

A Case Based-Shared Teaching Approach in Undergraduate Medical Curriculum: A Way for Integration in Basic and Clinical Sciences

Soheil Peiman¹, Azim Mirzazadeh^{2,3,4}, Maryam Alizadeh⁴, Sara Mortaz Hejri⁵, Mohammad-Taghi Najafi⁶, Abbas Tafakhori^{7,8}, Farnoosh Larti⁹, Besharat Rahimi¹⁰, Babak Geraiely⁹, Parichehr Pasbakhsh¹¹, Gholamreza Hassanzadeh¹¹, Fatemeh Nabavizadeh Rafsanjani¹², Mohammad Ansari¹³, and Seyed Farshad Allameh²

¹ Department of Internal Medicine, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran

² Department of Internal Medicine, Imam Khomeini Hospital Complex, Tehran University of Medical Sciences, Tehran, Iran

³ Department of Internal Medicine, Health Professions Education Research Center, Tehran University of Medical Sciences, Tehran, Iran

⁴ Department of Medical Education, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran

⁵ Department of Medical Education, Health Professions Education Research Center, Tehran University of Medical Sciences, Tehran, Iran

⁶ Department of Nephrology, Nephrology Research Center, Tehran University of Medical Sciences, Tehran, Iran

⁷ Department of Neurology, Imam Khomeini Hospital Complex, Tehran University of Medical Sciences, Tehran, Iran

⁸ Department of Neurology, Iranian Center of Neurological Research, Tehran University of Medical Sciences, Tehran, Iran

⁹ Department of Cardiology, Imam Khomeini Hospital Complex, Tehran University of Medical Sciences, Tehran, Iran

¹⁰ Department of Pulmonary and Critical Care Medicine, Advanced Thoracic Research Center, Tehran University of Medical Sciences, Tehran, Iran

¹¹ Department of Anatomy, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran

¹² Department of Physiology, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran

¹³ Department of Biochemistry, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran

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Abstract- To present a multiple-instructor, active-learning strategy in the undergraduate medical curriculum. This educational research is a descriptive one. Shared teaching sessions, were designed for undergraduate medical students in six organ-system based courses. Sessions that involved in-class discussions of integrated clinical cases were designed implemented and moderated by at least 3 faculties (clinicians and basic scientists). The participants in this study include the basic sciences medical students of The Tehran University of Medical Sciences. Students' reactions were assessed using an immediate post-session evaluation form on a 5-point Likert scale. Six two-hour sessions for 2 cohorts of students, 2013 and 2014 medical students during their two first years of study were implemented from April 2014 to March 2015. 17 faculty members participated in the program, 21 cases were designed, and participation average was 60 % at 6 sessions. Students were highly appreciative of this strategy. The majority of students in each course strongly agreed that this learning practice positively contributed to their learning (78%) and provided better understanding and application of the material learned in an integrated classroom course (74%). They believed that the sessions affected their view about medicine (73%), and should be continued in future courses (80%). The percentage demonstrates the average of all courses. The program helped the students learn how to apply basic sciences concepts to clinical medicine. Evaluation of the program indicated that students found the sessions beneficial to their learning.

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Introduction

There is a growing interest in the connection between basic and clinical sciences in teaching, and learning strategies and the medical schools seek to train

medical students who are able to apply their knowledge in novel situations (1,2). Medical schools have responded to this need by vertical and horizontal integration, changes in the structure, content and teaching methods of the curriculum. This approach,

Corresponding Author: M. Alizadeh

Department of Medical Education, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran
Tel: +98 21 88973670, Fax: +98 21 64053365, E-mail address: alizade.aban@gmail.com

which will hopefully to lead better knowledge retention and skills application, almost always refers to choosing the content together, whereas integration in teaching and learning strategies is a complementary neglected approach (3).

Shared teaching is also called co-teaching, cooperative teaching and collaborative teaching. In one model of shared teaching which was applied in this study, basic scientists and clinicians cooperate to teach a course concurrently by integration in teaching and learning strategies in medical education (3,4). We think that by using shared teaching, we would be able to highlight the integration of basic and clinical sciences.

In this model of teaching, teachers are in front of the class and communicate a great deal with each other and their students. They discuss and change the speech with each other around the learning case scenarios (4-6). Learning scenarios that are used to simulate real situations are known as learning opportunities, which makes them a very attractive way for the education and training (7,8).

Tehran University of Medical Sciences has revised the undergraduate MD program. The new undergraduate medical curriculum which was launched in September 2011 is organized into 4 main phases, including preclinical, fundamentals of medicine, clerkship, and internship. Ten organ-system blocks formed the preclinical phase. In order to support the vertical integration; we have implemented the case-based discussion sessions at the end of six Blocks (Cardiovascular and Blood, Gastrointestinal, Nervous, Endocrine, Respiratory, Urinary tract).

Empirical researches in the field of medical education have shown that health professions students enjoy the case-based discussion and believe that it could enhance the motivation of learning and engagement. To our knowledge case based teaching is a widely used method in health professional education. Yet, on utilizing it in the field of shared teaching, cooperation between clinical and basic scientists, in medical education there has been a little investigation (9). However, To the best of our knowledge, this is the first endeavor to report shared teaching-case based discussion as an integration of the teaching and learning strategies in medical education in Iran (3).

In this paper, we would like to present the implementation of a case based-shared teaching strategy in the preclinical Blocks for undergraduate medical students, providing an opportunity to discuss the application of knowledge in the practice of medicine. We also sought to determine students' reaction to this

approach to teaching and learning.

Materials and Methods

This educational research is a descriptive one. The project described here was executed by the Tehran University of Medical Sciences, School of Medicine from April 2014 to March 2015. The sessions were carried out in the undergraduate medical program into two main phases, developing case scenarios and implementing the sessions.

Health System Research (H.S.R) Review Committee at Tehran University of medical sciences has approved the work.

The process of developing appropriate integrated case scenarios

In order to develop effective, integrated and challenging scenarios, a small group of motivated faculty educators formed to determine the appropriate case scenarios that could be used effectively in targeted sessions. This initial group consisted of the Education Development Office director, two clinical faculty members with specific interests in medical education, and basic sciences faculty members who were involved in delivering the course to medical students. This group served as the foundation for the development of the appropriate scenarios over a 2-month period. Case scenarios were designed specifically for six organ-system Blocks (Cardiovascular and Blood, Gastrointestinal, Nervous, Endocrine, Respiratory, Urinary tract). These scenarios were the focus of discussion during the session.

The following grand rules were considered in developing the cases:

- Authentic case scenarios
- Looking at applied knowledge
- Defining a challenging situation
- Students could not derive the answer immediately
- Helping the integration of basic science and clinical practice
- Driving the higher order thinking

In order to develop a consensus on a case, two to four planning meeting per a Block for at least 45 minutes was held. In these meetings participants discussed, are the cases follow the above mentioned rules? What will be presented and in what order? Who is to present the information? Cases were finalized after discussion and agreement were reached using consensus. One motivated faculty member (an internist) was the leader of the program. He participated in all sessions and

was responsible for the quality of the teaching sessions.

The process of implementing the sessions and evaluating students' reaction

Each 2-hour session was implemented at the end of the six above-mentioned courses, from April 2014 to March 2015. Each of them was taught by at least 3 faculty members (clinical practitioners and basic scientists). During the integrated group activity, active learning exercise for each session, an anatomist, biochemist, physiologist, and clinical practitioner conducted the session together concurrently at a hall. One week prior to the session the students were informed about the session using a website. At the beginning of the session, students were given at least two written clinical cases and instructed to work in their teams to discuss and write their team's assessments of cases. Assessing the case and finding the reasons for signs, symptoms and management plan required the application of basic sciences concepts, afterward, cases were opened for full class discussion among all students. All instructors moderated the large group discussion, which was intended to facilitate active participation. Following the class discussion, the clinical faculty member summarized the discussion points and provided the preferred answers with justification.

The participants in this study were the medical students who study in the basic sciences phase of the TUMS MD program. They participate nonobligatory in 2-hour sessions that were implemented at the end of the six above-mentioned courses, from April 2014 to March 2015.

On an immediate post-session evaluation form with 5 items, participants rated each session on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). In addition, they were asked to comment on which aspects of the session were most beneficial. We didn't ask the questions about the program all in all at the end of the six sessions because it could cause some problems that may result miss the data. As the time span between first to sixth sessions was one year. We collected the data of all Blocks due to needs for evaluation of all sessions. As teachers, cases,

and students were variable in different sessions.

The evaluation forms were completed by the participants at the end of each session using a five-point Likert scale. Quantitative data were analyzed using the SPSS 16 and frequencies. The notes were analyzed manually using content analyses.

Results

Totally, 17 faculty members participated in the program. Nine of them were clinicians and 8 basic scientists. Six meetings were held for developing the scenarios, 21 cases were designed (Table 1). One case, which was developed for respiratory system is presented in Table 2. We implemented six two-hour sessions for 2 cohorts of students, 2013 and 2014 medical students during their first two years of study. Blocks, integrated case-based discussion sessions, cases, and topics for the First and Second-Year Medical School Curriculum at TUMS, School of Medicine, 2013–2015.

One example of a case scenario that has been used for the integrated case-based discussions in respiratory system Block.

Although attendance at the sessions was not mandatory for students, the participation average was 60 % at 6 sessions (almost 50 students for each session out of 80). Range of participation was 33-76. Totally, 304 people completed the survey at all Sessions. Overall, the sessions were rated 5-4 (strongly agree-agree) on each item. The results are shown in Figure 1. Totally, 304 people completed the survey at all sessions.

Written comments highlighted the benefit of the activities. Participants indicated that the number of sessions with this strategy during the course should be increased. They also noted that they were very excited about the cooperation between clinical and basic sciences faculty members. More frequent comments were excellent, exciting, enjoying, and helpful, Please continue in the future, and Please increase the number of classes with this model.

Table 1. The desired place is at the end of results

Blocks	No. of sessions	No. of cases	No. of faculties	Cases topics
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A case based-shared teaching in undergraduate medical curriculum

Gastrointestinal	2 two- hour	4	1 Physiologist 1 Anatomist 2 Internist	Gastroesophageal reflux disease Superior mesenteric syndrome Acute pancreatitis Peptic ulcer disease
Respiratory	2 two- hour	4	1 Physiologist 1 Anatomist 1 Internist 1 Pulmonologist	Chronic obstructive pulmonary disease Pneumothorax Obstructive sleep apnea tracheoesophageal fistula
Endocrine	2 two- hour	2	1 Physiologist 1 Anatomist 1 Internist 1 Endocrinologist	Diabetic Ketoacidosis Prolactinoma
Renal	2 two- hour	2	1 Physiologist 1 Anatomist 1 Internist 1 Nephrologist	Hyponatremia Urinary tract infection Azotemia
Nervous	2 two- hour	6	1 Physiologist 1 Anatomist 1 Internist 1 Neurologist	Parkinson disease Cord injury Brain stem tumor Stroke
Cardiovascular	2 two- hour	3	1 Physiologist 1 Anatomist 1 Internist 1 Cardiologist	Pulmonary embolism Myocardial infarction Aortic dissection Cardiac tamponade

Table 2. The desired place is at the end of results

A 62-year-old male, heavy smoker presents with increasing sticky sputum from 5 days ago. He reports a history of chronic progressive shortness of breath and sputum production from more than 10 years ago, and he remembers periodic accentuation of his symptoms, especially during winter months. He has also noticed a change in voice, sounding *raspy and harsh (hoarseness) from 2 months ago.*

*On examination, his face is congested and swollen (plethoric). He is sitting in a tripod position. Both of his legs are swollen. Chest roentgenogram showed a 4*4 cm left hilar mass, and direct inspection of larynx revealed associated left vocal cord paralysis. The result of arterial blood gas analysis is as follows : PH=7.30, PO2=60 mmHg, PCO2=60 mmHg, Saturation of O2=85%*

Please explain and discuss the following questions: Why is the patient’s appearance plethoric and edematous?(Define based on physiology of chronic hypoxemia)

What is the cause of sputum production? (Explain based on respiratory system histologic change).

Why is the amount of oxygen saturation less than what is expected? (Explain based on Oxygen–hemoglobin dissociation curve).

What caused the recent change in this patient’s voice and unilateral vocal paralysis? (Define according to chest roentgenogram findings).

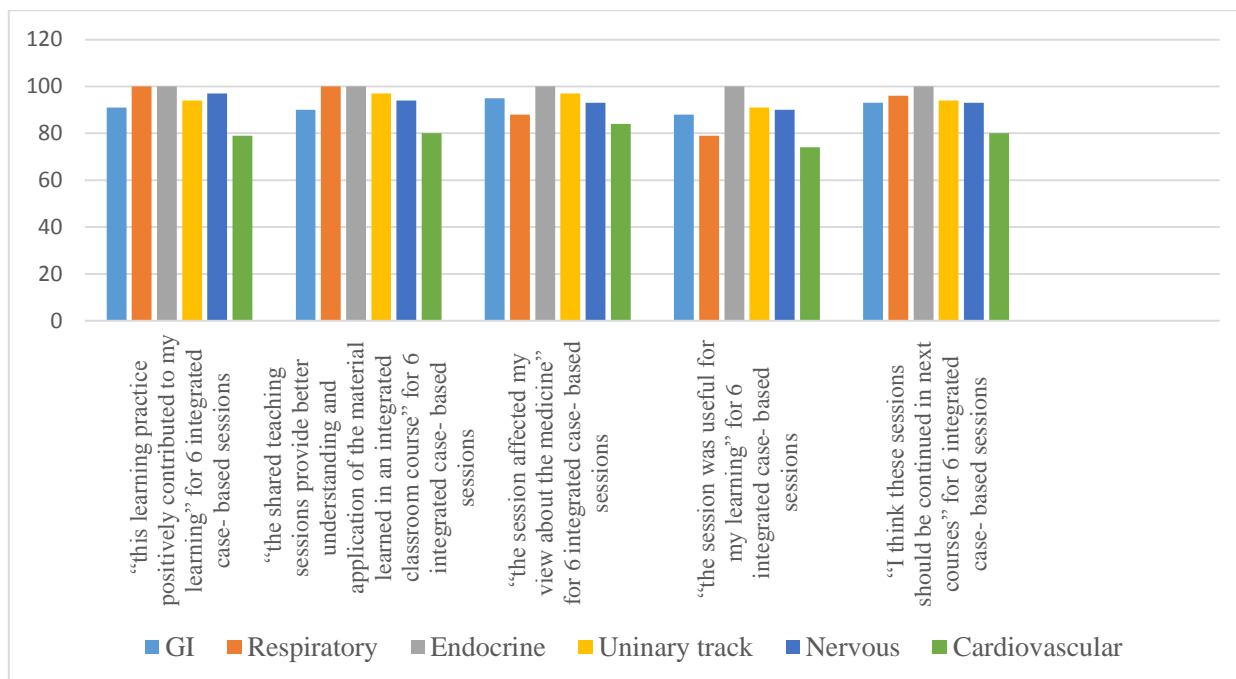


Figure 1. Basic sciences Medical Students evaluation about integrated case-based discussions at 6 Blocks, Tehran University of medical sciences, 2015*, *percepts show the sum of strongly agree and agree for each item

Discussion

We like the other medical education programs tried to find innovative methods to enhance student learning in our medical curriculum (3-5,10,11). The purpose of this study was to describe TUMS, medical school experience of implementing integrated case-based teaching strategies.

We have outlined how shared teaching strategy may be used to promote positive reaction of medical students toward learning. Through the process described in this manuscript, students would better appreciate applying the concepts of basic sciences when designing patient care plans.

The first concern to conduct the work was a development the proper case scenarios. As the success of the case based discussion sessions depends on the quality of the case, so our scenario development team tried to use the real case scenarios and construct the appropriate questions that show the basic science application. For instance, the students should explain the signs and symptoms of a case based on their physiology and anatomy knowledge.

The majority of students at all sessions believed that this strategy positively contributed to their learning. Shared teaching is used to promote active learning. This finding is similar to vast research studies which have reported the benefits of active teaching and learning strategies (1,4-6,9,12-16). Students' evaluation of sessions indicates that it is a viable method for several reasons; they reported that the sessions helped them to understand the basic science concepts and prepared them for clinical problem solving.

The majority of students believed that the session had a significant effect on their view about medicine. This is an important outcome since it provides the proper concept of the discipline to students as well.

Students felt that the shared teaching sessions provide better understanding and application of the material learned in an integrated classroom course. This finding is in line with one of the objectives of the new Tehran University of Medical Sciences MD curriculum and other world accreditation councils (17,18) to train students to apply knowledge and skills gathered from basic science for management of patients (17).

Students thought these sessions should be continued in future courses. In the written comments the most frequent request was increasing the number of sessions. Our assumption was that it would foster students' enthusiasm and learning. It is a very important outcome, as several studies have reported that medical students are not motivated to attend the class, and the rate of absenteeism is increasing (19-21).

This study provides the process and results of a successful cooperative teaching and learning strategy between clinical and basic sciences faculty members. We anticipate it will be of use to educators considering the implementation of shared teaching in that it demonstrates the positive students' reactions to this activity.

The lessons learned from this project include: teachers should sufficiently be committed to the program. They should have adequate time to planning ahead. The lack of this commitment to the program could result in team members leave the project. The institution should institute and communicate an awards program for faculty members who participate the sessions. All teachers should actively involve in instruction. If one teacher becomes dominant in the teaching session, the others may lose the motivation for participating in the future meetings. Assign tasks and timeframes could be helpful to give them a sense of power in the instruction session. There is a need for choosing a team leader who assigns tasks and timeframes, provides innovative solutions, sets team goals, monitors the quality of team decisions, inspires idea generation when the team seems stuck and encourages others to view issues in a different way. As described before, one motivated faculty member set out as the leader of the program. One of the most important issues was finding a good fit in personality, teaching philosophy and expertise between teachers who cooperate with each other. They should feel free to disagree politely without putting their fields of expertise in jeopardy. Motivated and competent faculty members should be involved; however, consensus should be developed with all of them on the structure and process of each session. Attendance of teachers also was voluntary. Adoption of integration by students often requires that their teachers appreciate it. They should be eager to devote time and effort to change the usual process of their classroom. This requires changes in a way that they teach. In many cases, teachers should believe integration will benefit their students. Students should be trained about the importance of integration. Part of the training includes helping them understand why integration is important and how it could help them to be better doctors. And finally, integration is a time consuming process, since the long term impact of the integration on students learning and performance should be evaluated to show behavior effects.

One of the greatest strengths of this project was the effective cooperation between basic and clinical sciences faculty members in a friendly environment.

Faculties including nephrologist, physiologist, anatomist, internist, neurologist and cardiologist were involved in the process. This opportunity potentially could promote the relationship between them.

Limitation

Critical to the success of any educational intervention is the assessment of competence. Although we have not explored the impact of our intervention on participants' performance yet, to address this, we are exploring the results and longtime effects of the intervention on participants. We would like to suggest further research on if there were students who attended a session and decided not to continue, what were their reasons.

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References

1. Parmelee D, Michaelsen LK, Cook S, Hudes PD. Team-based learning: A practical guide: AMEE Guide No. 65. *Med Teach* 2012;34:e275-87.
2. Khabaz Mafinejad M, Mirzazadeh A, Peiman S, Khajavirad N, Mirabdolhagh Hazaveh M, Edalatifard M, et al. Medical students' attitudes towards early clinical exposure in Iran. *Int J Med Educ* 2016;7:195-9.
3. Kulasegaram KM, Martimianakis MA, Mylopoulos M, Whitehead CR, Woods NN. Cognition before curriculum: Rethinking the integration of basic science and clinical learning. *Acad Med* 2013;88:1578-85.
4. Kolluru S, Roesch DM, de la Fuente AA. A multi-instructor, team-based, active-learning exercise to integrate basic and clinical sciences content. *Am J Pharm Educ* 2012;76:33.
5. Baeten M, Simons M. Student teachers' team teaching: Models, effects, and conditions for implementation. *Teach Teach Educ* 2014;41:92-110.
6. Rudich A, Bashan N. An interdisciplinary course in the basic sciences for senior medical and PhD students. *Acad Med* 2001;76:1072-5.
7. Rodriguez-Sedano A. Creating Scenarios and Guiding Learning in a Medical Simulation Center. *Creat Educ* 2011;2:316.
8. Takahashi Y, Oku SA. Attractive Scenario Writing. *Kaohsiung J Med Sci* 2009;25:250-3.
9. Thistlethwaite JE, Davies D, Ekeocha S, Kidd JM, MacDougall C, Matthews P, et al. The effectiveness of case-based learning in health professional education. A BEME systematic review: BEME Guide No. 23. *Med Teach* 2012;34:e421-44.
10. Ives TJ, Deloatch KH, Ishaq KS. Integration of medicinal chemistry and pharmacotherapeutics courses: a case-based, learner-centered approach. *Am J Pharm Educ* 1999;62:406.
11. Mylopoulos M, Woods N. Preparing medical students for future learning using basic science instruction. *Med Educ* 2014;48:667-73.
12. Eison J. Using active learning instructional strategies to create excitement and enhance learning. (Accessed March 2017, 12, at <https://www.cte.cornell.edu/documents/presentations/Active%20Learning%20...m%20-%20Handout.pdf>).
13. Kumar V, Gadbury-Amyot CC. A case-based and team-based learning model in oral and maxillofacial radiology. *J Dent Educ* 2012;76:330-7.
14. Letterman MR, Dugan KB. Team teaching a cross-disciplinary honors course: Preparation and development. *Coll Teach* 2004;52:76-9.
15. Robb M, Gerwick M. Team teaching: a resource guide for nurse educators. *Teach Learn Nurs* 2013;8:78-82.
16. Hadimani CP. Effectiveness of Small Group Discussion Sessions in Teaching Biochemistry for Undergraduate Medical Students. *South East Asian J Med Educ* 2014;8:77.
17. Mirzazadeh A, Mortaz Hejri S, Jalili M, Asghari F, Labaf A, Sedaghat Siyahkal, M et al. Defining a competency framework: the first step toward competency-based medical education. *Acta Med Iran* 2014;52:710-6.
18. Swing SR. The ACGME outcome project: retrospective and prospective. *Med Teach* 2007;29:648-54.
19. Bati AH, Mandiracioglu A, Orgun F, Govsa F. Why do students miss lectures? A study of lecture attendance amongst students of health science. *Nurs Educ Today* 2013;33:596-601.
20. Mattick K, Crocker G, Bligh J. Medical student attendance at non-compulsory lectures. *Adv Health Sci Educ* 2007;12:201-10.
21. Zazulia AR, Goldhoff P. Faculty and Medical Student Attitudes About Preclinical Classroom Attendance. *Teach Learn Med* 2014;26:327-34.