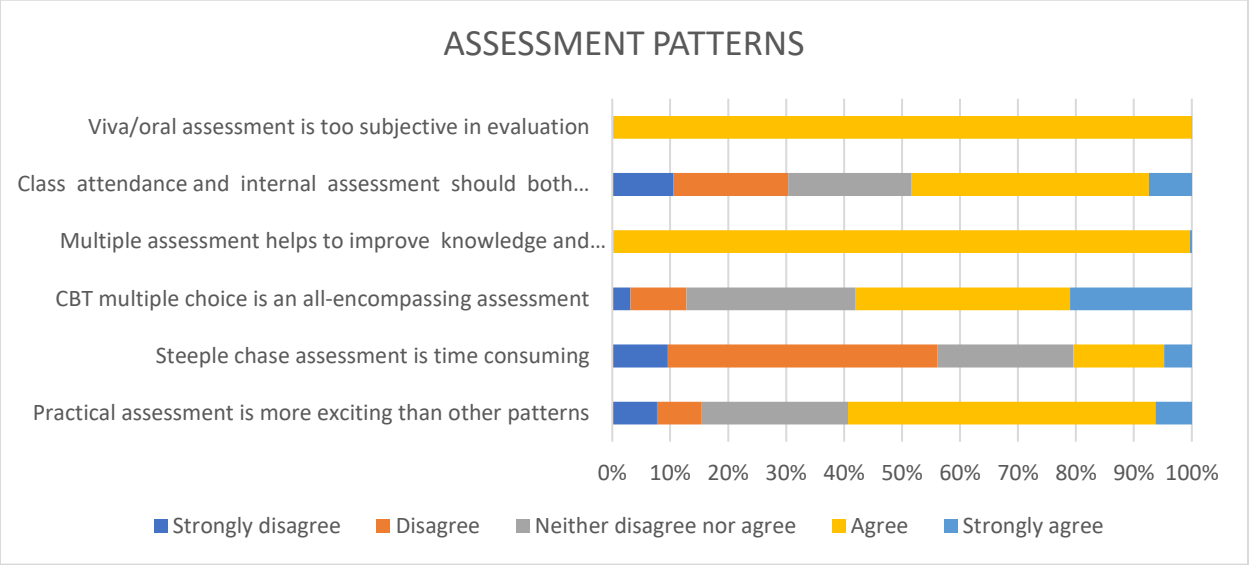

Figure 2: CHART SHOWING THE FEEDBACK ON ASSESSMENT PATTERNS USED IN ANATOMY DEPARTMENT.

Table 2: CHART SHOWING THE FEEDBACK OF LEARNING IMPACTS ON STUDENTS

	Strongly disagree	Disagree	neutral	agree	Strongly agree	mean	mode
I study and prepare more when facing viva assessment	2 3%	20 30%	25 40%	11 18%	2 3%	2.77	3
I am confident when facing steeple chase assessment	1 1%	16 26%	18 29%	22 36%	6 9%	3.14	3
I retain what was taught better during CBT assessment	1 1%	11 18%	27 44%	15 24%	7 11%	3.17	3
My frequent practical exposure helped better during steeple chase	*	4 6%	7 11%	37 60%	14 22%	3.94	4
Class lectures were helpful during Essay writing assessment	3 4%	1 1%	10 16%	34 55%	13 21%	3.94	4
My personal study during viva was not significantly helpful	3 4%	13 21%	26 42%	16 26%	6 9%	3.11	3

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I learn faster and easier preparing for CBT multiple choice assessment	*	10 16%	17 27%	25 40%	9 14%	3.47	4
The multiple modes of assessment in Anatomy improved my knowledge and skills	*	1 1%	14 22%	40 65%	5 8%	3.79	4
Questions asked during Viva assessment was relevant in clinical practice.	1 1%	5 8%	16 26%	38 62%	3 4%	3.58	4
The impact of objective structured practical exam is more than that of objective structured clinical exam.	2 3%	5 8%	41 67%	12 19%	*	3.03	3

DISCUSSION

The demographic statistics of this study in Figure 1 shows that anthropometric index of age and sex plays a role in preference to the methods of anatomy assessment in professional examinations and ultimately impact on learning and effectual outcome as seen in high percentage rate of females (72%) and age between 16 – 20 years old.

From Table 1, it is observed that about 74% finds the gross aspect of anatomy most appreciating with ease of understanding and effective learning towards examination success, especially when properly supported with clinical correlates which is the clinical branch of anatomy as against histology, embryology or neuroscience as a branch of anatomy. This can be said to be attributed to the direct correlational examples of cases that can be applied even right in class while learning without/before moving to the laboratory. Mohammad et al., (2017) opined the high level of understanding for gross anatomy to both the applied concept of it and group participation involvement especially during gross cadaver practical sessions. Miller (2000) added that learning gross anatomy would be an easier exercise if it started with empty body cavities, then building up, with a careful sequence of prosections, to the more complex gross cadaveric dissections.

The usefulness of multimedia technology in medical professional examination such as use of Anatomage table, non-flexible computer based examinations or learning management platforms are only secondary to the actual paper/essay writing where details and thoughts are freely expressed as noted in Table 1 where over 45% among other four modes and categories in the likes of microscopic slides viewing, oral viva and practical steeple chase were examined and chosen as their most cherished and of best interest though comes with disadvantage as noted by Samarasekera et al., (2014) on anatomy essay writing since it cannot sample widely, and hence, the reliability is generally low. The observation on computer based examinations here opposes the view of work done by Meyer (2015) on students' performance in gross anatomy examination where majority of students (87%) agreed that they felt comfortable using computers for gross anatomy examinations. Furthermore, the perceived students' best methods of practical examination is noted to be on models (51%) rather than soft tissue parts as seen in Table 1 which is contrary to the report of Sadeesh et al., (2021) on discussion relating to gross anatomy images. This preference against the soft tissue parts may not be far from their observation given that discussion of soft parts requires a good 3-dimensional orientation of the specimen to which students not trained properly for such understanding and interpretation may find it difficult. Mandeep (2021) also stated that though the type of image has no significance on the performance, their ability to interpret contributes to high success.

Mode of assessment of students were found to be satisfactory by the most of medical students in a study done

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by Anand et al., (2015) and in present study also most of the students (44.16%) were satisfied with the mode used for assessment in gross anatomy. Multiple modes of assessment like multiple choice questions, viva, short essay type questions were favored by most of the students as reported by Rafique et al., (2013) While Nagar et al (2012) and Larvalmawi et al., (2015) reported that most of the students favored weekly tutorials as most useful mode of assessment.

The chart of figure 2 shows the feedback on assessment patterns used in anatomy department. The feedback on criteria to be met in order to seat for any examination in Anatomy was assessed and as evident from the findings many students opined that class attendance and internal assessment should both be taken into consideration for allowing students to sit in any anatomy exams which is also in line with the response gotten by Rafique et al., (2013) of about 55.7% students. According to Marcus et al., (2010) class attendance affects cognition and motivation of students and as such both cognition and motivation influence academic outcome by two different mechanisms. Cognitive ability correlates with the degree to which students are able to process, integrate and recall information given to them. Motivation affects academic outcome by bringing about a behavioral change in the students that enable them to be self-directed learners, hence, Students' attendance is considered as an important factor contributing to academic performance in Medical education.

Knowing assessment as one of the most important aspect of teaching and learning process, hence in anatomy, there are multiple assessment methods available to assess the knowledge and skills of students.

On modes of assessment of students, multiple modes as currently undertaken by the students in their college were found to be satisfactory which agrees with views of most of medical students in a study done by Anand et al., (2015). In the present study most of the students (40; 65%) were satisfied as also seen in Table 2 with reason that it helps them learn and retain the knowledge of the course even in clinical practice. Equally multiple modes of assessment like multiple choice questions, viva, short essay type questions etc. were favored by most of the students as reported by Rafique et al., (2013), while Nagar et al. (2012) and Larvalmawi et al., (2015) reported that most of the students favored weekly tutorials as most useful mode of assessment.

In present study, about 37% of medical students were of the opinion that CBT multiple choice question encompasses all other assessment patterns which is in line with the conclusion made by Ahmed (2020) that CBT multiple choice questions assess the competency of the students' knowledge in Anatomy and help to differentiate good and poorly accomplished students.

In present study, majority of the students disagreed with the fact that steeple chase (practical exam) is time consuming and agrees with the fact that it is more exciting that other form of assessments used in anatomy examinations.

Table 2 shows the feedbacks of learning impacts on students. A greater number of students (37, 60%) agreed to the fourth statement which is "My frequent practical exposure helped better during steeple chase". While only four students (6%) disagreed to the statement and none strongly disagree as well as the least number of persons on neutrality among other impact statements. This reiterates the view of Pizzimenti et al., (2016) dissection, coupled with associated practical activities, is an effective pedagogical strategy for learning anatomy. Also Mclachlan et al., (2004) also strongly advocated for the use of cadavers as essential to medical learning; which goes to establish the call for more intense practical sessions increase direct experience in applying what is understood in class. Qamar et al., (2018) had the view that students who used cadaver for learning performed better in written exams but not clear on steeple chase as noted amnong medical students in Pakistan. However Gonsalvez et al., (2015) has a contrary opinion that preferential attendance

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at workshop or dissection style classes does not necessarily lead to better assessment outcomes. Although quite insignificant number of students both disagree and were neutral on the second statement in table 2 "I am confident when facing steeple chase assessment" which collaborated the views of Inuwa et al., (2011) that it is a summative assessment that is stress encumbered and not formative as team support is not possible as also noted by Mogali et al., (2020); which is noted knowing the occasionally doubt and fear associated with writing professional medical exams. There was higher agreement that Class lectures were helpful during Essay writing assessment as seen by the 55% and only 1% disagreement in table 2 with mean of 3.94. Gonsalvez et al., (2015) retrospective study on undergraduate students show that greater student attendance at practical classes is associated with better performance on anatomy assessments. This was noted to be so as most teachers will guide in answering questions while teaching in addition to the areas of concentration or focus usually given through lecture which aids clarity. According to Pearce and Geoffrey (2009). On the first impact statement "I study and prepare more when facing viva assessment" the highest percentage of the students (20%) with the lowest mean value of 2.77 disagree that viva mode of assessment encourages their seriousness to more studies. This opposing view is likely due to the subjective mode of oral exams that also cannot be easily predicted of the examiner's mind and response interest which therefore leaves the students with the option of merely preparing for it on an average level rather than with deep interest for maximum good output and performance. The author's view supports the opinion of Shenwai and Patil (2013) that impact on students will increase and well accepted if viva is structured to be more reliable with some modifications in blueprinting.

The students gave a 1% strongly disagree response (mean = 3.58) to statement 9 in Table 2, which is "Questions asked during Viva assessment was relevant in clinical practice." which with the $p < 0.01$ is in agreement with Brett et al., (2017). On the perception that students finds most discussions around questions during viva exams bordering on clinical applications of the anatomical concepts. Again the views of Shenwai and Patil (2013) and Naureen and Khadija (2016) that structured and modified viva is more impactful due to its reliability and uniformity should be considered. This has impacted on the students paying greater attention to the applied anatomy of topics taught by the teachers**.** This observation therefore requires a collaborative effort between class theoretical learning and practical demonstrative and stimulatory practices for a more effective clinically oriented learning and appreciation, Jan and Bruce (2009).

On the statement 7 of table 2 "I learn faster and easier preparing for CBT multiple choice assessment" 25 students (40%) actually agree as it is reported to aid fast mental rehearsal in choice making. This statement according to Chularuk et al., (2009) there is significance higher performance with CBT but students did not actually gain factual knowledge of the course content; hence there is the need to be able to identify the critical and most important points among many related contents as also agreed by students at Chang et al., (2007).

CONCLUSIONS

The study concluded that the perception of students in terms of preparation to each of the different anatomy assessment types varies and hence their commitment and ultimate the individual resultant effect on the outcome. This affirmed with the hypothesis that a given assessment type influences the preparation given to each assessment methods. It was noted that better preparation and modification pattern such as repetitive practice especially on soft tissues and applied relations before assessments will result in better outcome. Generally group cadaveric practical dissection was supported for interactive understanding and improved outcome for viva assessment methods; with less significant impact of knowledge seen on computer based assessment modes of steeple chase and essay writings.

REFERENCES

Ahmed, I.A.M. (2020). Role of Multiple Choice Questions in Assessment of Competency of Knowledge in Anatomy. International Journal of Medical Research and Health Sciences. 9(6):72-78.

Ainsworth, .S. (1999). The functions of multiple representations. Journal of Computer Education. 33:131–152.

Anand, M.K., Lakhani, C.J. and Javia, M.D. (2015). The role of medical student's feedback in undergraduate gross anatomy teaching. Indian Journal of Clinical Anatomy and Physiology. 9(2):72–78.

Archer, J. (2010). State of the science in health professional education. Effective feedback. Journal of Medical Education. 44. 101-8.

Chakravarty, M., Latif, N.A., Abu-Hijleh, M.F., Osman, M., Dharap, A.S., and Ganguly, P.K. (2005). Assessment of anatomy in a problem-based medical curriculum. Journal of Clinical Anatomy. 18(2):131-6.

Shao-Hua C., Pei C.L. and Zih-Chuan L. (2007). Measure of partial knowledge and expected response in multiple choice test. Educational Technology and Social Science.10:95-109.

Chularuk, K., Benchaporn, C., Yuwadee, L., Rujires, T., Bhinyo, P. and Pintip, R. (2009). Enhancing nursing students' skills in vital signs assessment by using multimedia computer-assisted learning with integrated content of anatomy and physiology, Nurse Education Today. 29(1):65-72.

Crooks, T.J. (1988). The impact of classroom evaluation practices on students. Review of Educational Research. 58:438-81.

Dakum, N.K., Misauno, M., Yiltok, S.J., Ugwu, B.T., Madaki, J.K., and Akwara, A.L. (2009). An analysis of final year medical students' examination in surgery. Annals of African Medicine. 8: 66-8.

DesMarchais, J.E. and Vu, N.V. (1996). Developing and evaluating and student assessment system in the preclinical problem-based curriculum at Sherbrooke. Academic Journal. 71:274-83.

Dettmer, S., Schmiedl, A., Meyer, S., Giesemann, A., Pabst, R., Weidemann, J., Wacker, F.K. and Kirchhoff, T. (2013). Radiological anatomy - Evaluation of integrative education in radiology. Fortschr Röntgenstr. 185:838–843.

Epstein, R.M. (2007). Assessment in medical education. New English Journal of Medicine. 356:387-96.

Fitzgerald, J.E., White, M.J., Tang, S.W., Maxwell-Armstrong, C.A. and James, D.K. (2008). Are we teaching sufficient anatomy at medical school: The opinion of newly qualified doctors. Clinical Anatomy. 21:718–724.

Gonsalvez, D., Ovens, M. and Ivanusic, J. (2015). Does attendance at anatomy practical classes correlate with assessment outcome? A retrospective study of a large cohort of undergraduate anatomy students. BMC Medical Education. 15:231.

Inuwa, I. M., Rawahy, M.A., Taranikanti, V. and Habbal, O. (2011). Anatomy "steeplechase" online: Necessity sometimes is the catalyst for innovation. Anatomical Sciences Education. 4(2): 115–118.

Jan, W. and Bruce, W. (2009). Enhancing Learning by Integrating Theory and Practice. Int. Journal of teaching and learning in higher education. 21 (2):258-265.

Khadija, Q., Sadaf, S., Humaira, A., Mohammad, K.A., Faiza,a., and Sana A.K. (2018). Do practical gross anatomy exams affect overall performance of

students? A mix study. Rawal Medical Journal. 43(4):1-4.

Lalvarmawi, F., Banik, U. and Devi, M. (2015). Feedback of medical students on teaching and evaluation methodology in Physiology. National Journal of Physiology Pharmacy and Pharmacology. 5(1):36–38.

Lowry S. Assessment of students. (1993). British Medical Journal. 306:51–54.

Mandeep, G.S., Marc, A.T.M.V., Peter, J.B., Harold, E., Maria, K. and Charlie O. (2021). Online Assessment of Applied Anatomy Knowledge: The Effect of Images on Medical Students' Performance. Anatical Science of Educatrion. 14:342–351.

Marcus, C., Sylvia, G.R., Urszula, M. and Keiszczynca E. (2010). Class attendance in college: A meta analytic review of the relationship of class attendance with grades and student characteristics. Review of Educational Research. 80(2):272-295.

McKeachie, W.J. (1986). Teaching tips: A Guidebook for the Beginning College Teacher, 8th ed. Lexington, Mass: Heath.

McLachlan, J.C., Bligh, J., Bradley, P. and Searle, J. (2004). Teaching anatomy without cadavers. Association For the Study of Medical Education. 38(4):418-424.

Meyer, A.J., Innes, S.I., Stomski, N.J. and Armson, A.J. (2015). Student performance on practical gross anatomy examinations is not affected by assessment modality. Anatomical Sciences of Education. 9(2): 111–120.

Miller, R. (2000). Approaches to learning spatial relationships in gross anatomy: Perspective from wider principles of learning. Clinical anatomy. 13(6): 439-443.

Mohammad, A.A., Alireza M., Hossein N., Vahid M. and Homayoun N. (2017). Learning styles and strategies preferences of Iranian medical students in gross anatomy courses and their correlations with gender. Anatomy & Cell Biology. 50(4): 255-260.

Mogali, S.R., Rotgans, J. I., Rosby, L., Ferenczi, M.A. and Beer. N. L. (2020). Summative and Formative Style Anatomy Practical Examinations: Do They Have Impact on Students' Performance and Drive for Learning? Anatomical Sciences of Education. 13(5):581-590.

Moxham, B.J. and Plaisant, O. (2007). Perception of medical students towards the clinical relevance of anatomy. Clinical Anatomical journal. 20:560–564.

Muzzin, Q. (1995). Oral examinations. In: Shannon S, Norman G, Falconer J, editors. Evaluation Methods: A Resource Handbook. Hamilton, Canada: McMaster University. p. 3742.

Nagar, S.K., Malukar, O., Kubavat, D., Prajapati, V., Ganatra, D. and Rathwa, A. (2012). Students' perception on anatomy teaching methodologies. National Journal of Medical Research. 2:111–115.

Naureen, C. and Khadija (2016). Importance Of Structured Viva As An Assessment Tool In Anatomy. Journal of University Medical & Dental College. 7(2), 29-34.

Orsbon, C.P., Kaiser, R.S. and Ross, C.F. (2014). Physician opinions about an anatomy core curriculum: A case for medical imaging and vertical integration. Anatomical Sciences of Education.7:251–261.

Patel K.M and Moxham B.J. (2006). Attitudes of professional anatomists to curricular change. Clinical Anatomical Journal. 19:132–141.

Pearce, G and lee, G. (2009). Viva voce as an assessment method: Insights from marketing Students. Journal of Marketing Education. 31:120-130.

Pizzimenti, M. A., Pantazis , N., Sandra, A., Hoffmann, D.S., Lenoch, S. and Ferguson, K J. (2016). Dissection and dissection-associated required experiences improve student performance in gross anatomy: Differences among quartiles. Anatomical Sciences of Education. 9(3): 238-246.

Rafique, S. and Rafique, H. (2013). Student's feedback on teaching and assessment at Nishtar Medical College, Multan. Journal of Pakistan Medical Association. 63(9):1205-09.

Sadeesh, T., Prabavathy, G. and Ganapathy, A. (2021). Evaluation of undergraduate medical students' preference to human anatomy practical assessment methodology: a comparison between online and traditional methods. Surgical Radiological Anatomy. 43(4):531-535.

Sagoo, M.G., Vorstenbosch, M.A., Bazira, P.J, Ellis, H., Kambouri, M. and Owen,C. (2021). Online Assessment of Applied Anatomy Knowledge: The Effect of Images on medical Students' Performance. Anatomical Sciences of Education. 14:342–351.

Samarasekera, D.D., Gopalakirshnakone, P. and Gwee, M.C. (2015). Assessing anatomy as a basic medical science. In: Chan LK, Pawlina W (Editors). Teaching Anatomy: A Practical Guide. 1st Ed. New York, NY: Springer International Publishing. 279–289.

Samarasekera, D. D., Gopalakrishnakon,e P. and Gwee, M. C.E. (2020). Assessing Anatomy as a Basic Medical Science. Asia-Pacific Biomedical Science Educators Association. 31:279-289.

Sande,r P., Stevenson, K., King, M. and Coates, D. (2000). University Students' expectations of teaching. Student Higher Education. 25(3):309–23.

Shenwai, M.R. and Patil, K., (2013). Introduction of Structured Oral Examination as A Novel Assessment tool to First Year Medical Students in Physiology. Journal of Clinical Diagnostic Research. 7(11):2544-7.

Struyven, K., Dochy, F. and Janssens, S. (2005). Students' perceptions about evaluation and assessment in higher education: a review. Assessment and Evaluation in Higher Education. 30(4):325–41. 12.

Van der Vleuten, C.P.and Schuwirth, L.W . (2005). Assessing professional competence: From methods to programmes. Medical Education. 39:309–317.

Vaughan, B., Orrock, P. and Grace, S. (2017). Reliability of a viva assessment of clinical reasoning in an Australian pre-professional osteopathy program assessed using generalizability theory. Journal of Education and Evaluation in Health Profession. 14:1.

Vorstenbosch, M.A, Kooloos, J.G, Bolhuis, S.M. and Laan, R.F. (2016). An investigation of anatomical competence in junior medical doctors. Anatomical Sciences of Education. 9:8–17.