

ORIGINAL ARTICLE

EVALUATION OF INTEGRATED LEARNING PROGRAM OF UNDERGRADUATE MEDICAL STUDENTS

Rehana Rehman, Azhar Iqbal*, Sadiqa Syed**, Ambreen Kamran***

Department of Physiology, Bahria University Medical & Dental College, Karachi, Pakistan

Background: When medical schools attempt to place, up to date information without coherence into their vast curricula, students face an overwhelming burden of dispersed information and desperately opt for rote memorisation rather than understanding. The objective of this study was to compare response and performance of students as a result of change from non-integrated to integrated curricula. **Methods:** The need of integration came from students' response to a non-integrated curriculum. Integrated Learning Program (ILP) was designed by curriculum development and integration committee. A structured questionnaire on perception of teaching methodologies and active learning was obtained from 95 students and 14 faculty members. Assessment test results were compared with a non-integrated module. **Results:** Overall satisfaction with ILP was shown by 78% students and 72% faculty members. The students realised greater command on subject and utility of course for better prospects in university exam and clinical orientation. Significant test performance was observed ($p < 0.001$) by integrated curriculum. **Conclusion:** Competency based education and professional learning of medical students can be enhanced by complete integration in basic sciences curriculum.

Keywords: Integrated Learning Program, Teaching Learning Methods, Problem Based Learning, Case Based Learning

INTRODUCTION

The advancement in scientific knowledge is responsible for day to day addition of novel information in the field of medicine. When medical schools attempt to place, up to date information without coherence into their vast curricula, students face an overwhelming burden of dispersed information and desperately opt for rote memorization rather than understanding. Studies show that students learn best when curriculum objectives are well identified, related to each other and allied to real-life experiences. Learning can thus be facilitated in our medical schools by integration of knowledge in basic and applied subjects with eradication of redundant details. An integrated curriculum is one that is focused on the organisation of central themes or concepts and synchronises several subjects. The goal of curriculum integration is to facilitate deeper level of understanding across subject areas through interrelated thematic study. The term integrated curriculum in medical education refers to coordination in the teaching and learning activities to ensure harmonious functioning of the educational processes and encompasses many models that provide a holistic rather than fragmented learning principle and reflects the real world which is interactive.¹ An interdisciplinary curriculum refers to 'a curriculum organisation which cuts across subject matter lines to focus upon comprehensive life problems or broad based areas of study that brings together the various segments of the curriculum into meaningful association'.²

The integrated curriculum is structured to foster relationships among learners, teachers, and the content itself by which students acquire ability to

perceive patient as a whole (horizontal and vertical integration). The non-integrated approach on the other hand imparts knowledge in a disjointed manner which does not allow students to develop skills to investigate, analyse and become critical thinker. The integrated system organised around organ systems such as cardiovascular or nervous with a major component of case based and problem based learning has been successfully implemented by good number of medical colleges.³

The academically challenging curriculum can be designed by inter departmental teams; formed by recruitment of faculty members from concerned disciplines. The planning involves frequent discussions for constructive alignment of learning objectives, meant to deliver relevant content by appropriate teaching/learning methodologies (TL), in calculated time frame. The exercise requires orientation of students, sensitization of teachers, participation from all departments and maintenance of set standards in order to sustain revolution in traditional teaching.

In undergraduate medical curriculum of our country basic sciences of Anatomy, Physiology and Biochemistry are taught in the preclinical period of two years, by a variety of disciplines named as term, block, semester or modules. The syllabus is taught by all the modalities in an incoherent, scattered manner that leads to repetition, loss of valuable time and lack of interest on part of students.⁴ The Bahria University Medical and Dental College is following a modular, integrated, hybrid system in which traditional teaching of lectures, demonstrations and lab skills is flavoured with problem based learning (PBL), case based sessions (CBL),

model study, seminars and interactive sessions. The administration truly believes in collecting feedback responses from students and the faculty not only for accountability but also in order to facilitate learning and improve university standards and ranking. The need for a restructuring of curriculum came from students' assessment results, remarks and view points after completion of a module with minimal integration. Thus it was planned to implement integrated model of Anatomy, Histology, Physiology, Biochemistry, and Community Medicine with orientation to clinical aspects of neurosciences in a modular frame of twelve weeks for better understanding, coherence, organisation, analytical and clinical reasoning skills among students.

The objectives were meant to generate innovations in medical education. It was desired to introduce quality teaching in traditional curriculum with less degree of compartmentalisation of basic sciences meant for improvement in diagnostic skills, cognitive and psychomotor domains of students and motivation of teachers to work as a team.

MATERIAL AND METHODS

The study was carried out at Bahria University Medical & Dental College from March to August 2010 to bring a change from non-integrated teaching curriculum to an integrated one. The causes of poor performance in examination was evaluated which identified that non-coherence of curriculum was the most important factor responsible for failure to understand the subjects of basic sciences. Integration of curriculum was made possible after approval from ERB (Ethical Review Board) of Bahria University. The following steps were accomplished during the procedure:

Framing of timetable

A 'Curriculum Development & Integration Committee' was formed with a core group of faculty members, recruited from all departments of basic sciences. Series of meetings were conducted for revision of learning objectives with respect to sequence, integration and application of basic science concepts in health and disease. Framing of weekly schedules was based on learning objectives, respective domains; mode of information transfer and method of assessment was discussed and approved by all the departments. Planner for the whole module was split into weekly schedule for students with notification of assessment tests and final examination. The TL methods were distributed in ordained time frame into lectures, (interactive, case based,) demonstrations with model study, interactive sessions, student group seminars, PBL and lab skills.

Implementation of Timetable

The program started with an orientation class to acclimatise students and teachers to the process and relevance of ILP in undergraduate medical course.

Didactic lectures were organised in succession to make students understand the location, structure, functioning and pathologies with which patients present in neurology clinics. The model demonstrations structured by the Department of Anatomy were further reiterated in relation to physiological and biochemical aspects in interactive sessions. Education of students to organise clusters of thoughts chronologically and present it sequentially was made possible by group seminars. Topics of clinical relevance were made clear by case based scenarios in lectures, tutorials and practice of clinical examinations. Application of basic science knowledge to understand the pathology, its presentation, investigations and treatment was specified in the form of PBL. Skill to examine integrity of components of nervous system and detect various pathologies during examination of neurological cases was demonstrated in the lab skilled sessions by trained staff members.

Student feedback

After completion of the module, strength and weaknesses of the programmed were evaluated by a feedback Performa generated after focused group discussions by researchers. The questions were framed to evaluate utility of ILP as an imperative tool for understanding: content, structure and functional relationship, difficult concepts, pathologies, appreciation and application of basic science knowledge of neurosciences in health and disease. A 5-point Likert scale with a score of 1= poor, 2= satisfactory, 3= good, 4= very good and 5= excellent was used to find out the ranking and a 3 point scale (1= not at all, 2= to some extent, and 3= to great extent) was used to elicit various responses from the students. The questionnaire also had a free comment section for suggestions by the students which were analysed and discussed by committee.

Faculty Feedback

The feedback form was sent to faculty in closed envelope from the Principal's Office. The form was designed to note their encountered problems, likes, dislikes, suggestions and level of satisfaction in execution and implementation of ILP. It also had a free section for narrative comments which were thereafter analysed.

Statistical Analysis

The data was interpreted with SPSS-15. Frequency and percentage of TL, response of students and faculty were analysed. Student's *t*-test was applied to assess students performance in integrated module with respect to non-integrated; *p* value was considered significant at <0.05.

RESULTS

The academic hours allocated to different TL methods in ILP were 111, 25, 25, 70, 8 and 18 hours for lectures, interactive sessions, demonstrations, lab skills, seminars,

and PBL which turned out to be 43%, 10%, 10%, 27%, 3% and 7% of the total time frame respectively.

The feedback form was completed and returned by 90.06% second year medical students. Table-1 describes an overall satisfaction of 78% students in understanding, appreciation and application of ILP. 61% of respondents claimed to have greater command in neuroscience as compared to courses taught in previous module without integration. Inclination to implement in all other modules with greater student-centred approach was documented by 79%. The utility of course for better prospects in university examination and clinical orientation was narrated by 85% and 92% students. Recommendations for additional hospital visits with patient exposure were contributed by 90% respondents. Students emphasized a need of greater case based sessions for understanding of difficult clinical topics. A negative response for entire computer based teaching and assignment was given by 47% respondents.

From the faculty, 87.5% responded to the questionnaire. Table-2 shows their absolute satisfaction on student's outcome as far as better understanding (64.28%), performance in exams (29%) and clinical orientation (71.4%) is concerned. Teachers developed interpersonal skills (71.4%) and positive attitude towards medical education (59%). The main stream (57.14%) thoroughly approved framing of time table,

delivery of integrated content but was not convinced with the traditional method of students assessment used in examination (86%). They gave valuable suggestions for execution, implementation and reinforcement of Integrated Learning Program. The help of the above in learning is given in Table 3 which shows better understanding of content, difficult concepts, perception of pathologies, integration of basic sciences with application in clinical practice as a result of implementation of integrated learning program. The improvement of results in subjects of Anatomy, Physiology and Biochemistry in integrated module is shown in Figure-1.

Table-1: Perception of students on various aspects of Integrated Learning Program (n=87)

Item	Yes		No	
	n	%	n	%
Better performance in university exams	74	85	13	15
Better performance in clinical courses	87	90.8	8	9.2
Strong grip on subject	53	61	34	39
Requirement of more integration	62	75	34	25
Integration of all modules	69	79	18	21
Integration of all medical subjects	51	59	36	41
Increase in student centred teaching	69	79	18	21
Increase in number of assignments and PBL	48	55	38	44
Computer based teaching and assessment	41	47	45	52
Incorporation of community based learning	78	90	9	10
Satisfaction with integration	68	78	19	22

Table-2: Faculty satisfaction on utility of Integrated Learning Program

Activity	Great extent	Less extent	Not at all	No Response
PROGRAM EVALUATION				
Framing of the Time Table (n)	8 (57.14)	4 (28.57)	2 (14.28)	0
Interdepartmental discussions (n)	4 (28.57)	6 (42.8)	2 (14.28)	2 (14.28)
Delivery of integrated content to students (n)	5 (35.71)	3 (21.42)	3 (21.42)	3 (21.42)
Method of assessment of students (n) Theory-Practical	2 (14.28)	2 (14.28)	8 (57.14)	2 (14.28)
FACULTY DEVELOPMENT				
Development of interpersonal skills in terms of listening, giving, discussing, receiving criticism	10 (71.4)	4 (28.57)	0	0
Developed positive attitude towards medical education	4 (28.57)	4 (28.57)	2 (14.28)	2 (14.28)
STUDENTS PERFORMANCE				
Improvement in the understanding and application of basic science knowledge in health and disease	9 (64.28)	5 (35.71)	0	0
Better performance in University exam of nervous system	4 (28.57)	4 (28.57)	4 (28.57)	2 (14.28)

Values in n (%)

Table-3: Positive responses derived by students after implementation of Integrated Learning Program

Objective	Response (%)
Understanding of content of subject	91.56
Understanding of structure and functional relationship	89.48
Understanding of difficult concepts	85.65
Perception of pathologies	82.28
Integration of knowledge in basic health sciences	87.18
Application of knowledge in health and disease	88.5

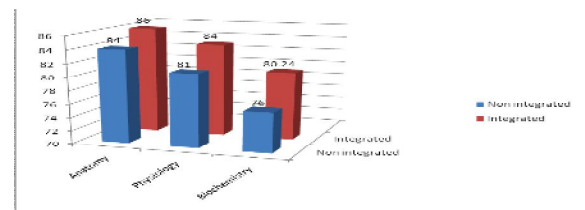


Figure-1: Comparison of examination results in integrated/non-integrated modules

DISCUSSION

The ultimate objective of medical education in this era is to bring new perspectives on content, process, extent

and evaluation of medical curriculum, with integrated modular system being recently evolved as an important strategy that aims to bring coordination in the teaching and learning activities.⁵ Learning is described as

'development of integrated, coherent growing web of understanding, knowledge and skill'.⁶

Various TL methods are in vogue in medical schools, all over the globe to ensure holistic rather than a fragmented approach in an attempt to promote evocative and meaningful learning.⁸ The hierarchy of teaching and learning activities in terms of their educational effectiveness comprise Level 1, interactive and clinically integrated activities; Level 2(a), interactive but classroom based activities; Level 2(b), didactic but clinically integrated activities; and Level 3, didactic, classroom or standalone teaching.

In the nervous system module for 2nd year MBBS students with level 2(a) was applied, rationale although was horizontal integration by all TL methods but students were introduced to clinical perspectives and presentation of disease process by case based learning and patients exposure.⁸

As students experience the curriculum, their feedback is very important and can be employed in improvement of design and development of next cohort.⁹ In order to know whether medical teachers have been successful to present the vast amount of information to the students in a planned, organised and integrated manner, the feedback evaluation and comments of students was gathered by a questionnaire.

In our study 91.56% students agreed that unified teaching system provided effective learning with better perception of content and organisation of nervous system. The facilitators induced problem solving abilities, by delivery of organised framework in lectures rather than all the traditional details and factual information (Figure-1). The results are supported by a study in which students acquired competency in the core abilities of neurosciences with the help of guiding principles given in lectures to promote acquisition of knowledge.¹⁰ Integration is achieved through exposition and discussion of related experiences which is responsible for retention of facts and enhances the recall and activation of knowledge to develop diagnostic reasoning skills.¹ It was applied by the researchers to improve understanding of difficult concepts in 85.65% students. The interactive sessions and model demonstrations helped in understanding of structure and functional relationship of nervous system in 89.48% students with the help of repetition, clarification and explanation of objectives in an affable environment. Integration of knowledge in 87.18% of students was found to be the outcome of sequence of planned lectures of functions in relation to molecular and biochemical aspects. Explanation of commotion of normal physiological process that forms basis of disease enabled 82.29% of learners to understand relevant pathologies. Presentation of scenarios in case-based sessions enhanced comprehension of health and presentation of disease in 88.5%. The results are

comparable to a study which reported CBL to be an effective modality of imparting medical education by case scenarios after successful integration of respective departments.¹¹

The imperative role of teachers as guide, mentor, reporter and program director in changing students' attitude by developing, activating, implementing, testing, and refining their ideas as well as making instructional decisions for educational policies can not be overlooked.¹² The perception of faculty therefore has to be evaluated in terms of program deficiencies, student's performance, personal learning and obstacles faced during the implementation of integrated learning strategies. Majority of faculty showed satisfaction on better understanding and performance of students in exams. Positive response of students and faculty members on ILP is comparable to a study, in which both students and faculty valued the program to be a successful effort for perception of interrelating concepts in health and disease.¹

Assessment is a very important tool that serves multiple roles; for example, it can provide feedback to learners on areas of strength/weakness, it can present the teacher insight into effectiveness of a given approach, and also limitation of integrated approach.¹³ Summative assessment of pupils was facilitated by questions asked during large as well as small group discussions while formative assessment was applied to judge their competencies at the end of the term. The examination was compartmentalised into Anatomy, Physiology, and Biochemistry, and comprised of traditional theoretical and practical schedules.¹⁴ The statistically significant results ($p < 0.05$) attained in Physiology and Biochemistry exams as compared to a non-integrated module, signify accuracy of knowledge in recall and application of concepts after integration, however free comments from students and teachers reflect need for improvement in system of examination.

The main objective of medical education is to develop effective learning in students to understand physiological alterations that forms basis of a disease process. This can only be made possible when future doctors are aware of location, structure, function, derangements, diagnostic tests and plans required for treatment of the diseased. The unified curriculum is thus meant for better understanding of normal and disease process related study of a specific organ and is especially helpful for diseases which are not organ-based for example diabetes.¹⁰ In such instances there should be case-based integration of cardiovascular, endocrine, metabolic, haematologic, renal and genitor-urinary courses.¹⁰ It becomes necessary that teachers and learners consciously find ways of integrating and incorporating teaching and learning into routine clinical practice.

The study had a few limitations regarding training of faculty members, lesser amount of time spent on patient exposure and conventional method of examination instead of an integrated one.

The redesigning of curriculum is a laborious, tedious, time consuming, and ongoing activity for which researchers have to keep in mind all the objectives, facilities and limitations from students and teachers point of view. This can only be achieved, by synchronisation of students and faculty that will endorse shift, from discipline-oriented to longitudinal patient-centred curriculum. The implementation will offer students an opportunity to become true 'healer', by relating basic and clinical approach to comprehend and treat the involved subject. The steady-state homeostasis can thus be derived by sustained commitment, positive reinforcement, comprehensive criticism and thorough encouragement of programmers by an enlightened administration that is fully dedicated to systemic change.

CONCLUSION

The perception and performance of students and comments of faculty after implementation of integration can be used as a rationale for acceptance and application of transformation from non-integrated to integrated curriculum. It was thus concluded that:

- New TL method of integrated learning was more effective than traditional one.
- Change was well accepted by students as well as the faculty.
- Staff members developed coordination to assemble as a team to think and devise innovations in medical education.

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Address for Correspondence:

Dr. Rehana Rehman, B-102, Block A, KDA Officers Housing Society, Karachi, Pakistan. **Cell:** +92-300-8275889

Email: drrehana7@gmail.com