Experience with a theme-based integrated renal module for a second-year MBBS class

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Shafi R, Quadri KH, Ahmed W, Mahmud SN, Iqbal M. Experience with a theme-based integrated renal module for a second-year MBBS class. Adv Physiol Educ 34: 15–19, 2010; doi:10.1152/advan.00069.2009.—Integrated learning is the need of the hour. We at Shifa College of Medicine switched to an integrated modular curriculum last year. In the present article, we describe our experience with the renal module in year 2 of a 5-yr undergraduate medical curriculum. A multidisciplinary renal modular team developed the relevant objectives, themes, and clinical cases. The learning strategies used were large-group interactive sessions, small-group learning, problem-based learning, practicals, and self-directed learning. Assessment was both formative and summative. Student and faculty feedback questionnaires were administered at the end of the module. Forty-four percent of the students agreed that the basic science and clinical concepts were well balanced and integrated. Fifty-seven percent of the students believed that important learning issues could be identified and that participation and critical thinking were encouraged during the small-group sessions. Eighty-five percent of the facilitators agreed that they were able to motivate students for critical thinking and better learning through integrating various disciplines. In conclusion, the integrated method of curricular delivery was well received by students and faculty members, and it can be used successfully in undergraduate medical education in developing countries.

during the past few decades, revolutionary attempts have been made to introduce integrated curricula in undergraduate medical schools in many parts of the world (8, 12, 15, 27, 29, 31).

Learning is best accomplished when information is presented in meaningful and connected patterns. Fragmented teaching schedules, concerns about curriculum relevancy, and lack of connections and relationships among disciplines led to a drive toward an integrated curriculum (13). Medical educationists realized that there was a need for integrating basic and clinical medical sciences, eliminating sharp discipline boundaries as defined in the traditional way of teaching (17). Traditional methods of teaching were mainly teacher centered, and basic science teaching lacked clinical relevance (23). It has been reported that information presented in an integrated approach with strong clinical relevance captures students’ attention and creates more excitement in learning (5). It has been observed that students trained within an integrated curriculum made more accurate diagnoses than did students trained in a conventional curriculum (25). Moreover, vertical integration between basic sciences and clinical medicine in a problem-based learning (PBL) curricula stimulated a better understanding of biomedical principles than did conventional curricula (3). There is evidence that PBL is more likely to promote a deep approach than conventional teaching (1, 21). Harden (11) argued that curricular integration can be viewed as a ladder, with discipline-based teaching (“isolation”) at the bottom of the ladder and full integration (“transdisciplinary teaching”) at the top. Although medical students from traditional curricula have been shown to score highly for surface learning (20), the report Tomorrow’s Doctors: Recommendations on Undergraduate Medical Education London (7) criticized British medical school curricula for overburdening students with factual information and not promoting a critical understanding of the core material.

Integrated learning is the need of the hour. In recent years, such curricula have been used by faculties of many medical schools throughout the world, including South Asian countries (4, 8, 12, 15, 26, 27, 29). The World Health Organization supported the integration of outcome-based and competency-based strategies and student-centered approaches in the learning process (30). Inspired by international and regional changes in medical education, the Pakistan Medical and Dental Council of Pakistan and Higher Education Commission of Pakistan decided to introduce major reforms in medical education to meet health needs and expectations. This has sent a wave of curricular reforms throughout the country. We at Shifa College of Medicine switched to a system-based integrated modular curriculum in year 2008 for the whole 5-yr curriculum. Spirally integrated modules were developed for years 2, 3, and 4. An effort was made to bring together basic, clinical, and social sciences into one course and to implement longitudinal curricular themes across the curriculum. In the present article, we describe our experience with the renal module in year 2 of the 5-yr undergraduate medical curriculum.

**METHODS**

A multidisciplinary renal modular team was formed, which laid down a timeline for developing the module. As an initial step, appropriate and relevant objectives were developed by the team for the renal modules of years 2, 3, and 4 separately using the specific, measurable, attainable, relevant, and targeted (SMART) technique (18). Longitudinal clinical themes covering all the important clinical concepts were developed for the three modules. These included: a patient with hematuria, generalized edema, oliguria, electrolyte disorder, acid-base disorder, a progressive rise in serum creatinine, and difficulty in passing urine. Relevant clinical cases were also developed according to the themes. The year 2 objectives revolved around the normal structure and function of kidneys. The year 3 objectives addressed basic pathological and pharmacological concepts, and the year 4 objectives revolved around diagnosis and management according to guidelines provided by Pakistan Medical and Dental Council. Relevant ethical and professional aspects were also addressed according to the developmentally appropriate level of the students.

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**Address for reprint requests and other correspondence:** R. Shafi, Dept. of Basic Health Sciences, Shifa College of Medicine, Sector H-8/4, Islamabad, Pakistan (e-mail: shafiriffat@hotmail.com).
The timetable template for year 2 showed different learning strategies and faculty involvement. The learning strategies used in the module are shown in Table 1.

As a general rule, a clinical theme was introduced on the first day and the objectives around that theme were covered over the next 2–3 days.

**Development of a Study Guide**

A study guide containing the objectives for knowledge, skills, and attitudes along with clinical cases was also developed (10). The guide mainly provided objectives, learning strategies, and references to the resources. The module was 4 wk in duration.

**Learning Strategies Used**

- **Large-group interactive sessions.** These sessions were used to introduce the clinical theme and to discuss the concepts in an interactive manner using, at times, small-group brainstorming followed by a debriefing session by facilitators to clarify concepts using audiovisual aids.

- **Small-group discussions.** Some of the objectives included in the curriculum were discussed in small groups of 8–10 students. These sessions involved a facilitator who mainly controlled the process and, at times, was a content expert. These discussions were structured as follows: reading of the case scenario by the students, brainstorming within the group about the application of the learned knowledge, and clarification of the concepts by the facilitator. These sessions were strategically placed in the timetable to go along with the other learning strategies.

- **PBL sessions.** PBL was used as one of the learning strategies for one of the clinical themes. Three sessions for one problem were conducted with an interval of 1–2 days. In the first session, students identified the objectives related to that particular case followed by self-assigned tasks and discussions in the subsequent sessions.

- **Integrated practical sessions.** In line with the integrated philosophy, we also introduced integrated practical sessions. Students were divided into four groups, which performed the relevant practical in basic science and clinical skill laboratories. The practical sessions were designed in such a manner that basic science knowledge was linked with the following real life clinical practice task:
  
  A 40-yr-old male presents to the emergency room with history of severe pain in his right loin for 2 days.

  - Station 1: take the patient history relevant to the symptoms (standardized patient).
  - Station 2: identify the abnormality in the imaging study (intravenous urogram with a stone).
  - Station 3: identify the structure under the microscope and give two reasons that favor your identification (slide under microscope).
  - Station 4. How do you relate the urine microscopic findings with the patient’s presentation? (Urine microscopy.)

- **Self-directed learning.** Sufficient time was allocated for self-directed learning to study for the task given to the students beforehand.

**Assessment and Program Evaluation**

A test blueprint for the assessment was developed. Each objective was categorized based on Miller’s pyramid (16). The objectives for formative assessment were evaluated as quizzes run during the small-group learning exercises. Summative assessment at the end of the module was mainly integrated multiple-choice questions (MCQs), which were developed by the multidisciplinary modular team including members from the clinical faculty.

**Process for Developing Integrated MCQs**

A workshop was arranged to sensitize and train faculty members to develop the integrated MCQs in early years. A template was used from the National Board of Medical Examinations (2), which incorporated two and, at times, three disciplines in a scenario-based single MCQ or sequential MCQs. Subsequently, MCQs were developed by the renal modular team. After the initial vetting, MCQs were forwarded to the Medical Education Department, where they were checked for quality assurance using a checklist based on an evidence-based review (9).

**Student and Faculty Feedback**

Student and faculty feedback questionnaires were designed. The form was divided into two components. One component was administered during the final week of the module, and the second one was administered immediately after the end of the modular assessment. The student questionnaire allowed statements to be rated on a Likert scale and gave an option for free comments. The faculty survey addressed views regarding the different learning strategies and integration process.

**RESULTS**

The module was implemented in a second-year Bachelor of Medicine-Bachelor of Surgery (MBBS) class of 103 students. The module lasted for 4 wk. The study guide was distributed well in advance. The guide was composed of objectives, six clinical themes, and clinical cases. The distribution of various learning strategies is shown in Table 1. Small-group discussions were used maximally to encourage critical thinking among the students. A total number of 70 integrated MCQs were developed for the assessment; of these, 41 MCQs were application and 29 MCQs were recall. The results of the assessment showed that 71 of 103 students scored 50% and more in the exam. The mean percent score was 57.1, and the coefficient (Cronbach) $\alpha$ was 0.77 for the MCQ tests. Sixty-nine percent of the students passed the examination. The passing standard was set at 50%. The result was found to be satisfactory and correlated with the performance of students in other modules. The result of the renal module improved in subsequent years of administration as students became acclimated to the integrated delivery of the curriculum.

Feedback of the students regarding the delivery of the module was assessed; 99 of 103 students (96%) completed the feedback form, which was administered during one of the dedicated sessions of the module. Students gave a mixed response on the module organization and structure, but generally they were satisfied with the organization of the module (Table 2).

Student feedback on the different learning strategies was mixed. About half of them found the learning strategies useful in learning, although some of them remained uncertain about their opinion (Table 3).

Student feedback on the support services and graded activities was mixed. Only 28% of the students could find the material that they needed in the library and standard textbooks, but 45% of them agreed that they received adequate guidance from faculty and support staff. Forty-one percent of the stu-
students agreed that the exams reflected the learning objectives in the module, and 34% of them thought that the assessment methods promoted deep learning.

Regarding instruction, 56% of the students agreed that they could identify important learning issues for further study during the small-group sessions with the help of facilitators. More than half (57%) of the students agreed that all members of the group were encouraged to participate in the small-group sessions. Forty-four percent of the students believed that critical analysis of the data was encouraged during the small-group sessions.

In their free comments, students perceived that clinical relevance was overemphasized. They generally liked the change, but at the same time, they found it hard to switch to a more active learning process, with less interest in PBL and self-directed learning.

Faculty members’ perceptions regarding active participation by the students was positive. Most of them thought that the interactive way of teaching promoted critical thinking, relevance, and connections across various disciplines. Faculty members gave positive feedback on the cooperation of senior faculty members, but they thought that the students were hesitant to be involved in the newer way of learning (Table 4).

**DISCUSSION**

Integration of disciplines both vertically and horizontally was possible despite several restraints. We evaluated this program using level 1 ("reaction") and level 2 ("learning") of the “Kirkpatrick model" (14). The Kirkpatrick model (14) defines “reaction” as what the participants thought of a particular program, including the materials, instructors, facilities, methodology, and content; “learning” is concerned with measuring the knowledge principles, facts, techniques, and skills presented in a program. In our case, the outcomes related to bedside performance would take a few years to establish, but behavioral change (level 3) requires frequent measurements, which may not be possible. However, the student performance in the integrated practical examination was assessed where basic science knowledge was linked with a real-life clinical practice task. This may reflect some effect on clinical performance.

The feedback both from students and faculty members was encouraging but at the same time showed areas that needed improvement. These results are consistent with experiences in other developing countries. Vyas et al. (29) described that their feedback, which highlighted benefits such as integrated learning of the basic sciences, their application to clinical cases, and active student learning, from faculty members and students was positive. Most of them recommended that the integrated program should be continued (29). In a study conducted by Ghosh and Pandya (8), the results of feedback from first-year undergraduate students and faculty members after an integrated learning program was introduced showed that the majority of students rated the program as good to excellent in regard to appreciation, understanding, and application of basic science knowledge in health and disease. Seventy-eight percent of the students felt that the integrated program might not be helpful in their later days of clinical training. However, 60% of the students felt that the integrated program might not be helpful in performing better in the summative university examinations (professional examinations), which are conducted yearly in our 5-yr curriculum. The first two university examinations mainly consist of basic sciences.

This notion mainly arises due to a mismatch between the delivery and assessment. If the assessment continues to be subject based and not in line with curricular change, it is bound to create confusion. A previous study (8) has shown that such a mismatch can eventually lead to failure of any adopted curriculum.

Another study (24) demonstrated that students clearly enjoyed the experience of case-stimulated learning and perceived that it was valuable. This is consistent with our results, where 38% of the students agreed that case-based learning was useful.

Forty-nine percent of the students disagreed that the small-group learning method was useful in learning, which probably reflects students resistance, as mentioned in an article by Fielder and Brent (6). Passive-learning strategies and spoon-feeding strategies were highly favored by the students, as only 24% agreed that they were useful. This might reflect the increasing concern and anxiety levels of the students with regard to the impact of their learning performance on their examinations.

**Table 2. Student feedback on the module organization and structure**

<table>
<thead>
<tr>
<th></th>
<th>Agree</th>
<th>Uncertain</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic science and clinical concepts were well balanced.</td>
<td>44</td>
<td>19</td>
<td>37</td>
</tr>
<tr>
<td>The emphasis on basic science concepts was appropriate.</td>
<td>34</td>
<td>20</td>
<td>45</td>
</tr>
<tr>
<td>The emphasis on clinical science concepts was appropriate.</td>
<td>34</td>
<td>20</td>
<td>45</td>
</tr>
<tr>
<td>The amount of scheduled time was appropriate.</td>
<td>28</td>
<td>17</td>
<td>55</td>
</tr>
<tr>
<td>The amount of unscheduled time was appropriate.</td>
<td>24</td>
<td>16</td>
<td>60</td>
</tr>
<tr>
<td>The lectures, small groups, team learning, and laboratories were well integrated with each other in the module.</td>
<td>54</td>
<td>14</td>
<td>32</td>
</tr>
<tr>
<td>The learning material was consistent with the objectives.</td>
<td>46</td>
<td>25</td>
<td>28</td>
</tr>
<tr>
<td>The ethical aspects were well integrated with the medial knowledge.</td>
<td>47</td>
<td>28</td>
<td>24</td>
</tr>
<tr>
<td>The module was well organized.</td>
<td>43</td>
<td>21</td>
<td>36</td>
</tr>
<tr>
<td>The facilitation of this module was of high quality.</td>
<td>54</td>
<td>22</td>
<td>24</td>
</tr>
</tbody>
</table>

Values are student responses (in %).

**Table 3. Student feedback on the utility of the learning strategies**

<table>
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<th>Agree</th>
<th>Uncertain</th>
<th>Disagree</th>
</tr>
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<tbody>
<tr>
<td>Case-based learning</td>
<td>38</td>
<td>25</td>
<td>37</td>
</tr>
<tr>
<td>Small-group learning</td>
<td>51</td>
<td>18</td>
<td>31</td>
</tr>
<tr>
<td>Preparatory readings for team learning (task assignment)</td>
<td>50</td>
<td>15</td>
<td>35</td>
</tr>
<tr>
<td>Large-group discussion</td>
<td>50</td>
<td>15</td>
<td>35</td>
</tr>
<tr>
<td>Laboratory exercises</td>
<td>50</td>
<td>26</td>
<td>24</td>
</tr>
<tr>
<td>Self-directed learning</td>
<td>43</td>
<td>23</td>
<td>34</td>
</tr>
<tr>
<td>Prior awareness about the learning objectives</td>
<td>43</td>
<td>26</td>
<td>31</td>
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</tbody>
</table>

Values are student responses (in %).
knowledge can make students dependent on teachers, and such students may find it hard to adjust when switched to more active student-centered learning.

In a survey conducted at Ziauddin Medical University (Karachi, Pakistan), which follows a PBL curriculum, the integrated curriculum course was favored over conventional lecture-based education by both the students and faculty members. Eighty-eight percent of the students thought that PBL was relevant to the course objectives and that the material was covered in a logical sequence. A total of 65% of the students agreed that the course reflected an integration of theoretical knowledge with practical application. In all, 81% of the students agreed that PBL items motivated them to consult various learning resources. Interestingly, only 39% of the students agreed that the use of only PBL was more effective than lectures in facilitating understanding of the subject, which once again can be a reflection of a long-lasting passive-learning approach (22). In our case, PBL was used just as one of the learning strategies along with large-group interactive sessions, small-group case-based discussions, and integrated practical learning.

Similarly, medical students in Saudi Arabia responded positively to integrated case-based learning and were able to answer problem-solving questions in a better way (4).

In our modules, formal teaching of important competencies related to medical ethics, professionalism, and communication skills, which are generally ignored in the traditional curriculum (19, 28), were also introduced. History taking, physical examination, professionalism, and communication skills were assessed during the integrated practical examinations. Ethics-related issues were also incorporated in the written assessment.

About half of the students agreed that the issues related to ethical professional aspects were well integrated with the medical knowledge. The student feedback on learning/teaching methods was mostly positive. The students suggested that the module organization and structure could improve further. Considering that the change in curriculum was new for both the faculty members and students, we found encouraging responses from both students and faculty members. At the same time, their feedback is being incorporated to refine the delivery for the coming years.

Limited resources, scheduling conflicts, and resistance from senior and junior faculty members, students, and their parents were major hurdles in implementing the change in the curriculum. In Pakistani culture, families live jointly, and parents are responsible for sponsoring their children’s education and, therefore, want to be actively involved in their children’s progress. An integrated curriculum is something new to northern Pakistani medical schools. The change created anxiety in parents as well when they compared it with curricula in other institutions. This required reassurance and counseling on the institution’s part. The new curriculum required major changes in the learning environment, but we were able to launch the initiative despite all the constraints. The PBL sessions were conducted in large lecture halls with flip charts provided to each group. The library was upgraded in regards to resources and physical space. Clinical skills and an informatics laboratory provided the space for communication skills and procedural skills training along with 40 Web-enabled work stations for efficient searching. The orientation and training of the faculty members through seminars and workshops helped us to overcome the reluctance of faculty members to shift to the new curriculum model. The training was carried out by invited regional and international experts in medical education. Several of the faculty members engaged in medical education provided constant input in integrating the various disciplines and refining delivery strategies.

Scheduling conflicts were overcome by rescheduling other classes that were occurring at the same time. Counseling of the students was done by the advisory committee, by listening to and discussing their queries and problems and incorporating their reasonable suggestions into the system.

Further organization of the study guide and training faculty members through workshops on conducting case-based group discussions, integrated practical sessions, and developing integrated assessment tools will help in implementing this system successfully in medical colleges. In conclusion, the integrated method of curricular delivery was well received by students.
and faculty members, and it can be successfully used in undergraduate medical education in developing countries.

DISCLOSURES

No conflicts of interest are declared by the author(s).

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