

## ORIGINAL ARTICLE

## DESIGNING AND IMPLEMENTATION OF VERTICALLY AND HORIZONTALLY INTEGRATED ENDOCRINOLOGY AND REPRODUCTION MODULE

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**Background:** There is a worldwide trend of change in Medical Education from subject-based towards system-based approach. Several reports from various medical universities all over the world indicate that system based integrated curriculum may be considered as one of the major reforms to prepare better physicians for the next century. The objective of this study was to design and implement a horizontally and vertically integrated module for endocrinology and reproduction (ENR). It also aimed to evaluate study and faculty satisfaction for the continuation of this module in the future. **Methods:** It was an observational study of six months duration carried out on second year Medical students of Shifa College of Medicine (SCM). A multidisciplinary ENR modular team comprising of 18 highly relevant team members, finalized the clinical cases, themes, relevant objectives, learning strategies, time table and assessment tools for this integrated module. Student and faculty feedback questionnaire was administered at the end of module. **Results:** Seventy-four percent of the students and 96% of the faculty agreed that integrated teaching is better than the traditional teaching. Eighty-six percent students responded that the integrated approach makes learning and understanding easy; 70% students agreed that there was well balanced horizontal and vertical integration and LGIS, SGDs and PBLs were complimenting each other. Seventy-five percent students and 86% faculty favoured the continuation of integrated approach in future. **Conclusion:** Mode of ENR module delivery was highly appreciated by the students and faculty. System based curricular delivery can be implemented successfully in undergraduate medical education.

**Keywords:** Endocrinology, Reproduction, Large group interactive sessions, small group discussions, problem-based learning

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## INTRODUCTION

Medical colleges in Pakistan have been following a traditional curriculum, characterised by a high degree of compartmentalisation into preclinical, paraclinical and clinical years. Several areas of redundancy and overlapping along with a gap between the qualitative and quantitative advancement in medical education prompted Pakistan Medical & Dental Council of Pakistan to introduce major reforms in medical education to meet health needs and expectations. Inspired from international and regional changes in Medical Education<sup>1,2</sup> Shifa College of Medicine switched to system-based integrated modular curriculum in year 2008 for all 5-year curriculum. An effort was made to bring together basic, clinical and social sciences into one course and to implement horizontal and vertical integration across the curriculum. Spirally integrated modules were developed for years 2, 3 and 4.<sup>3</sup>

Vertical integration is defined as the integration between the clinical and basic science sections of the curriculum. It can occur throughout the curriculum with the basic medical and clinical sciences beginning together in the early years of the curriculum and continuing until the later years. More emphasis may be placed on the basic medical sciences in the earlier

years and on clinical sciences and the practice of medicine in the later years.<sup>4</sup> Horizontal integration blends either related basic science disciplines in order to enhance students' understanding of body systems or related clinical sciences through interdisciplinary clerkships. This form of integration is often accomplished by the elimination of departmentally-oriented teaching.<sup>5</sup>

Introducing an integrated curriculum may be considered as one of the major reforms to prepare better physicians for the next century.<sup>6</sup> Vertical and horizontal integration between basic sciences and clinical medicine has been found to stimulate profound rather than superficial learning, and thereby results in better understanding of important biomedical principles.<sup>7</sup> Benefits of vertical integration may include: improving motivation, enhancing deep learning, preparing for lifelong learning, facilitating curricular reforms, enhancing clinicians reflections on scientific practice and enhancing scientists reflections on clinical application and research.<sup>8</sup>

Integrated learning is gaining momentum all over the world. Medical education has also been changing rapidly in Pakistan and most of the medical colleges are now shifting towards innovative, integrated and problem based programs.<sup>9</sup> The objective of this study was to share the experience of designing and

implementing a vertically and horizontally integrated ENR module, and to evaluate student and faculty satisfaction for the continuation of this integrated module in the future.

## MATERIAL AND METHODS

It was an observational study, carried out at Shifa College of Medicine from Sep 2008 to Feb 2009. One hundred and twenty-four, 2<sup>nd</sup> year medical students were exposed to ENR module, teaching modalities, materials and evaluation tools. At the end of the module a feedback questionnaire was filled-in by students anonymously and a total of 104 questionnaires were returned by students. This questionnaire addressed the issues related to horizontal and vertical integration, module organization, delivery and teaching methodologies. Eighteen faculty members involved in the delivery of this module also gave their feedback.

The following steps were involved in the designing and implementation of this module:

### Module designing

A multidisciplinary ENR team comprising of 18 members was formed. Team was headed by a team leader and included highly relevant and dedicated team members from preclinical (physiologist, anatomist and a biochemist), paraclinical (pharmacologist and pathologist), and clinical (endocrinologist and gynaecologist) faculty. The entire faculty was oriented to the process of implementing integrated curriculum, and a series of the workshops were conducted in order to train the faculty to accept the evolving challenges in medical education. Learning objectives, clinical cases, themes, learning strategies, timetable and assessment tools for the module were finalised after several meetings and discussions amongst the team members.

Attempts were made to ensure the integration of the different topics horizontally as well as vertically. Clinical themes, covering all objectives related to the endocrine glands were developed for year 2, 3, and 4. Clinical cases were also developed for the year 2, but the objectives revolved around normal structure and functions of the glands. Year 3 objectives addressed basic pathological and pharmacological concepts and year 4 objectives dealt with the diagnosis and management.

A 4-week timetable covering all the objectives of the ENR module in an integrated and highly organized manner was finalised. Different slots were allotted for small group discussions, problem-based learning, Large group teaching, Wrap-up sessions, pictorial sessions, self-directed learning and lab practical. A clinical scenario was introduced at the beginning of the specific theme, and the objectives revolving around that scenario were covered in next 2 to 3 days.

The final draft indicating all the details about the module, including timetable, learning objectives, clinical cases, learning strategies, and assessment tools was presented to the faculty. Changes and modifications were incorporated in light of the suggestions of the faculty. Final approval about the quality assurance was given by the Department of Medical Education.

### Module implementation

The module was implemented on 2<sup>nd</sup> year MBBS class of 124 students. The program started with an orientation class to introduce the students with the team of ENR. Process and relevance of integrated learning in basic sciences was also highlighted.

Various teaching and learning methods were decided to ensure active participation from the students and to improve their analytical and clinical reasoning skills.

### Role of facilitator

An important target focused during ENR module was to shift the students from the teacher-centred towards the student-centred learning. Multiple workshops were conducted to guide and train the facilitators. Some of the important guidelines given to the facilitators were:

Facilitate, do not teach; encourage students to learn on their own; turn questions back to students, help keep the group organised and punctual; help students to stay on track; ensure equal participation; and keep track of students' performance; make sure to let the students explore all of their knowledge before offering suggestions; if one participant is reluctant, target him/her and ask if he/she agrees with what is going on; manage those who always want to jump in. In summary, the role of the facilitator was to act as a silent guardian, not a source of primary information.

### Teaching methods

The topics were delivered by means of the various teaching/learning methods as described below.

Case Stimulated Interactive Lectures: This approach consisted of large group lectures delivered by faculty of Basic Sciences Departments. These sessions were used to introduce the clinical theme and were intended to give an idea of the basic concepts to the students through an interactive approach. Mostly the difficult topics were covered through large group teaching.

Small Group Discussions (SGD): Most components of the module were delivered through this learning strategy. Students were divided into groups of 10–12, and each group was supervised by a facilitator who was responsible to control the session. Students were intended to discuss the given objectives and clarify the concepts amongst themselves. Assessment of students' participation was done by using a form. Aggregate score of these forms was an important component of the final assessment.

**Problem-based Learning sessions (PBL):** Problem-Based Learning is a method of learning in which learners first encounter a problem followed by a systematic, learner-centred inquiry and reflection process. One problem was conducted through 3 sessions.

**Self-directed Learning (SDL):** After a clinical theme was introduced to the students, they were given time for SDL to study for objectives beforehand. These SDL sessions were also supervised by the facilitator.

**Pictorial Sessions:** The team searched and selected a wide range of videos and pictures related to various endocrinological disorders. These interactive pictorial sessions were arranged at the end of each theme, which further helped the students to clarify their concepts.

**Wrap-up sessions:** A wrap-up session was held at the end of each theme. This session was conducted by a senior faculty member and was aimed to clarify the difficult concepts and compile all important information related to the theme.

### Examination and Results

The ENR team designed and employed objective rather than subjective assessment techniques. A blueprint for the assessment was developed in which categorisation of each objective was done on the basis of Miller's pyramid.<sup>10</sup> End-of-module assessment included horizontally and vertically integrated questions comprising of 80% MCQs and 20% SEQs.

The importance of integration was strongly reflected in the end-of-module examination. Pass percentage of the examination was 60%. One hundred and four out of the 120 appeared students passed. Mean percent score was 68.5 whereas internal consistency and reliability (Cronbach's alpha/KR21) of this exam was found to be 0.76.

## RESULTS

Seventy-four percent students believed that integrated teaching is better than the traditional teaching, 86% students responded that integrated approach makes learning and understanding easy, and 75% students favoured the continuation of this integrated approach in future. Other details related to horizontal and vertical integration are addressed in Table-1. The students were also satisfied with the teaching methodology and commented positively about it (Table-2). The students responses about the module organization and delivery are summarised in Table-3.

Faculty highlighted the fact that most of the students did not pre-read the required material for the small group sessions, and some steps should be taken to promote SDL before coming for the SGDS in future. Faculty members indicated that high quality study guides with full degree of horizontal and vertical integration should be developed to facilitate the learning process. Faculty also indicated that further workshops

should be conducted to train the faculty members (Table-4).

**Table-1: Feedback from students on horizontal and vertical integration in ENR module**

Parameters	Agree	Uncertain	Disagree
Integrated teaching is better than the traditional teaching.	74	14	12
Integrated approach makes learning and understanding easy.	86	5	9
Integrated teaching would be helpful to you in Future	78	12	10
Integrated teaching methodology should be continued in future.	75	15	10

Values are responses in percentage

**Table-2: Feedback from students on teaching methods in ENR module**

Parameters	Agree	Uncertain	Disagree
Large Group Interactive Session (LGIS)	82	10	8
Small Group Discussion	71	9	20
Problem Based Learning Sessions	36	12	52
Self directed learning (SDL)	55	14	31
Pictorial Sessions	68	12	20
Wrap up Sessions	86	11	3

Values are responses in percentage

**Table-3: Feedback from students on module organization and delivery**

Parameters	Agree	Uncertain	Disagree
Interactive discussion, small groups, team learning and practical were complimenting each other in the module (flow, sequence, simple to complex, clinical relevance)	70	11	19
Assigned learning materials were consistent with session objectives	82	8	10
Facilitator encouraged participation by all members of the group	67	16	17
Time duration for the module delivery was enough	25	10	65
There was a balance between basic and clinical concepts	48	7	45
I could find material that I needed in SCM print library/standard textbooks/online	38	12	50

Values are responses in percentage

**Table-4: Feedback from faculty on module organization and delivery**

Parameter	Agree	Uncertain	Disagree
Integrated teaching is better than the traditional teaching.	96	4	0
I was able to motivate the students for critical thinking through SGDS and PBLs.	70	20	10
Interactive way of teaching promotes relevance and helps create connections across various disciplines.	95	5	0
Integrated approach should be continued in the future.	86	10	4

Values are responses in percentage

## DISCUSSION

Students gave a very positive feedback about the module but at the same time also highlighted the areas

which need improvement. Majority of the students responded that integrated teaching is a better than traditional teaching and integration makes learning and understanding easy. Similar results have been quoted by Rafiq N from their students and faculty that vertically integrated teaching methodology is better than the traditional teaching.<sup>11</sup> Abraham Flexner was also in a strong favour of correlating the knowledge of clinical and basic sciences because it make learning and understanding easy.<sup>12</sup> In a survey involving three teaching hospitals in Australia, the responding staff and faculty strongly supported the integration of biomedical sciences into clinical teaching.<sup>13</sup>

In another study the students indicated that integrated teaching improves the performance in clinics.<sup>14</sup> Alam *et al* also indicated that an early clinical exposure, and use of clinical scenarios and clinical examples in teaching sessions of basic medical sciences generates interest among the learners and help them to see why it is important to learn basic sciences.<sup>15</sup> This is in accordance with our results; 78% of our students think that integrated mode of teaching will be helpful to them in future years for better understanding of the clinical concepts. Integration leads to better retention of knowledge and the ability to apply basic science principles in the appropriate clinical context.<sup>8</sup> 75% of our students favoured continuation of integrated approach in future. The studies of Ghosh *et al* and Sathishkumar also showed that the students liked the integrated and case stimulated teaching and agreed upon its continuation in future.<sup>16,17</sup>

Most of the difficult topics were delivered via the large group interactive sessions in our study, and 82% of the students agreed that this teaching methodology was useful, but in open comments the students also highlighted that these LGIS should be delivered by senior faculty members. Similar type of case stimulated lectures were used in Department of Physiology, Pramukhswami Medical College, India with a very positive response from the students.<sup>18</sup>

Students also responded positively to the active learning methodologies like SGDS and SDLS as active learning stimulates the audience to think, link and participate.<sup>19</sup> But 52% of our students disliked the PBL methodology which probably reflects students' resistance and may indicate that passive learning strategies and spoon-feeding knowledge can make students dependent on teachers and such students may find it hard to adjust when switched to more active student centred learning.<sup>20</sup>

Majority (70–80%) of the students were satisfied with the module delivery and responded that the module was interesting, assigned learning materials were consistent with session objectives and facilitators interacted with the students. But the students were not satisfied with the duration of the module, they

complained about the content overload and commented that too much course was delivered in a short period of time. It has been indicated that to prevent course overload and to enhance the integration between basic and clinical sciences, course content should be created with the strong coordination between the basic and clinical faculty, otherwise a medical school curriculum may suffer from content overload and content gaps.<sup>20</sup>

Forty-five percent of our students indicated that a balance was not maintained between basic and clinical concepts. Students indicated that in some sessions clinical relevance was over emphasised due to which the students suffered in grasping some of the basic physiological concepts. Study of Dahle mentioned that there is a risk that clinical studies direct too much attention from basic sciences. Therefore the clinical examples should be used initially only to motivate efficient learning, and a balance between the basic and clinical sciences should be maintained with more emphasis on basic concepts at preclinical level.<sup>7</sup> Students were also complaining about the lack of availability of enough reading material and suggested that high quality study guides should be provided to the students before the beginning of each module.

The success of any modular delivery depends on the active participation and devotion by the faculty members; 96% of our faculty members agreed that integrated teaching is better than traditional teaching and 86% of the faculty members favoured the continuation of this modular integrated system in future. Faculty development programs in our department contributed in motivating the faculty and highlighting the importance of integration. As integration entails a lot of time and work in respect of planning, organization and execution, the teachers have to be deeply involved and enthusiastic.<sup>21</sup> Moreover, faculty development is important to ensure high levels of competency in facilitating learning.<sup>22</sup>

## CONCLUSION

Integrated delivery of ENR module was highly appreciated by the students and faculty. This mode of system-based curricular delivery can be implemented successfully in future for undergraduate medical education. Further studies are needed to compare the results of traditionally delivered modules with the integrated modules in order to assess the feasibility of continuation of integrated modules in future.

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