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Level of integration in current undergraduate curricula of two private-sector medical colleges in Karachi

Niveau d'intégration du contenu dans les programmes d'études médicales prédoctorales actuels de deux facultés de médecine privées à Karachi

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Résumé de l'article

Contexte : Diverses stratégies sont employées dans le monde pour intégrer le contenu des programmes d'études médicales. Toutefois, le rôle des enseignants dans la mise en place d'une intégration de contenu efficace n'a jamais été évalué. Nous avons créé et utilisé un outil pour explorer le niveau actuel d'intégration du contenu, pour évaluer les pratiques individuelles des enseignants en matière d'intégration et pour examiner les éléments contextuels qui minimise son intégration.

Méthodologie : Cette étude transversale, menée en septembre et en novembre 2020, a utilisé un échantillonnage de convenance. Les participants à l'étude étaient des enseignants en sciences fondamentales et cliniques de deux facultés de médecine privée à Karachi, au Pakistan (avec un taux de réponse de 53,5 %, n = 107). Nous avons validé un questionnaire papier par le biais d'une étude pilote auprès de cinq participants. Onze questions fermées sur une échelle de Likert à 5 points ont permis de calculer les scores bruts des enseignants pour leurs pratiques en matière d'intégration de contenu, et six questions ouvertes ont permis de sonder leurs opinions.

Résultats : Le score moyen d'intégration était de 37,4±6,7. D'après les opinions exprimées, il est nécessaire d'inviter des cliniciens à enseigner dans les premières années de la formation prédoctorale, de faire participer le corps professoral dans les réunions du programme d'études afin de mettre en place une évaluation intégrée. Le coefficient alpha de Cronbach du questionnaire était de 0,732 et l'analyse des composantes principales était satisfaisante.

Conclusion : Les enseignants en médecine ont facilité l'intégration principalement par la coordination d'horaires pour pouvoir aborder simultanément des sujets similaires. En outre, une consultation formelle par le biais de réunions de comité ainsi que la complémentarité de l'approche disciplinaire et intégrée ont été mises en œuvre pour atteindre les objectifs du programme d'études.

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Niveau d'intégration du contenu dans les programmes d'études médicales prédoctorales actuels de deux facultés de médecine privées à Karachi

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Abstract

Background: Diverse strategies are employed globally to integrate medical curricula. Nevertheless, a gap exists in assessing the role of medical instructors in meaningful integration. We developed and used a tool to explore the current level of integration, score medical instructors' individual practices for integration, and investigate contextual elements minimizing integration.

Methodology: This cross-sectional study, conducted in September-November-2020, used convenience-sampling. The study participants were basic-sciences and clinical instructors at two private-sector medical colleges in Karachi-Pakistan (with a response rate of 53.5%, *n* = 107). We validated a paper-based questionnaire through a pilot study on five participants. This tool with 11 close-ended questions on a 5-point Likert scale generated instructors' integration scores, and six open-ended questions probed instructors' perspectives.

Results: The mean integration score was 37.4±6.7. Participants' perspectives indicated a need for participation of clinical faculty in teaching initial undergraduate years, involving lecturers in curriculum meetings, and integration of assessment. The questionnaire Cronbach-alpha was 0.732 with satisfactory principal-component-analysis.

Conclusion: Medical instructors facilitated integration mainly through concurrent timetabling of similar topics. Moreover, formal consultation through committee meetings, with discipline-based and integrated approaches complementing each other, were in practice to achieve curricular goals.

Résumé

Contexte : Diverses stratégies sont employées dans le monde pour intégrer le contenu des programmes d'études médicales. Toutefois, le rôle des enseignants dans la mise en place d'une intégration de contenu efficace n'a jamais été évalué. Nous avons créé et utilisé un outil pour explorer le niveau actuel d'intégration du contenu, pour évaluer les pratiques individuelles des enseignants en matière d'intégration et pour examiner les éléments contextuels qui minimise son intégration.

Méthodologie : Cette étude transversale, menée en septembre et en novembre 2020, a utilisé un échantillonnage de convenance. Les participants à l'étude étaient des enseignants en sciences fondamentales et cliniques de deux facultés de médecine privée à Karachi, au Pakistan (avec un taux de réponse de 53,5 %, n = 107). Nous avons validé un questionnaire papier par le biais d'une étude pilote auprès de cinq participants. Onze questions fermées sur une échelle de Likert à 5 points ont permis de calculer les scores bruts des enseignants pour leurs pratiques en matière d'intégration de contenu, et six questions ouvertes ont permis de sonder leurs opinions.

Résultats : Le score moyen d'intégration était de 37,4±6,7. D'après les opinions exprimées, il est nécessaire d'inviter des cliniciens à enseigner dans les premières années de la formation prédoctorale, de faire participer le corps professoral dans les réunions du programme d'études afin de mettre en place une évaluation intégrée. Le coefficient alpha de Cronbach du questionnaire était de 0,732 et l'analyse des composantes principales était satisfaisante.

Conclusion : Les enseignants en médecine ont facilité l'intégration principalement par la coordination d'horaires pour pouvoir aborder simultanément des sujets similaires. En outre, une consultation formelle par le biais de réunions de comité ainsi que la complémentarité de l'approche disciplinaire et intégrée ont été mises en œuvre pour atteindre les objectifs du programme d'études.

Introduction

A teaching-learning system that equips medical students with a comprehensive and complex view of medical science is a prerequisite for students being able to cope with healthcare needs and problems.[1,2] Creating linkages between different concepts[3] is imperative for a problem-solving capability in medical graduates. For instance, how basic knowledge of structure, functions and blood/nerve supply of a body part plays a role in the diagnosing or treating a disease. More than two decades ago, curriculum integration surfaced as a solution to equip medical graduates with deep seated understanding of the greater whole and the clinical skills required for society's preventive and curative healthcare demands.[1,4] It proposed dissolving the interdisciplinary barriers, and adopting a progressive approach with reinforcement.[5] Ronald Harden's Integration Ladder[6] describes a continuum of integration, where each of the 11 rungs of the ladder signifies more deeply interwoven concepts and their applications.[1,6] The first four steps of the ladder[6] emphasize discrete discipline-based teaching. Particularly so in the first step "isolation," where fragmented teaching and assessment of one subject ignores the other subjects in the curriculum, with subject mastery being the main objective. Similarly, the second step, "awareness," also nurtures subject-based teaching and assessment. However, some documentation is established to create awareness of what is taught by instructors of other subjects, avoiding repetition. In step three, "harmonization," consultation and connection among instructors of different subjects creates linkages among the concepts taught with different subject perspectives. This step indicates an active integration through formal curriculum meetings, taking aboard all who contribute to deciding course details, so that they can play a collective role in the achievement of programme outcomes. Step four, "nesting," indicates subject-based teaching. It, however, implies infusion of the content and generic skills from different subjects drawn-in to enrich teaching of a specific subject, helping achieve wider curriculum aims. The remaining six steps elaborate on the ways to ensure a deeper integration among disciplines. For instance, "temporal coordination," step five, involves appropriate timetabling and scheduling of the similar and related topics of different subjects to be taught in the same day or week. Step six, "sharing," suggests a joint effort by subject specialists while planning and implementing a course—hence a shared teaching session covers the overlapping topics of two subjects. Step seven, "correlation," advocates a democratic framework where the subject-based teaching is supplemented by integrated sessions, consolidating the conceptual linkages. Step eight, "complementary programme," further deepens the integration by introducing a theme or topic. Different subjects contribute accordingly in teaching related areas of the theme. In step nine, a "multi-disciplinary" strategy involves student learning through themes, tasks, and patient problems involving knowledge of different subjects. This approach requires contribution from multiple basic and applied medical science disciplines. In step ten, an "inter-disciplinary" framework requires drawing the content from different subjects into a single new course that is even more theme-based, without discrimination of individual subjects. The eleventh step, "trans-disciplinary" approach, demands eradication of boundaries that identify different subjects. It involves students' learning through their own real-world experiences in the field of medicine.[6]

A study in the Netherlands reported a positive effect of a vertically integrated undergraduate medical curriculum on a smooth transition to a residency program.[7] Another study on graduates of six medical schools in the Netherlands reported a multifaceted positive role of vertical integration in the facilitation of smooth transition to post-graduation.[8] A qualitative approach by some authors has formulated four theoretical constructs for a framework for analysing curricular integration.[9] Contextual issues and medical educators' perspectives on integration formed the basis of these different approaches to curricular integration.

Henceforth, diverse strategies have been employed regionally[5,10,11] and globally[1,3,12,13] to seek curriculum integration. Nevertheless, there is a gap in assessing the role of medical instructors in facilitating students' development of meaningful linkages for content and concepts taught under different disciplines (see example in the above paragraph). There is a need to focus on the importance of the role played by basic science teachers in implementing the required change in literature.[14] An effective role of medical instructors needs to be informed by continued observation, investigation, and evaluation of the existing teaching, learning and assessment activities in medical institutes.

The purpose of this study was to devise a tool based on Ronald Harden's Integration Ladder[6] that could help score the medical instructors' practices for curriculum integration, mapped as integration scores. We explored the overall existing level of integration in teaching-learning

and assessment activities at two private sector medical institutes in Karachi. Furthermore, this study highlighted the contextual elements as perceived by medical instructors that can be worked on to implement integration with its maximum benefits in improving the quality of medical education.

The two institutes examined in this study, Ziauddin Medical College and Liaquat College of Medicine and Dentistry, run a five-year undergraduate medical programme. Both institutes follow an organ system-based, integrated modular curriculum (with a spiral approach at Liaquat College of Medicine and Dentistry), adopting Problem-Based Learning (PBL) as the main instructional strategy in the initial two and a half years. Hospital-based experience is offered in the latter two and a half years. Assessment is through multiple choice questions/extended matching questions-based written exam, Objective Structured Practical Examination with scenario-based viva in the initial three pre-clinical years, with Objective Structured Clinical Examination and viva in the last two clinical years.

Methods

Methods and materials

We conducted this multi-centred analytic cross-sectional study at two Karachi-based medical institutes from September to November 2020. Using convenience sampling, the potential study participants were all basic-sciences and clinical instructors of any age, gender or academic rank, currently involved in undergraduate teaching at Ziauddin Medical College and Ziauddin Hospital, Ziauddin University, 135±05, and Liaquat College of Medicine and Dentistry and Darul Sehat Hospital, 75±05, (total 210±10).

We obtained ethical approvals from both institutes' review boards/committees (reference: 2290620NBEDU and DSH/IRB/2020/0016), and the participants' signed written informed consents for both pilot and the main study. Participation in the study was on participants' free will and completely voluntary.

The pilot study was conducted on five participants (basic and clinical science instructors) randomly selected from both institutes. For the main study, 107/200 participants completed the questionnaire (response rate=53.5%). The tool used was a self-designed validated questionnaire that included a structured section for self-reported demographic details, 11 close-ended questions based on Harden's integration ladder,[6] and six open-ended questions.

The outcome measures we explored were the current level of integration in two medical institutes, the role of medical instructors in meaningful integration in these two institutes (reflected as medical instructors' integration scores), and the contextual elements hampering true integration.

Questionnaire development and validation

A literature review and discussions with medical instructors at Ziauddin Medical College and Ziauddin Hospital, Ziauddin University and Liaquat College of Medicine and Dentistry and Darul Sehat Hospital preceded the questionnaire development, with particular emphasis on the phrasing of questions in the light of Harden's integration ladder.[6] Medical instructors from both institutes and external experts examined multiple initial drafts of the questionnaire to reach a consensus on content and face validity. For the pilot study, we used the questionnaire for which the experts expressed their agreement on its content and phrasing. Pilot study reflected the acceptability and feasibility of the main study. The participants' views supported the content and face validity of the tool and understandability of the questions (pilot questionnaire Cronbach's alpha was 0.8). After minor changes, we used a final version of the questionnaire for the main study. The time required for responses was approximately 15-25 minutes. Cronbach's alpha for the main study questionnaire was 0.732. The Principal Component Analysis for the main study questionnaire showed: KMO = 0.733, Bartlett's test $p < 0.001$ and correlation coefficient value among questions up to 0.5. We extracted a three-component model (each with Eigen value > 1), with cumulative variance explained = 57.1% and all questions tightly loading (0.5-0.9) to their respective components.

Integration ladder questionnaire details

This tool has 11 close-ended and six open-ended questions. Sequentially, each close-ended question addresses the 11 steps of integration as indicated by Harden's integration ladder[6]. We arranged these mark-response type 11 questions on a 5-point Likert scale, resulting in a "total integration score" of 55. The options (never, rarely, sometimes, mostly, always) are scored as 1-5, respectively, except the first two questions that are reverse scored. A participant's response to close-ended questions generates their "integration score," which is calculated by adding the scores per response to one of the five options. This score

reflects each participant's practice for facilitation of meaningful integration of different concepts in students' minds. We reported the mean of all participants' integration scores as "mean integration score," mirroring the average level of curricular integration against the total score of 55. To infer the current level of curricular integration at an institute (indicating where it lies on Harden's integration ladder[6]), we calculated the percentage of responses to each option for all 11 close-ended questions. The six open-ended questions probed the participants' perspectives on current integration strategies and how to improve them.

Results and analysis

We used SPSS version 21 to analyze data from 107/200 completed questionnaires (response rate approximately 53.5%). With 67/107 (62.6 %) females, the male-to-female ratio was 1:1.68. The median age (in years), for 102/107 (95.33%) participants who reported their age, was 37 (15). The median teaching experience (in years), for 96/107 (89.72%) participants who reported their teaching experience, was 6(5). Basic health sciences instructors were 76/107 (69.7%), and 31/107 (30.3%) were clinicians.

We have reported the response details for 11 close-ended questions in Table 1 (Response details for 11 close-ended questions). For a total integration score of 55 on 11 close-ended questions, the mean integration score was high (37.4±6.7), indicating a reasonably integrated curriculum and depicting instructors' potential to adopt advanced steps of integration. Still, boundaries existed between discrete disciplines. We analyzed the responses to six open-ended questions to generate common themes of participants' perspectives, summarized in the Box 1.

To help students create linkages among concepts taught, study participants moved through the continuum of the integration ladder. The most prevalent response was "mostly" (the fourth option on the 5-point Likert scale). However, the respondents picked this option least for questions on isolation, awareness, interdisciplinary and transdisciplinary integration. Temporal co-ordination was the integration level reported to be practiced "always" or "mostly" by the maximum number of instructors, followed by harmonization and complementary programme. Responses also implied that correlation and multi and interdisciplinary approaches of integration were employed only to some extent to create linkages among the concepts taught.

In contrast, many instructors reported "never" or "rarely" employing isolation**.** "Never" staying on this step was, no doubt, better than "always" clinging to it. For this reason, this question was reverse scored for calculating integration scores. For question two, the most common response was "mostly," followed by "sometimes." This response suggested that teaching-learning activities happened to be subject-based, with some communication among instructors of different disciplines, about what they have taught or will be teaching in a recent session of interaction with students. Since largely sticking to this step of the integration ladder would hamper higher and effective integration of knowledge and clinical practice, this question was also reverse scored for calculating integration scores.

Reporting as "sometimes" practicing harmonization, nesting, and higher steps on the integration ladder means a more meaningful integration than "never" employing these methods. Those marking "sometimes" for transdisciplinary integration reflected a potential for inclination towards adopting this level of integration in future, a healthy sign indeed.

Table 1. Response details for 11 close-ended questions (N= 107)*

Question No. (Integration Level)	Responses *n†* (%)				
	Always	Mostly	Sometimes	Rarely	Never
Q-1 (Isolation)	09(08.4)	17(15.9)	19(17.8)	24(22.4)	38(35.5)
Q-2(Awareness)	07(06.5)	33(30.8)	26(24.3)	21(19.6)	20(18.7)
Q-3 (Harmonization)	38(35.5)	39(36.4)	16(15.0)	11(10.3)	03(02.8)
Q-4 (Nesting)	21(19.6)	37(34.6)	27(25.2)	15(14.0)	07(6.5)
Q-5 (Temporal Co-ordination)	38(35.5)	40(37.4)	17(15.9)	09(8.4)	03(2.8)
Q-6 (Sharing)	14(13.1)	33(30.8)	27(25.2)	19(17.8)	14(13.1)
Q-7 (Correlation)	18(16.8)	27(25.2)	31(29.0)	19(17.8)	12(11.2)
Q-8 (Complementary Programme)	34(31.8)	39(36.4)	23(21.5)	08(07.5)	03(02.8)
Q-9 (Multidisciplinary Approach)	13(12.1)	28(26.2)	37(34.6)	14(13.1)	15(14.0)
Q-10 (Interdisciplinary Approach)	06(05.6)	29(27.1)	38(35.5)	24(22.4)	10(09.3)
Q-11 (Transdisciplinary Approach)	10(09.3)	30(28.0)	33(30.8)	19(17.8)	15(14.0)
**total number of participants*					
†number of responses					

Qualitative analysis and common themes

We coded the responses to six open-ended questions and individually analyzed them to emerge at main themes. We then compared and matched these themes (from authors) and reached an agreement on common themes. We summarized the main contextual issues and their solutions in Box 1.

- Dearth in collaboration among basic-sciences and clinical instructors.
- Faculty resistance to change (time and effort intensive).
- Active participation of senior basic-science instructors required.
- Clinicians need to be involved even in initial undergraduate years.
- Higher representation of junior faculty in curriculum meetings might help move up the integration ladder.
- Incentives and rewards for medical instructors could bring-in their higher quality effort.
- Dire need of professionalism and empathy for students.
- Lack of respectful behaviour of students towards teachers.
- Deeper incorporation of student's feedback required.
- Higher community exposure required for medical practice in diverse social contexts.
- More patient exposure and simulations might help true integration.
- Integration of assessment required to ensure development of linkages among concepts taught.

Box 1. Contextual issues and their solutions, as identified by study participants

Discussion

Based on Ronald Harden's integration ladder,[6] we devised a tool to gauge medical instructors' methods directed towards curricular integration. We explored the current level of curricular integration in two private sector medical institutes.

Results indicated that teaching-learning practices fluctuated up and down the ladder, not being consistent at any level of integration. This inconsistency could be because instructors practiced different levels of integration at various times in a course and throughout the programme, as per students' need and their own integration skills. Though instructors primarily practiced temporal co-ordination, their general teaching practices moved a few steps higher or lower on the integration ladder.

The discrete steps of the integration ladder[6] indicate eleven different approaches to integrate medical science concepts. Each step represents a different degree of subject-based or integrated teaching, overlapping somewhat. The study participants' responses also indicated that each step was taken as a distinct entity and not a point on a continuum. Hence, while responding as "always" to questions addressing harmonization and temporal coordination, the participants also responded as "mostly" employing the steps three to six (harmonization, nesting, temporal coordination, and sharing) and the step eight (complementary programme) while teaching medical undergraduates. This means that in addition to harmonization and temporal coordination as their most frequent way of integration, they also appreciated the importance of nesting and sharing and practiced all these four methods to effectively integrate their teaching.

Undergraduate medical curricula can be more effective at helping students learn the basic sciences if each advancing phase involves repeatedly going back to those basic science concepts.[1] This reinforcement helps students retain the information for longer periods of time. Integrated assessment plays an even more vital role. A loosely fitting set of teaching and assessment strategies, with the latter lacking application testing and, instead, promoting rote memorization, can sabotage good teaching.[4] Assessment items need to be prepared with the same inter and multidisciplinary collaboration as used in integrated teaching. Proponents have further endorsed the importance of multimodal evaluation of integration.[13] Pakistan-based studies indicate meaningful reforms[5,10,11,15,16] with attempts at formulating an integrated assessment guide.[11,17] In one of the institutes included in this study, scenario-based oral assessment (viva) was introduced as an innovative integrated assessment approach[17] where patient scenarios were presented to first, second, and third year students and five-to-seven minutes were provided to understand and think about that patient problem. This was followed by an oral question and answer session based on the basic knowledge and problem-solving skills required for pathophysiologic mechanisms underlying that particular problem. This inclusion was an addition to the multimodal assessment at the institute. The students were required to apply their integrated basic science knowledge in answering the viva questions. To evaluate this mode of assessment, the students, examiners, and neutral observers provided feedback after the administration of viva. They mostly rated it to be useful in the integration of knowledge and in reflecting deeper linkages between the content taught, despite being resource intensive. Muzaffarabad-based authors have shared a guide to evaluate an integrated curriculum, using students' perception surveys, interviews, focus group interviews, and assessment results (94.6% result for 1st-year and 92.5% for 2nd-year professional examinations).[11] Authors have also reported a substantial

reduction in student attrition rate, from 35% to 1.4 %. Peshawar-based authors expressed the need to understand integration methodologies for its implementation by proposing a curriculum model with reverse integration.[18]

Despite all kinds of efforts to revitalize a curriculum, the role of medical instructors cannot be overlooked. It is essential to assess how this role is played.

Conclusion

The undergraduate medical curricula of the two institutes studied generally exhibited integration at step five, **Temporal Coordination**, with fluctuations at step three, **Harmonization,** through to step eight, **Complementary Programme,** of the Harden's integration ladder.[6] This result indicated meaningful attempts through timetabling and close sequencing of similar topics of different subjects, along with consultation among instructors through formal meetings. Thematic elements are introduced through a PBL strategy, where all relevant disciplines contribute.

Participants' perspectives highlighted the gaps in curriculum integration at these two institutes, particularly so for integrated assessment, community exposure, higher representation of junior faculty in curriculum meetings and involvement of senior basic sciences and clinical faculty members in student-instructor interaction.

Study strengths and implications

The new tool introduced in this study can be used for large-scale studies on the role of instructors in facilitating the development of conceptual linkages in medical students' minds, and ways to overcome barriers against meaningful integration. Taking a multi-centered, and mixed method design, this study worked as an opportunity for respondents to share their valuable practices and insights that, otherwise hidden from the larger community of practice, might lead to true integration. There is the possibility of generalizing the findings nationally and globally, comparing integration practices and bringing new insights. Issues and solutions highlighted by participants might help prepare the future medical-science-workforce for effective, community-based healthcare delivery in diverse psycho-socio-economic contexts, consistent with principles of equity and altruism.

Study limitations

Convenience sampling and the low response rate under-reflected the practices and views of the target audience and might have rendered the results less generalizable. Self-reported information on instructional practices might have added bias. A cross-sectional design could not establish a causal relationship among study variables. Students' perspectives would have added meaning. Further tool validation is needed to support wider application.

Recommendations

Large-scale, robust integration evaluations are required, reflecting currently employed integration, in the contexts of the undergraduate medical curricula. Such evaluations might include concrete evidence on instructor-learner interaction. Further studies are required to explore the impact of integrated medical curricula.

Previous presentations: This study has been presented by Dr. Naila Baig, the corresponding author, as an Oral Presentation in the International Conference on Medical Education-2021 (ICME-2021 Virtual Conference), on April 04, 2021, held in Indonesia.
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