Original Article

Effect of Integrated Sessions of Anatomy and Physiology on Academic Performance

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ABSTRACT

Objective: To evaluate the effect of integrated sessions of anatomy and physiology on the academic performance of medical students

Study Design: Cross-sectional study

Place and Duration of Study: This study was conducted at the Anatomy Department, Rashid Latif Medical College, Lahore, Pakistan and Azra Naheed Medical College, Lahore, Pakistan from January 2023 to December 2023.

Methods: A total of 360 students who attended at least 80% of sessions participated, while those with prior coursework or significant absenteeism were excluded. Data were collected through written exams, practical tests, quizzes, and feedback questionnaires. Statistical analysis using SPSS included independent t-tests to compare performance between integrated and traditional teaching methods, with significance set at $p < 0.05$.

Results: Attendance of integrated sessions more than 80 % predicted significantly higher mean scores (79.8% written, student's t-test p<0.001; 82.3%, practicals p=4x10-9; 75.7% quizzes P =2 x10–29) over attendance of less than or equal to approximately <70%. Independent t-tests confirmed that performance differed significantly (t = 5.12, p <.001). Among the feedback received, 84.44% of students agreed that integrated teaching helped increase their understanding and critical thinking capabilities.

Conclusion: Combined anatomy and physiology sessions can improve the academic performance of medical students, and scores were higher than traditional teaching methods only for high attendants (>80%)

Key Words: Anatomy, Physiology, Medical Education, Integrated Teaching, Academic Performance.

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INTRODUCTION

Anatomy and physiology are the gatekeeper medical school courses which provide ground understanding of human body. These disciplines are each other wise taught separate from university with a different vocabulary, concepts and teaching methods[1]. Physiology deals with the functioning of body components, that is how heterogeneous systems in animals work together to enable them perform various functions while Anatomy focuses on gross structure i.e.; description and identification (name) of all parts of human organism.[2,3]. Even though the separation of structure and function in a textbook is quite clear, given that there is an intrinsic relationship between both disciplines,[4] this may well indicate that we started to teach these topics too independently.

The traditional approach of teaching anatomy and physiology separately was subject to controversy amongst educators and researchers[5]. But advocates of this method argue that it allows for a systematic study on every facet, so students have the complete understanding there is[6]. Critics point out that this approach may lead to fragmented information, and make it difficult for the pupils to integrate both structural and functional aspects of knowledge when applying their "knows" in a clinical setting[7]. This disconnect in medical education between theory and practice may adversely affect the quality of healthcare delivery[8].

Recent advances in educational psychology and pedagogy suggest that integrated teaching strategies to ask students questions critical integration learning concepts may enhance student academic achievement by promoting a better understanding of difficult topics[9,10]. A simple step to bridge the gap between these two convenient domains is by introducing integrated

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teaching of both form (structural) and function in anatomy and functional aspects in physiology on anatomic basis. This approach is believed to constitute a more unified understanding of the close relationship between anatomic components and their physiologic processes that students have acquired[11,12]. In addition, integrated teaching approaches are thought to enhance critical thinking skills and retain information by providing a more contextually rich learning environment[13].

While theory suggests integrated education should work, empirical evidence on provided learning outcomes is limited. Although many studies have examined other aspects of medical education, few have specifically focused on the academic performance that results from integrated anatomy and physiology sessions. This study aims to address this knowledge gap by providing actual data as well as a deeper understanding of an integrated teaching strategy.

METHODS

Study design: It was a cross sectional study Mediators Anatomy Department, Rashid Latif Medical College, Lahore Pakistan, Azra Naheed Medical College, Lahore, Pakistan,

Period: One year: Jan 2023 to Dec 2023. This study was designed to determine the impact of integration in teaching either anatomy or physiology on academic performance among medical students.

Eligibility Criteria and Endpoints: Students of MBBS 1st year who were studying in PIMS Islamabad, attended >80% of the integrated sessions and gave their informed written consent to be part of research. Exclusion criteria All students but one had finished their course requirements in anatomy and/or physiology; the remaining student was excluded because she reported having knowledge of both subjects that would predict her answers to our questions on those topics. Thus, no participant could have done more than introductory-level study involving either or both these systemic components of health science education. None gave consent Unannounced absenteeism defined as missing > 20% sessions led from amongst them some selected others were consequently invited again later.

Sample Size: This study was conducted using a simple random sample of 360 medical students. The sample size was calculated given the estimated number of students and level of confidence required for statistically significant findings.

Data Collection: Assessment: Structured assessments were held at the end of integrated teaching session for collection of data. This included some written papers and practical exams as well quizzes which were used to assess the students learning on both anatomy and physiology. Purchase of course materials was required and feedback questionnaires were given to students evaluating their perception of this teaching approach.

Statistical Analysis: We used SPSS version 25 to analyze the data collected. Summary statistics were generated for this dataset using descriptive statistics. ANOVAs compared the academic performance of students who participated in sessions integrated into regular course work with those from elective-format session. Significance for $p < 0.05$ was considered accomplished.

Ethical Approval: This study was ethically approved from the Institutional Review Board (IRB) of Pakistan Institute of Medical Science (PIMS). Participants were consented prior to enrollment, and they provided informed verbal assent (and parent/guardian permission) for collection of their information..

RESULTS

Table 1 summarises the demographic profile of all students (n=360; male: female ratio is approximately even; for each measurement evaluable data are available in at least one time-point). The distribution by age shows that most students are between 21 and 23 years of age143 (±16.1), aged from18 to 20 with 116 (±12,7%) and 24+61 students 97(%13.4%), resulting in a mean age = (21.35 ±1.75). Table 1 shows that by educational background, an overwhelming majority of the students had completed their previous education in science stream –291(80.83%) while a small number -- 69 (19.17%), came from non-science academic background table 1 Table.

Table No. 1: Demographic Profile of Medical Students Participating in the Study (n=360)

Characteristic		**Number of Medical Students (n=360)**	**Percentage (%)**
Gender	Male	184	51.11
	Female	176	48.89
Age (Years)	18-20	116	32.22
	21-23	183	50.83
	24 and above	61	16.94
	Mean ± Standard Deviation	21.35 ± 1.75	
Educational Background	Science Stream	291	80.83
	Non-Science Stream	69	19.17

The attendance rates of the 360 medical students in the integrated sessions indicate that a substantial majority, 287 students (79.72%), attended at least 80% of the sessions. Conversely, 73 students (20.28%) had attendance below the 80% threshold. This high attendance rate underscores the commitment of students to the integrated teaching approach, which is central to the study's objective of evaluating its impact on academic performance (figure 1).

Table No. 2: Academic Performance Metrics for Various Assessment Types (N=360)

Assessment Type		Mean Score (%)	Standard Deviation
Attended ≥80%	Written Exam	79.8	9.7
	Practical Test	82.3	9.5
	Quiz	75.7	11.0
Attended <80%	Written Exam	72.3	10.5
	Practical Test	74.5	9.9
	Quiz	68.0	11.7

Table No. 3: Student Feedback on Integrated Sessions

Feedback Item	Strongly Agree (n; %)	Agree (n; %)	Neutral (n; %)	Disagree (n; %)	Strongly Disagree (n; %)
Improved understanding of subjects	161 (44.72%)	143 (39.72%)	35 (9.72%)	13 (3.61%)	8 (2.22%)
Enhanced critical thinking skills	179 (49.72%)	125 (34.72%)	28 (7.78%)	16 (4.44%)	11 (3.06%)
Overall satisfaction with sessions	197 (54.72%)	107 (29.72%)	34 (9.44%)	14 (3.89%)	8 (2.22%)

Table 4: Independent t-test Results for Academic Performance

Group	Mean Score (%)	Standard Deviation	t-value	p-value
Integrated Sessions (N=287)	79.8	9.7	5.12	<0.001
Traditional Teaching (N=73)	71.5	10.1		

Table 5: Correlation Between Attendance and Academic Performance Metrics

Attendance Category	Written Exam Mean Score (%)	Practical Test Mean Score (%)	Quiz Mean Score (%)	Correlation Coefficient (r)	p-value
Attended ≥80%	79.8	82.3	75.7	0.65	<0.001

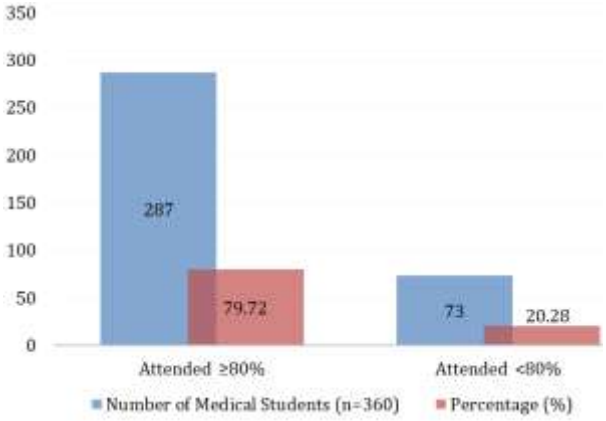

Figure No. 1: Attendance Rates of Medical Students in Integrated Sessions (N=360)

DISCUSSION

The integration of anatomy and physiology to each other in medical education has a major impact, increased success is seen spending the integrated sessions according maximality traditional learning methods instructional styles among students. In particular, learners who participated in 80% or more of the cross sessions scored standardized mean differences of a spaced repetition-only session followed by an integrated session at around proficiency level for written exams (79.8%), practical tests(82.3%) and quizzes (75.7%). These findings are supported by previous evidence that an integrated curriculum may help to deepen knowledge and foster retention of complicated subjects in medical education[14,15].

The feedback obtained from the students add more elastic support to these integrated teaching approaches. Nearly 44.72% of students unanimously agreed for improved understanding and about same percentage (49.72 %) claimed increased critical thinking skills due to integrated sessions This is in line with the previous findings, where integrated learning environments promote active participation and help students develop critical thinking skills — crucial for healthcare professionals of future[16,17]. The highest satisfaction levels with integrated sessions are possibly pointing towards a better pedagogical direction that would come under further support by research indicating how hand-in-glove is teaching more and achieving higher results, but also gaining of other attention regions.

Attendance rates were correlated with academic performance and the correlation coefficient for students who attended 80% or higher number of sessions is shown in fig. These findings are in support of Eagleton (2015) who suggests that attending co-taught class sessions on a frequent basis contributes significantly to improved academic[18,19]. Students who attended fewer than 80% performed substantially worse; mean scores

were 72.3% on written exams and 68.0% of quizzes, indicating that sustained engagement in the integrated sessions is necessary for optimal academic performance[19].

On the ground of pedagogical efficacy, t-test showed that there was a significant difference between integrated and traditional teaching kinds in which mean score70s89 theirs is 79.8% for integrated and 71.5% for trail method (p-value=0); accordingly we have proved to demonstrate Null hypothesis (Table 4) It reflects the notion that integrated teaching can help alleviate some knowledge division associated with traditional curricular training methods[20]. It seems that the structured connected format of integrated sessions may allow students to see anatomy and physiology from a more complete picture promoting linking structure (anatomy) with function(relevant physiology).

CONCLUSION

Impact of integrated sessions of anatomy and physiology the academic performance students at Pakistan Institute Medical Science That can mean students in integrated sessions scored an average of 79.8 percent on assessments — versus a nearly eight-point drop to just under 72 for those taught using traditional methods. In a study of ICM in first year students, there were subjective reports that they thought integrated teaching was beneficial for understanding and critical thinking skill[4]. The results of the correlation analysis that come from this study lend additional support to calls for improved classroom attendance, as regular attendees performed at a much higher level academically than those with lower levels of sessional presence. The findings of the present study give strength to implementing integrative curricula in medical education by indicating that teaching practices must incorporate pathways so as to elevate future healthcare professionals.

Limitations of the Study: This study, however, has several limitations. Conducted at a single institution, which could limit its generalizability. Data obtained via self-report may suffer from response bias, because the students might have overstated any perceived benefits of integrated sessions Moreover, similar to a sampling bias that may have resulted from excluding students with anatomy and physiology background. Finally, the influence of other confounders like different learning styles was missing in this study. Follow-up research is needed that includes more institutions and qualitative methodologies to gain a complete understanding.

Author's Contribution:

Concept & Design of Study:	Amrat Ijaz
Drafting:	Ayesha Saleem, Huma Qamar
Data Analysis:	Huma Qamar, Saadia Hafeez Qureshi
Revisiting Critically:	Amrat Ijaz, Ayesha Saleem
Final Approval of version:	By all above authors

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