Review Article

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Integrated Teaching in Forensic Medicine and Toxicology: How to Integrate Interdisciplinary Approach in MBBS Curriculum

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Abstract

Forensic Medicine & Toxicology in MBBS curriculum tends to produce a physician who will be well informed and alerts about his/her medico-legal responsibilities and is capable of being discharging medico-legal duties in medical practice. Integrated teaching and learning aims to provide better deliverables, better understanding and more student engagement. In undergraduate medical education in Bangladesh, the term 'integrated teaching' has become familiar among medical teachers and students just over a decade; however, not all medical colleges have resources, expertise and practice of integrated teaching in their instructions. Transformation towards integrated teaching involving teachers of different disciplines to teach common topics in Forensic Medicine & Toxicology aims to develop creativity, critical and logical thinking, practical learning, extended retention of knowledge and research aptitude as well as ethics and professionalism among the students. Through student-centric pedagogy, our integrated teaching approach is expected to be more helpful in reducing the theoretical and practical gap in Forensic Medicine & Toxicology education under MBBS curriculum. Besides, such teaching approach will open new avenues of research in medical education including further curriculum designing and revisiting assessment procedures, which will result in a paradigm shift. In this review paper, we will discuss regarding integrated teaching in Forensic Medicine & Toxicology curriculum in undergraduate medical education focusing on how to integrate interdisciplinary approach, 'SPICES' teaching model and benefits as well as challenges encountered during its implementation.

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Introduction

In the latest MBBS Curriculum (published in 2021), Bangladesh Medical & Dental Council (BM&DC) stated that the goal of teaching Forensic Medicine in the undergraduate medical course is to produce a physician who will be well informed and alerts about his/her medico-legal responsibilities and is capable of being discharging medico-legal duties in medical practice.[1] In undergraduate medical education in Bangladesh, the term 'integrated teaching and learning' is familiar among medical teachers and students just over a decade; however, not all medical colleges have resources, expertise and practice of integrated teaching in their instructions to date.[2-5] In simple words, integration is the arrangement of

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teaching content in a manner that brings together concepts that are typically taught in different academic departments or courses. The terms 'interdisciplinary teaching' or 'thematic teaching' are synonymously used to describe an integrated curriculum. An integrated medical curriculum enables students to put the information they have learned together to comprehend the big picture and treat patients or develop healthcare plans holistically in their future practice.[2,3] In many of the developing countries in the Southeast Asia region, e.g., India, Pakistan, Nepal, Sri Lanka, Thailand, Indonesia, Malaysia, integrated, student-centered, competency-based curricula have already been established, emphasizing new modules in different departments.[3] Forensic Medicine & Toxicology is not also an exception to this phenomenon. Most of the medical colleges in Bangladesh have started using integrated teaching so that related subjects within the disciplines are covered at the same time. For instance, similar topics, such as the structure of the kidney in anatomy and its functions in physiology, are covered on the same day or during the same week, which has been taught in Phase-I of MBBS programme through integrated teaching.

However, those topics were taught according to a subject-based approach, leaving it up to the students to figure out the connections,[4,5] as we usually did in our traditional approach of teaching previously. In this review paper, we will discuss regarding integrated teaching in Forensic Medicine & Toxicology curriculum in undergraduate medical education focusing on how to integrate interdisciplinary approach, 'SPICES' teaching model and benefits as well as challenges encountered during its implementation.

Integrated Teaching in Undergraduate Medical Education

The term 'integrated curriculum' appeared first in medical education in 1984, as Harden et al. defined integration as "the organization of teaching matter to interrelate or unify subjects frequently taught in separate academic courses or departments."[6] McMaster University in Canada was among the pioneers in implementing a trans-disciplinary curricular structure across all years of Medicine; that has been adopted, revised, and copied over the past several decades across the globe.[7] Since then 'integrated curriculum' has rapidly gained tremendous popularity with the perception that Medicine is an integrative discipline and breaking down the barrier between the basic and clinical sciences improves connections between those sub-disciplines and enhances students' knowledge and skills.[8]

Every new pedagogical approach to teaching and learning should aim to provide better deliverables, better understanding and more student engagement.[9,10] However, in the context of undergraduate medical curriculum in Bangladesh, Forensic Medicine & Toxicology is a core subject (taught in the Phase-II of MBBS Programme) that has been designed in a way where teacher/instructors are hardly able to introduce new teaching and learning pedagogies because of the vast amount of course content and limited time of deliverables.[11] Forensic Medicine is a truly amalgamation of different disciplines like science, arts, and laws. As a specialty subject, Forensic Medicine & Toxicology evolved to investigate the death and dying, human behaviour, crime scene, detect and examine victims' bodies and the clues, and help law-enforcement agencies identify the perpetrator using various scientific methods and cooperate court of justice procedures. That is why it is

one of the most captivating subjects that can very easily entice students. However, teaching this subject is not an easy task.[12] In this digital era, students are influenced by various movies, TV shows and podcasts based on crime and forensic investigations. Therefore, it has become a bit difficult for a teachers to attain the highest of students' satisfaction through our traditional pedagogies like didactic lectures in the classroom and case based demonstration in forensic laboratory or mortuary. Therefore, to transform our traditional approach to an innovative curriculum integration, adoption of the 'SPICES' model could be an effective option (Table-I).

Table-I: Difference between innovative (SPICE model) and traditional curriculum[6,13,14]

Innovative Curriculum	Traditional Curriculum
Student-centred learning	Teacher-centred approach
Problem-based learning	Information gathering
Integrated teaching	Discipline-based teaching
Community-based education	Hospital-based education
Elective-oriented programme	Standard programme
Systematic approach	Apprenticeship-based or opportunistic

For curriculum integration to be in line with our current curricular transformation to innovative curriculum perspective, such moving on from the traditional learning perspective toward the 'SPICES' learning model is essential.[6,8,13,14] Adopted pedagogy described as 'integrated teaching' is expected to be well-coordinated among departments involved and such 'parallel' or 'concurrent' teaching procedures, the class timetable is adjusted so that the related topics within the disciplines are scheduled at the same time.[8,9]

How to Integrate Interdisciplinary Approach in MBBS Curriculum

Integrated teaching is "the organization of teaching matter to interrelate or unify subjects frequently taught in separate academic courses or departments. Integrated teaching aims to provide knowledge to the students in a complete organized and wholesome manner."[13] This enables them to correlate knowledge gathered from teachers from different subjects which will be helpful in patient management in hospital and individual practice in near future.[8,13,14] Closely related topics among preclinical, paraclinical and clinical disciplines can be taught through integrated teaching. The most common types of integrated teaching in the context of medical education are: i) horizontal Integration, ii) vertical integration, and iii) spiral integration.[9,12,15]

i) *Horizontal integration:* It is organization of subject matter across disciplines over a finite period of time. It is integrating two or more disciplines taught during same phase of the curriculum. In other words, horizontal integration means that two or more departments teaching concurrently merge their educational identities, where individual department contributes to the development and delivery of learning in a meaningful, holistic manner.[9,12,15,16]

ii) Vertical integration: Organization of subject matter across disciplines over an indefinite period of time. Integrating two or more disciplines taught during different phases of the curriculum. In other words, vertical integration is an integration between disciplines traditionally taught in the different phases of curriculum; therefore, it breaks the traditional division among pre-clinical, para-clinical and clinical subjects.[9,12,15.16]

iii) Spiral integration: Assimilation of horizontal and vertical integration in spiral form depicts integration of

basic/foundational sciences and clinical/applied sciences perfectly, in which key concepts are presented throughout the curriculum, but with deepening layers complexity.[9,12,15,17,18]

Bangladesh Medical & Dental Council (BM&DC) has given an outline on how to adopt integrated teaching and learning in MBBS programme.[1] Some of the examples of integration in teaching and learning in important topics of Forensic Medicine & Toxicology are shown in Table-II. In the Western countries, Forensic and Legal Medicine courses are taken commonly as an integration into clinical courses.[20] Such redesigned pedagogical model in Forensic Medicine brings about meaningful achievements among students in various theoretical practice as well as practical tasks, e.g., treating a case of opioid poisoning.[19] Unlike the traditional didactic teaching method focusing on conveying theories, here students are provided more opportunities with experience of real cases and promoted capabilities of analyzing and decision making.[8,11,19-21]

Table-II: Outline of integrated teaching in Forensic Medicine & Toxicology under MBBS curriculum[1,19]

Teacher of Anaesthesiology: Hazards of anaesthesia and causes of death, injury and disability	***Teacher of Pharmacology:*** Pharmacological aspects of opium and opioids	***Teacher of Medicine:*** Clinical aspects of acute opium and opioids poisoning	***Teacher of Forensic Medicine:*** When and how far anaesthetisiologists are responsible for such death? Legal responsibilities of an anaesthetist. Forensic aspects of acute opium and opioid poisoning Determination of causes of death due to above poison Methods for determination and confirmation of the poison
Teacher of Community Medicine: Epidemiology and public health importance of HIV/AIDS, prevention and control programme	***Teacher of Microbiology:*** Aetiology, pathogenesis, diagnosis of HIV/AIDS	***Teacher of Medicine:*** Clinical features, opportunistic infections, and treatment options in HIV	***Teacher of Forensic Medicine:*** Medico-legal aspects in HIV/AIDS infection, professionalism, privacy and confidentiality of patient data, public health ethics
Teacher of Community Medicine: Mental health and well being, public health importance of community mental health, socio-demographic factors	***Teacher of Pharmacology:*** Opioid drugs, sedatives and tranquilizers, drug dependence, safe drugs, side-effects	***Teacher of Psychiatry:*** Common mental health problems in youths, addiction, violence, sexual disorder	***Teacher of Forensic Medicine:*** Medico-legal aspects of addiction, self-harm, suicide and violence, sex crime, forensic psychiatry
Teacher of Community Medicine: Socio-demographic factors of child marriage, family planning, domestic violence, reproductive health rights	***Teacher of Microbiology:*** Aetiology, pathogenesis, diagnosis of STDs	***Teacher of Obstetrics and Gynaecology:*** STDs and its consequences, unplanned pregnancies, fertility issues, women's health	***Teacher of Forensic Medicine:*** Medico-legal aspects of marriage, age of consent, rape, sex trafficking, unnatural sex, grounds of divorce

Advantages

Students who study medicine initially expects that they will learn the basic sciences before moving on to the clinical sciences.[3] Amalgamation of basic science with clinically relevant information is getting popular now.[4,5,21,22] Therefore, integrated teaching in forensic medicine & toxicology is of key importance for undergraduate medical education in our country because here basic science is placed in the context of clinical and professional practice and is considered by students to be more meaningful and relevant, as it teaches learners how to use the classroom acquired knowledge in a real-world situation.[11,12,19,20,23] Hence, integration is crucial for medical education, both horizontal and vertical integration, as methods of curriculum reform; in forensic medicine and toxicology, we tried to mix early clinical experience with pre- and para-clinical sciences. This has unquestionably brought benefits in medical education. It enables learners to comprehend the course material more thoroughly. Involving teachers and using examples and case studies from multiple disciplines helped us illustrate key concepts, encourage students to apply knowledge from other subjects to their work, and provide opportunities for students to engage in collaborative projects that require them to integrate different areas of knowledge.[11,12,21-32] Encouraging students to synthesize knowledge from multiple disciplinary lenses influences how problems can be understood, and provides opportunities for innovative solutions to be considered in those situation as well.[11,12,21-32] Through a spral integration, three domains of learning, e.g., cognition (knowledge), skills, and attitudes were always in focus of all levels of the integrated teaching. Meanwhile, we looked at whether other essential themes persist throughout all years, e.g., clinical methods, ethics, and prevention and promotion of health.[9,10,18,32] Particular attention was given towards medico-legal issues, ethics and professionalism and patient safety, while implementing integrated teaching (through horizontal and vertical integration) in forensic medicine & toxicology, further emphasizing an evolution and subsequent broadening of medical education for our future physicians of the country.[9,10,23] Moreover, we could relate a shift toward a lower hierarchy in the classroom and the collaboration-oriented learning strategies, which may make our students experience less stressful than that of traditional model.[15,21,26,31,32] Last but not the least, integrated curriculum offers enjoyable learning experiences leading to students' satisfaction with the educational environment.[9,11,12,15,21-32] Overall, integrative teaching is designed to help students develop a more comprehensive, interconnected understanding of a subject, which ultimately enhance their critical thinking skills, creativity, and ability to solve complex problems in practice of medicine.[11,12,15,21-31] We, therefore, argue that an integrated and balanced curriculum encourages and facilitates critical thinking, which is an extremely crucial ability for our future physicians.

Challenges

The first challenge observed is the resistance to change, which is true for each domain – curricular reform, teaching and learning strategies and assessment procedures.[2,9,15,21,27,28,30-34] Most of the medical teachers in the country still follow traditional approach where medical courses typically present isolated knowledge, leading students to understand parts but not the whole. Moreover, lack of resources, training and expertise emphasizes further faculty development in medical colleges.[21,24,28,30-32] Although integrated teaching and learning is innovative and

work well into forensic medicine & toxicology course, it is hard to decide how much prior knowledge would be required for our students before using such pedagogy in the classroom. As being 'hosted by several departments', the sequential arrangements of the topics and teachers from various disciplines are critical as we have tightly scheduled time-frame and resource constraint. Sometimes students face difficulties while trying to assimilate all information given by different teachers. Moreover, it seems difficult to know how many students understood the topic and how many developed the skill related to it.[21,24,28,30-32] That also relates that despite the delivery of knowledge in an integrated teaching session, none of the summative assessments are being conducted in an integrated fashion.[21,26,32,34] Therefore, we still struggle adjusting the course content and deliverables as well as doing proper assessment/evaluation, and achieving the maximum without compromising students' understanding of the topic and skill development. While being in such transition, many of the teachers and students who are more adapted to traditional forms of teaching and learning, face challenges physically and mentally for maintaining a balance between the number of integrated teaching sessions and traditional sessions in a specific subject.[8,21,24,27,28,30-33]

Recommendations

Integrative teaching refers to approaches that emphasise the interconnectedness of different areas of knowledge and seek to promote a deeper, more comprehensive understanding of a problem by integrating different perspectives and disciplinary approaches, which is also suitable for lessons in Forensic Medicine & Toxiocology under MBBS curriculum. Based on our literature review and personal experience, we would like to recommend some critical points: i) revision of aims and objectives for competencies in forensic medicine & toxicology, ii) faculty development to enhance teaching skills to design and adopt integrated teaching, iii) experimenting with case-based approach or problem-based learning to make it more student-centric, iv) competency-based assessment measures based on learning objectives, v) uphold students' enthusiasm and motivation better implementation implementation of integrated teaching method and vi) allowing feedback from the students periodically.[8,9,11,12,15,21-32]

Conclusion

Bangladesh Medical & Dental Council (BM&DC), medical colleges and faculty members often face the need to develop and implement innovative curricula rapidly as reflected in recent changes in integrated teaching methods in MBBS curriculum in Bangladesh. However, periodic assessments by oversight group of educators, e.g., curriculum committee, need to identify where additional modifications are required to allow better teaching and learning and assess the performances of teachers and students in rapidly changing global contexts. Moreover, in regard to integrated curriculum design, we must identify "what integrated curricular elements had not been designed adequately, what could no longer be supported with current resources, and how curricular revisions could be assessed for adequacy".34 Our attempt is to elucidate that it is high time to revamp the integrated teaching and learning procedure and make it more skill and activity-oriented for better achievement.

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