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Impact of Integrated teaching after exposed to traditional didactic teaching on learning of clinically oriented Physiology among Phase-I medical undergraduates

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Abstract

Background: In the field of medicine, the teaching approaches are constantly evolving, which greatly transforms the construction and focus of curriculums. An integrated approach for teaching basic sciences in the form of clinical case discussions will enhance better comprehension of basic sciences concepts, development of clinical skills and higher order thinking. **Objective:** To evaluate the outcome of integrated teaching on learning Physiology with clinical focus among medical undergraduate after experiencing traditional didactic teaching in Physiology. **Methods:** This study involved 138 phase-I students of MBBS course. This study was composed of two parts. In part - A all participants were at first exposed to traditional lecture on physiology and then attended integrated teaching session. Performance of all the enrolled students were evaluated after both traditional & integrated teaching session by a written assessment on 3 selected topics recommended in updated MBBS curriculum 2021 in Bangladesh. For this purpose, 20-objective type of questions carrying 20 marks comprising 10 multiple true false type (MTF) and 10 single best answer (SBA)] was used for assessment with duration of 20 minutes. Bloom taxonomy level 1 through 3(recall, understanding and clinical application) was applied to construct

each type objective question. Mean test score between post-traditional and post-integrated session was compared by paired sample t test. In addition, frequency of students with correct, incorrect and unattempt response was also calculated and compared by chi square test. In the part- B, all students and faculties were administered questionnaire with instruction to apply tick mark against the statement reflecting the perception and experience of integrated session after the test of part- A finished in the same place. Responses were assessed by using a likert scale on 1 to 5 gradations. **Result:** In part- A, mean ± SD test score of all type of question at all given level on all topics significantly increased after integrated session (P<0.001). In addition, frequency of students with correct answer significantly increased whereas with incorrect and unattempt response significantly reduced (P<0.001) after integrated teaching. In Part- B, majority of students agreed that integrated sessions are more productive after traditional didactic session. Most of the faculties had the opinion that integrated teaching method as most effective teaching learning method. **Conclusion:** It may be concluded that the integrated teaching is an effective as well as preferred method after being taught by traditional didactic teaching method for learning physiology with clinical focus for undergraduate medical students.

Key words: Integrated teaching, traditional didactic teaching, Effectiveness, clinically oriented physiology.

Introduction

All areas of education are changing quickly, with quality improvement being given top priority.[1] In medical education, there are numerous trends and innovations. that have been carried out worldwide, such as problem-based learning, self-directed learning and integrated learning[2].

With the emergence of new developments in medical education, the traditional medical curriculum must be revised for generating better health care professionals[3] by reducing too much emphasis on memorization of facts and figures and overloading the students with excessive unnecessary details[4].

The strategic approach to modern teaching is focused on "why we want to teach?". For medical teaching the answer should be to produce competent doctors. From this view, it is needed to teach our students to correlate the clinical aspects with the basic science knowledge to create better practitioner who can learn the practical implication of knowledge to provide better health care of the community[4]. The idea of implementation of improved teaching and learning through curriculum integration is not a new one[5]. It is believed that integrated teaching sessions will perhaps be an effective instructional method in medical education for learners in order to properly retain the information and utilize the knowledge of basic sciences in the clinical practice[2].

In 2021, content- based curriculum for undergraduate medical education in Bangladesh

has been updated and transformed into competency based curriculum which recommended integrated teaching on a small scale on some previously selected topic contributing 30% of teaching.[6]

The concept of 'Integration' is drawn from the Latin word integer, which means combination of different activities to make a whole.[7] Integration of teaching is defined as the organization of teaching matter to interrelate or unify the subjects which are frequently taught in separate academic courses or departments.[2] In the context of medical education, integration is explained as bridging connections between academic knowledge and practical application. An integrated approach allows students to engage in purposeful, relevant learning and better understanding.[7]

Usually medical college courses typically present isolated knowledge, leading students to understand parts but not the whole. Ultimately, the students are left with the task of correlating and integrating all the knowledge learned for the purpose of diagnosing and treating patients. Integrated teaching is a key approach, enabling students to connect symptoms, signs, and diagnoses to form a cohesive understanding.[2]

Physiology is one of the prime subjects of medical science which lays the foundation of all branches of medical science. The core knowledge about human health and physical performance is gained by studying human physiology. Proper understanding of physiological mechanisms can help to provide a deeper perception of the perplexity of the human body.[8] Since ancient times, it has been known that students learn best when they are actively engaged with a variety of learning resources given in a range of formats and styles[9] and the concept of integrated teaching is one of them.[10]

As because evaluation is still more effective than teaching methods at influencing students' learning behavior, it is widely acknowledged that assessment is a single, potent tool that propels students' learning. No matter how good the instruction is, pupils will focus more on the evaluation process.[11] Like any other developing educational program, the effectiveness of this newly incepted teaching learning method needs to be assessed. Several previous researchers found the excellent contribution of integrated teaching to cause improvement of student's focal learning compared to traditional lecture method in various basic sciences including Physiology. These studies compared the influence of integrated session and traditional didactic lecture session individually on students learning behavior. But the impact of integrated session on same student's learning physiology with clinical focus after experiencing traditional didactic lecture has not been explored. Therefore, we designed this study to implement integrated teaching module and test its effectiveness on learning clinically oriented physiology after being exposed to didactic traditional lecture among the phase one MBBS students in the Medical Physiology course.

Methods

Design and setting

This study was partly analytical and partly descriptive in design,carried out at the Department of Physiology. Bangabandhu Sheikh Mujib Medical University .Dhaka, Bangladesh during 2024.

Study participants

One hundred thirty eight (138) Phase- 1 medical students including both male and female of a government medical college,Dhaka, Bangladesh participated in this study.

Sampling

Participants were selected by purposive sampling.

Study procedure

Before recruitment of students for this study written permission was obtained from the concerned authority. After that a written

advertisement calling for a voluntary participation in this study explaining the aim objective benefits, procedure & time of the study was published and circulated among the students as well as faculties of the Department of Physiology. Students and also faculties who showed interest to participate were enrolled & their written informed consent was taken.[28]

Data collection

The study was divided in to part A&B-

In part A:

The effectiveness of integrated teaching after being taught by traditional teaching method in physiology was investigated by a written assessment to evaluate the student's performance immediately after traditional teaching as pre integrated and after integrated session held few days later as post-integrated test with same question paper observing the difference between the test score and the percentage of correct, incorrect and unattempt responses. This ensures the result more reliable.

The assessment tool was prepared after prior meetings with the faculties involved in integrated teaching session regarding respective topics.

In Part B:

Evaluation of students' as well as faculties' perception and experience of integrated teaching was done by using different questionnaire as assessment tool.

Assessment procedure

The time, place, procedure and duration of the test was explained to the participants before the test day. On the test day, a set of question papers were supplied to the students and they were instructed to put tick mark (") and marking true (T) or false (F) against statement as applicable in the question sheet. The duration of test was 20 minutes. After the test is over, all the answer marked question sheets were collected and evaluated by two randomly selected senior teachers of physiology.

Assessment tool

The assessment tool for part- A comprised of objective type of question which were prepared by applying principles of Blooms taxonomy at different level of cognitive domain upon each sorted topic. Three topics (Refractive error, anemia and coronary artery disease) were randomly selected among the topics recommended in curriculum for integrated session.[6] In total, 20 marks were allocated for each topic. For that 10 Single best answer (SBA) questions and 10 multiple choice questions of true false type were constructed. Among them 10 questions reflect basic concept and 10 question were clinically oriented in topic refractive error and anemia. In topic coronary artery disease 16 questions were based on basic concept and 4 questions were clinical application based. On anemia and coronary artery disease, only first year MBBS students participated in the test. On refractive error second year MBBS students participated according to distribution of three topics in different term. Same question paper was used for post-traditional (pre integrated) and post-integrated evaluation on each sorted topic though it was not previously known to the students. Ratification of prepared question paper was done by the teachers involved in integrated teaching session. There was time limit for 20 minutes for answering the questions. The assessment tool for part-B was a feedback questionnaire to know medical undergraduates & faculties perceptions, experiences & views on the effectiveness of the integrated teaching. Their evaluation was done by using Likert scale from 1-5 gradation. Undergraduate participants of part-A & Part- B were same.

Grouping

In Part-A. According to the period of performance data collection after each session they were divided into

Group (Post-traditional or pre-integrated): test score of all students after traditional didactic session.

Group –(Post-integrated): Test score of all students after integrated session.

Then the mean test score was compared and the percentage frequency of different type of responses were calculated and was compared between pre and post integrated session.

In Part-B, perception and experience of integrated teaching was evaluated by using different feedback questionnaire.

Statistical analysis

In part-A, the mean scores of pre and post-integrated test was compared using paired t-test. The frequency percentage of type of response was compared by chi square test. P-value ≤.05 was considered statistically significant. In part-B, the frequency percentage of each category were calculated.

Results

Seventy (70) second year students took part in both pre and post-test on topic refractive error and 68 first year students also participated in both test on topic anemia and coronary artery disease**.** Overall better performance of medical undergraduates irrespective of topic was noted after integrated session.(Table I)

Table I: Test score of different type of objective questions on all topics (n= 138)

Questions	Test score		P value
	Pre-integrated (n=138)	Post-integrated (n=138)	
MTF (Full mark-10)	5.58± 0.29	7.06± 0.39	0.026*
SBA (Full mark-10)	4.49± 0.82	6.69± 0.59	0.028*

Test score is expressed as mean± SD. Statistical analysis was done by paired sample t test. MTF- Multiple True False, SBA- Single Best Answer. * - statistically significant (p≤0.05).

The mean score of taxonomy level-based questions of MTF on three topics showed significant increase after integrated teaching session in all topic except the mean score of understanding questions on refractive error and coronary artery disease which was not significantly different after integrated teaching session. (Figure 1-3).

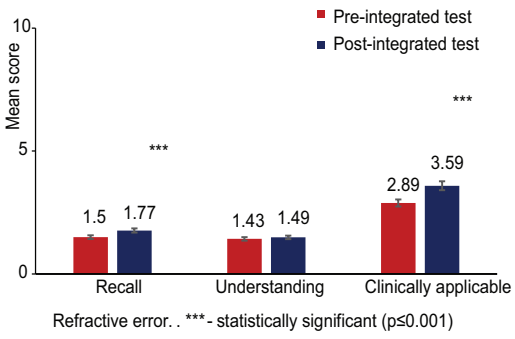

Figure 1: Comparison of mean scores obtained in taxonomy level-based questions of MTF in post-traditional & post-integrated session on topic refractive error.

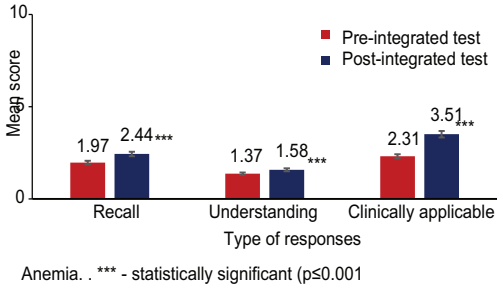

Figure 2: Comparison of mean scores obtained in taxonomy level-based questions of MTF in post-traditional & post-integrated session on topic anemia

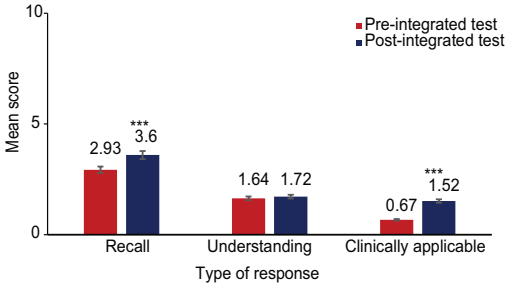

Figure 3: Comparison of mean scores obtained in taxonomy level-based questions of MTF in pre integrated l & post integrated session on topic Coronary artery disease. *** - statistically significant (p≤0.001)

Test score of taxonomy level-based SBA type of questions on three selected topics demonstrated significant increase (P< 0.01, 0.001)at all level after integrated teaching session. (Figure 4-6)

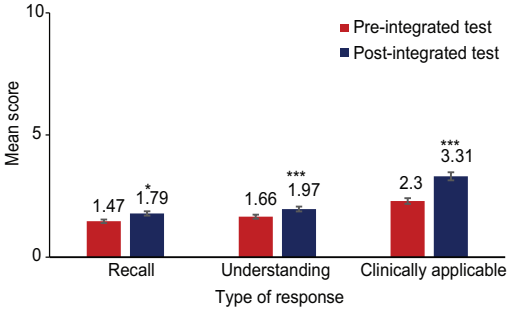

Figure 4: Comparison of mean scores obtained in taxonomy level-based questions of SBA in pre integrated & post-integrated session on topic Refractive error. * - statistically significant (p≤0.05); *** - statistically significant (p≤0.001)

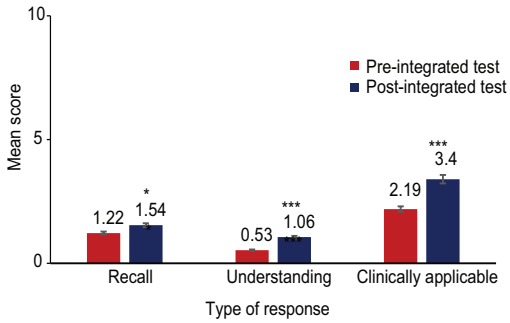

Figure 5: Comparison of mean scores obtained in taxonomy level-based questions of SBA in pre integrated & post-integrated session on topic Anemia. * - statistically significant (p≤0.05); *** - statistically significant (p≤0.001)

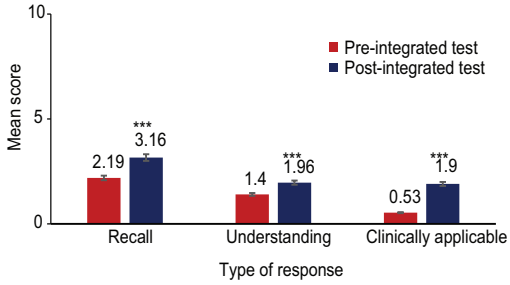

Figure 6: Comparison of mean scores obtained in taxonomy level-based questions of SBA in pre integrated & post-integrated session on topic Coronary artery disease. ***-statistically significant (p≤0.001)

Moreover, frequency of correct response significantly improved and incorrect as well as unattempt responses significantly reduced in post-integrated test (Figure 7).

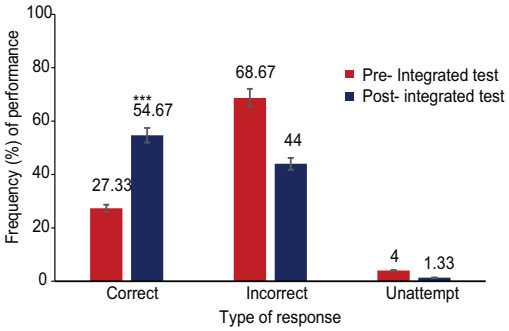

Figure 7: Comparison of frequency of different responses of first- and second-year medical students after pre integrated and post integrated test (n=138).

The results of opinion survey (part B) through questionnaire on the impact of integrated teaching session showed 88% students of students agreed that integrated teaching sessions helped them better understanding of topic. Fifty- eight percent (58%) of students were of opinion that this exercise could reduce the time needed for study. Ninety-one percent (91%) of students agreed that integrated teaching session would help them to grasp the clinical aspects of topic from the beginning.

Maximum satisfactory index was observed for item number 1, 6, 7. (>70%) (Table II)

Data from similar survey on faculties of Physiology showed 87.5% of faculties viewed integrated teaching learning (TL) methods was very useful for the better understanding of the topic. Seventy five percent (75%) of faculties agreed that integrated teaching learning program would help the students to perform better in clinical practice. Eighty eight percent (87.5%) recommended that this method should be applied for some "must know" areas of curriculum. Seventy five (75%) percent of them viewed that concept of integrated TL program is much time consuming for them. (Table III)

Table II: Students feedback on the various aspects of integrated teaching session on a 5-point Likert scale (n=138)

Question	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
1. Understanding of a topic is easier with integrated teaching	33(24%)	88(64%)	13(9%)	4(3%)	0
2. Time allocated for the integrated session was not adequate	7(5%)	15(11%)	19(14%)	73(54%)	22(16%)
3. To understand a topic integrated teaching is better when compared to Traditional teaching	24(17%)	67(49%)	23(17%)	19(14%)	5(3%)
4. This integrated session should be added to traditional curriculum for better learning	30(22%)	62(45%)	33(24%)	10(7%)	3(2%)
5. It helps to lessen the self-study time	23(17%)	57(41%)	33(24%)	22(16%)	3(2%)
6. This teaching technique encourage my intellectual curiosity	36(26%)	78(57%)	16(12%)	6(4%)	2(1%)
7. The knowledge & skills acquired via integrated teaching will help me to correlate with clinical application	49(36%)	76(55%)	11(8%)	2(1%)	0
8. Integrated teaching has increased my self confidence and concept toward learning	27(20%)	58(42%)	37(27%)	13(9%)	3(2%)

Scale of grading: 5= strongly agree, 4= Agree, 3= Neutral, 2= Disagree, 1= Strongly disagree

Table III: Faculties feedback on the various aspects of integrated teaching session on a 5-point Likert scale (n=138)

Question	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
Integrated teaching learning (TL) program is an effective TL method	1(12.5%)	3(37.5%)	3(37.5%)	1(12.5%)	0
With integrated TL program students would be able to understand the concept more easily	0	7(87.5%)	1(12.5%)	0	0
Concept of integrated TL program is much time consuming for us	2(25%)	6(75%)	0	0	0
This will need a lot of trainings and refresher training at the faculty level	5(62.5%)	3(37.5%)	0	0	0
Interdepartmental coordination is a very difficult task	2(25%)	3(37.5%)	2(25%)	1(12.5%)	0
This integrated TL program will help the students to perform better in clinical practice	1(12.5%)	6(75%)	1(12.5%)	0	0
Understanding of the topic is better with this method	0	6(75%)	2(25%)	0	0
This exercise can be regularly incorporated in the curriculum for must know areas of curriculum	0	7(87.5%)	1(12.5%)	0	0
It reduces the amount of time needed for self study	1(12.5%)	5(62.5%)	0	2(25%)	0
Integrated learning will result in a more relevant, meaningful, and student centered curriculum	0	7(87.5%)	1(12.5%)	0	0

Discussion

The outcome of this study demonstrated the impact of integrated teaching method after being taught through traditional didactic teaching method by investigating student's test result after integrated teaching and opinion survey on students as well as faculties of Physiology. Integrated approach to teach basic science concepts in the form of clinical case discussions motivated and created interest among the students to learn the basic sciences.[12] The present study found that, after the exposure to integrated session medical undergraduates performed better in answering all type of questions irrespective of topic. A previous study had suggested that though both the integrated and traditional teaching had shown a significant improvement in post test scores but in topic epilepsy, higher post integrated score was achieved by students than in traditional group.[13] A similar study revealed that the marks obtained by the students who were exposed to the integrated approach was much greater than the marks obtained by the students who were exposed to traditional fragmented approach.[14]

The overall better student's academic performance after integrated teaching provide stronger evidence of the good impact of integrated teaching on better and deep understanding of clinical problem based on knowledge of underlying pathophysiology.[15]

In the present study, the test score of both MTF and SBA type of question significantly increased in post-integrated test. Again, the test score of taxonomy level-based questions (recall, understanding and clinically applicable) of MTF and SBA was significantly higher in almost all level after integrated session. This means that the capacity of students increased to recall, understand and also to apply the knowledge in clinical field.

It also proves that integrated teaching session have important role for increasing the grasping capacity as well as knowledge retention capacity of students. Moreover, increment in the number of students with correct response while reducing the number of students with incorrect or un attempted after integrated session revealed their enhanced competence owing to integrated session. Furthermore, Perception of students about various aspects of integrated teaching session, assessed by feedback questionnaire noted that a large portion of students gave positive review about integrated teaching and they found the session more effective than traditional didactic teaching. The positive attitudes of students towards the integrated session as came out from the questionnaire-based feedback proved their grater acceptability of integrated teaching as more fruitful teaching learning method for learning Physiology. This finding was also strengthened by the feedback from faculties who also agreed that integrated teaching learning program would help the students to perform better in clinical practice if it's possible to overcome few limitations.

This study found that learning Physiology was better among the medical undergraduate students when they were taught by the integrated approach after an initial exposure to the traditional teaching and the use of taxonomy level-based question increased the sensitivity of the result. The impact of integrated teaching is also visible on the skill development at both higher order thinking and lower order thinking of the students by their uniform better performance in taxonomy level- based questions compared to traditional teaching method. The feedback from the students was also encouraging, and majority of the students showed a positive attitude toward integrated approach and asked for more integrated sessions in future and this method is also well accepted by the faculties.

Conclusion

This study concluded that integrated teaching is more effective approach especially when it is

applied after previous exposure to didactic teaching which enables to utilize principles of Physiology for developing insight to clinical problem and its better management. This study also demonstrated the plausibility of integrating integrated teaching and traditional teaching and how it will improve students' clinical application. If the course material is more closely related to the professional needs of medical students, they will become more attentive and active in the learning process.

Limitations

This study could not collect data separately from students taught by traditional teaching method and from integrated session group due to tight academic schedule.

Conflict of interest

Authors declare no conflict of interest.

Ethical issue: Ethical aspects of this study was checked and approved by Institutional review board of BSMMU.

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