

A Re-design Proposal for the ‘Occupational’ & ‘Environmental’ Medicine syllabus under ‘Community Medicine’ subject of the third-year MBBS curriculum in Bangladesh: Suggesting to apply ‘PBLs’, ‘Blended-learning (or, flipped classroom)’ and ‘Guest-lectures’ for providing students with practically-oriented learning.

Sharafat Malek

Abstract:

The reported illnesses and injuries attributed to environmental and occupational factors is a major health challenge being experienced globally over the years.¹ In current decade, Bangladesh has experienced a number of environmental and occupational health-related hazards that not only have cost huge government involvement, medically and financially but also caused international bodies to intervene into local affairs (see Table 1). These unprecedented events often question how prepared are young Bangladeshi doctors if they are to receive and manage disaster-victims at real time.²

Globally, ‘Occupational and Environmental Medicine (OEM)’ subject is lectured at third-year of the MBBS course during ‘Population Health’ or ‘Community Medicine’ rotation. Efficient, effective and enjoyable learning on OEM-topics can equip future doctors with important basic knowledge and required practical skills that are necessary to manage cases/victims from pandemic, work-hazards or disasters. Students’ positive engagement with OEM may raise their interest with specialist careers in Community Medicine (Com-Med).

Some developed-country studies³⁻⁷ reported that students who went through problem-based-learning (PBL) tutored classes made better academic performance on Preventive Medicine, Public Health and Community Health topics than those who had experienced traditionally lecture-tutored curriculum. An Indian study done by Joseph et al.⁸ documented similar findings. The purpose of this review paper is to appraise current OEM-syllabus under the Com-Med curriculum in Bangladesh and scope, whether the PBLs or case-based-learning (CBLs) model could be appropriate if applied through ‘blended-learning’ or, ‘flipped-classroom (backed by audio-video supports)’ format. This literature-evidenced, student-centred teaching model expectedly would improve students’ practically-oriented learning via their in-class working over real-life cases/problems. Ideally, these cases would be constructed by content-experts and delivered initially by guest-lecturers.

Key Words: Occupational & Environmental Medicine, Community Medicine, Blended-learning

Researcher, Monash University, Australia

Address of correspondence:

Dr Sharafat Malek, Mount Waverley, Melbourne, VIC 3149, Australia
Email: sharafat.malek@gmail.com

Introduction:

Monash University’s MBBS-third-year lectures introduce ‘OEM’ subject by following terms:

“Occupational medicine is where a doctor acts at the interface between a person’s work and his or her health”.

“Environmental medicine demonstrates ways that a medical practitioner may

Bangladesh Journal of Medical Education 2021; 12(1); Malek et al., publisher and licensee Association for Medical Education. This is an Open Access article which permits unrestricted non-commercial use, provided the original work is properly cited.

address health-relevant environmental issues encountered in ordinary practice”. Globally, topics included under the ‘OEM’ units are taught to third-year students during ‘Population Health’ or ‘Community Medicine’ rotation of their MBBS course.⁹ The co-author of this paper has advised [personal communication] that Bangladesh Medical and Dental Council (BMDC) had revised the undergraduate MBBS curriculum at first in 1982, then in 1988, next in 2002 and the fourth (current) one was in 2012.

Hussain et al.¹⁰ undertook a cross-sectional study in 2008 to explore the students’ experiences of the revised 2002 curriculum. Students’ expectations of teaching were reported:

“there should be smaller group sessions; more interactive sessions; more clinical and practical sessions; more problem-oriented sessions”.

A Canadian educator⁷ had suggested that several topics of community medicine under a traditional lecture-based curriculum can be effectively taught using PBL-format that would result in better academic performance of students as well as appreciated reporting of their social and emotional aspects of health care. Hussain et al. recommended in this regard:

“...subject wise review and updating is essential to make the curriculum more need based, user friendly and applicable considering context of Bangladesh”.

Experiencing 2020 global pandemic and other environmental issues (i.e. climate change), internationally the current tertiary

education focus is on OEM curriculum upgrade.¹¹ However, through all possible online searches, no published study was found that specifically reviewed the OEM-topics under Com-Med curriculum in Bangladesh.

A recent multi-centre study performed in Bangladesh revealed that medical students suffer from *stress*.¹² Building piles of stress and tiredness, lack of a good stress alleviating system, and struggling to manage the year-round cognitive load through longstanding rote learning culture were also identified as the most significant problems perceived by the students in Mohsena et al. study¹³ where the authors sadly commented in this relation:

“... senior teachers could guide juniors to make it more student-centered. Medical education is very expensive, and academic failure is wasteful both to society and to the individual.”

Students’ satisfaction on assigned cognitive load is an important determining factor of the effectiveness of a recently completed course. Their overall performance in the exit assessment/s is a reliable indicator to their level of satisfaction over the curriculum they just had experienced. A stepwise, explicitly-directed and easy-to-manage learning load expectedly leads to client-satisfaction on a curriculum, positive attitude towards assessments, confident progress as a scholar and importantly, choosing Public Health or Community Medicine as specialist career in future. Unfortunately, only 36% medical students in Bawa et al.study¹⁴ submitted their future interest to build a specialist career in

community medicine. About half of those respondents (47.9%) in Bawa et al. study opined: “CM [Community Medicine] lack application and needs practical example rather than just being theoretical”. Eva et al. study¹² therefore recommended re-designing of the curriculum according to evidence-based needs and demands of the users. They said:

“The goals of the medical education curriculum are to produce graduates who have adequate knowledge, sufficient problem solving and manipulative skills, and the correct professional attitudes ...

thus need a curriculum that includes more problem-based learning and structured teaching with specific curricular objectives, might improve the learning environment for students”.

The purpose of this paper is to review the OEM-syllabus under Com-Med subject of the Bangladesh MBBS curriculum and scope, whether the ‘problem-based’ or ‘case-based’ learning model could be applied in order to improve students’ practically-oriented learning via in-class working over varieties of scenarios built from the real-life cases or problems.

Year	Hazard/Disaster	Reference
2020	Covid-19 Pandemic affecting Bangladesh.	Shammi M, Bodrud-Doza M, Islam A, Rahman MM. Strategic assessment of COVID-19 pandemic in Bangladesh: comparative lockdown scenario analysis, public perception, and management for sustainability. <i>Environment, development and sustainability</i> , 2020; 7:1-44. https://doi.org/10.1007/s10668-020-00867-y
2020	Health issues, health care utilization and patient’s dissatisfaction to treatment & care in Bangladesh.	Mohiuddin AK. (2020), “An extensive review of patient health-care service satisfaction in Bangladesh”. <i>Adesh Univ J Med Sci Res</i> , Vol 2, Issue 1, pp 5-16.
1971-2020	Natural disasters in Bangladesh. (i.e. Cyclone, flood, draught, hailstorm)	Hossain, A.M. & Miah, G. M. (2011) “Environmental Disasters in History: Bangladesh Perspective”, <i>Int. J. Soc. Dev. Inf. Syst.</i> Vol 2, Issue 1, pp 31-37.
2019	Fire Hazards in Dhaka city (i.e. 2010 Nimtoli electricity-fire accident, 2019 Chawkbazar chemical-fire infarno).	Islam, Z. M. (2018) “Fire Hazards in Dhaka City: An Exploratory Study on Mitigation Measures”. <i>IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)</i> Vol 12, Issue 5, pp 46-56.
2000 - 2016	Mental health illnesses (i.e. Panic attack, PTSD, Anxiety, Depression) in Bangladesh.	Anwar H, Jinnat R, Musammat S R. (2018) “Mental Health Disorders Status in Bangladesh: A Systematic Review”. <i>JOJ Nurse Health Care</i> . Vol 7, Issue 2, pp 1-4: 555708. DOI: 10.19080/JOJNHC.2018.07.555708.
1976-2016	Earthquake incidents in Bangladesh.	Zaman, M. A. & Monira, N. (2017). “A Study of Earthquakes in Bangladesh and the Data Analysis of the Earthquakes that were generated In Bangladesh and Its’ Very Close Regions for the Last Forty Years (1976-2016)”, <i>Journal of Geology & Geophysics</i> , Vol 6, Issue 4. Online. DOI:10.4172/2381-8719.1000300.

Bangladesh Journal of Medical Education 2021; 12(1); Malek et al., publisher and licensee Association for Medical Education. This is an Open Access article which permits unrestricted non-commercial use, provided the original work is properly cited.

Since 2015	'Rohingya' citizens from Myanmar seeking asylum to Bangladesh.	WHO report on 'Rohingya refugee crisis' is available online at (accessed on 29.10.20): https://www.who.int/bangladesh/emergencies/Rohingyacrisis
2013	'Rana Plaza' garments factory building collapse in 2013 causing instant 400 and final death toll of 1,127 people.	M. Taplin, I. (2014), "Who is to blame? A re-examination of fast fashion after the 2013 factory disaster in Bangladesh", <i>critical perspectives on international business</i> , Vol. 10 No. 1/2, pp. 72-83. https://doi.org/10.1108/cpoib-09-2013-0035
Last 50 years	Other major environmental health issues in Bangladesh.	Hasnat GNT, Kabir MA, Hossain MA. Major Environmental Issues and Problems of South Asia, Particularly Bangladesh. In: Hussain C. (eds). Handbook of Environmental Materials Management. Springer, Cham. 2018. https://doi.org/10.1007/978-3-319-58538-3_7-1
Last 50 years	Other major occupational health and safety issues in Bangladesh.	Tasnim et al. "A Review on Occupational Health Safety in Bangladesh with Respect to Asian Continent", <i>Int J Pub health safe</i> , 2016;1(1):1-9. http://dx.doi.org/10.4172/ijphs.1000102

OEM-teaching in the Australian medical universities:

The major OEM-topics that are typically taught under 'Population health' block of the third-year undergraduate medicine course have been listed below (Based on my recent three years of OEM-teaching experiences at one of the 'Go8' Australian Universities¹⁵):

2. Diseases from water and food pollution.
3. Diseases from climate change and natural disasters.
4. Health of the vulnerable groups & ensuring cultural safety: children, seniors & indigenous people.
5. UV radiation, EM radiation and Noise safety.

Occupational Medicine:

1. Hazard, Risk and Exposure. Use of 'Material Safety Data Sheet' in the factories.
2. Work-related injuries, diseases and mental illnesses.
3. Workplace safety procedure, Ergonomics and communicating skills with third party/s following an incident (Work cover/Compensation claims).
4. Fitness certificate (physical & mental assessment) for returning to work.
5. Fitness check for permission to drive vehicles on-road (following major diseases or conditions).

Under the formal major topics, a number of relevant sub-topics (problems/diseases) are covered. There are no formal lectures. The '**Blended Learning**' format is used through **Seminar-style** teaching (combined lecture-tutorial and mixed-mode-teaching using physical interactions and online materials simultaneously).¹⁶ All topics are constructed under CBL format and are taught applying varieties of in-class group-activities led by an expert facilitator. There are 12 seminars taken on mixed OEM-topics each consists of two-hour duration. All topics are regularly reviewed and changed according to rules, necessities and students' demands. The class size of each

Environmental Medicine:

1. Diseases from air and soil pollution.

seminar-group consists of around 15 to 25 of the third-year medical students.

Assessment (via internal-staff-communications):

The third-year final exam assesses students' knowledge in the OEM area through:

a) **Written Examinations:**

Formative: Online quiz practices per module year-round.

Summative: A combination of MCQ/SAQ/EMQ questions in the year final written paper-2.

b) **Clinical Examination:** One history-taking role-play station from OEM-topics

out of total ten OSCE (practical part) stations in the year-final exam.

OEM-teaching under Com-Med curriculum (3rd-year) in Bangladesh:

Available detailed information on 3rd-yr medical curriculum (prepared by Mymensingh Medical College) was perused from the BMDC website.¹⁷ (pp 92-3, 98-9, 107) Retrieving relevant information, the tables below are created. The total allocated teaching hours for Community Medicine is shown in Table 2.

Lecture	Tutorial	Practical	Integrated Teaching	Total
110 hrs	160 hours	COME (community based medical education):30 days (10 days day visit + 10 days RFST+ 10 days study tour)	5 hrs	275 hrs + 30 days

The topics covered under 'Environmental Health' and 'Occupational Health' modules are listed in Table-3.

Table-3: Learning topics and Allocated teaching-hours for ‘Environment & Health’ and ‘Occupational Health’ Modules in BD-curriculum.	
Environment & Health	Occupational Health
<ul style="list-style-type: none"> • Environment and its components <li style="text-align: center;"><u>Water</u> • Safe and wholesome water • Sources, uses and requirement of water • Water impurities • Principles and methods of purification of water • Water quality standards for drinking water • Water borne diseases <li style="text-align: center;"><u>Air and ventilation</u> • Composition of air • Air pollutants and their sources • Indicators of air pollution • Effects of air pollution on health • Methods of prevention and control of air pollution • Ventilation • Climate change and green house effect <li style="text-align: center;"><u>Light</u> • Criteria of good lighting • Measurements of light • Effect of improper lighting on health <li style="text-align: center;"><u>Noise</u> • Sources and properties of noise • Acceptable noise levels • Effects of noise exposure • Control measures of noise <li style="text-align: center;"><u>Radiation</u> • Sources and types of radiation • Effects of radiation on health • Measures of radiation protection 	<ul style="list-style-type: none"> • Occupational health and its objectives • Occupational environment • Occupational health hazards • Principles of prevention of occupational diseases • Employees’ benefits
Teaching hours	Teaching hours
Lec = 10hrs, Tute = 12hrs	Lec = 4, Tute = 6

In BD-curriculum, assessment on OEM-learning is formally exercised through (see Table-4):

Table-4: Marks distribution and Assessment methods in Community Medicine (BD-curriculum).
2 nd Professional Examination:
Total marks – 300 <ul style="list-style-type: none"> • Written =100 (MCQ-20, SAQ-70+ formative assessment marks 10) • Structured oral examination= 100 • Practical (Conventional Practical / OSPE, RFST including Survey Report, Study Tour Report and Report on Day Visit) = 100

From Table 3, we see that a generous number of teaching hours are invested on OEM areas. We are unsure though whether the OEM tutorials offer real-world training that could enable new graduates to treat OEM-relevant cases both in hospital and primary care (GP) settings.

Absence of this specific patient-management skill often results into patient's dissatisfaction to treatment & care in Bangladesh.¹⁸ If to ensure quality of this practical training, mode of instructions and contents of the tutorials should be also published following completion of a curriculum review.

When we compare developed country's OEM-curriculum with BMDC's one (Table-3), it is visible that proportionately less-contents and teaching-hours are allocated for students' 'Occupational Health' learning. Taking lessons from recent 'Rana Plaza' incident and repeated 'Fire disasters' in Dhaka, this deprived teaching area perhaps deserves priority budget allocation from the policy-makers for Com-Med curriculum.

Assessment criteria for OEM that would contribute to the final summative assessment (2nd professional examination) in Com-Med were found unavailable through online-searches.

The Unit-guide or Course-syllabus¹⁹ which is published to students at start of the course should clearly specify how their knowledge in OEM areas will be assessed in all formative and summative exams. Educational literature advises that learners' expectation of an ideal curriculum is to get explicit and clear information on: 1. the

contents to be tested on and 2. the ways and criteria that are set for assessments.^{16, 20} Specific information surrounding assessments (MCQ/OSCE- type, quantity of questions/stations) would encourage students' deep learning on OEM-topics and initiate their pro-active preparation towards year-final assessment/s. Failure to confirm this often invites negative perceptions to teaching, dissatisfaction with curriculum (i.e. Hidden curriculum²¹) and development of resistance towards completing a medical career.²² There is an old proverb: "*For every completion, there was always a start and there's nothing called delayed, always it can be started*". So, once this specific disclosure practice regarding assessment instructions will start with Com-Med and receive appreciation from the students, other subjects expectedly would follow the same.

Mosaddek et al. study²³ conducted with medical teachers in six private medical colleges in Bangladesh reported that 68% participants were dissatisfied with the present implementation of the undergraduate curriculum, and they recommended a review of the curriculum to include more community-oriented and competency-based elements to produce better doctors for the community. Ahmed et al.²⁴ recommended that selection of study-tour sites should be regularly reviewed for the curriculum and the knowledge gained from those tours should be formally assessed in the course-exit exams. The authors commented:

"A comprehensive and integrated curriculum needs to be developed and

health-related sites identified for CBT programs such as study tours, RFST, rural placement and urban demonstration areas. Summative examination, both written and oral, could include questions related to study tours, not only on community medicine, but also in other subjects”.

Taking above findings into account, current (2012) curriculum-guideline on practical study excursions (Day visit, Residential Field Site Training-RFST, Study tour)²⁵ (pp 120-22) should include students’ surveying of some mandatory ‘Occupational Health’ sites for example: export-oriented garments, textile mills, prisoner-workers, multi-story building construction, small factories in old Dhaka, automobile mechanical workshops, etc. This arrangement needs to be an ongoing process albeit reviewed regularly.

The current Community Medicine curriculum: ‘optimum’ or ‘overloaded’?

Mosaddek et al.²³ study was not quite positive about the quality of medical curriculum being used in south-east Asia. They commented:

“Most medical schools, especially in South-East Asia, currently are experiencing difficulties in providing the right quality and quantity of educational experiences, as the curricula have failed to respond to the needs of the community and country”.

Now, to explore the users’ experiences on revised 2002 MBBS curriculum, Talukder et al.²⁶ conducted a cross-sectional survey on 257 (the then) intern doctors from different government and non-govt.

medical colleges. All (100%) survey-respondents in this study (Table-1, p 36) opined: “*Course contents of Community Medicine curriculum need to be reduced*”! The literature on educational theories²⁷⁻²⁸ demonstrates that for long time there have been critiques and debates on how much of information should be enough in a curriculum that would enable a student both to understand and learn the contents as well as pass hurdles in the assessment tasks. This debate often invites argument pointing to the investment of time and manpower associated with regular updating of the curriculum by replacing old contents with the recent information. The literatures have encouraged the educators to accept the challenge with undertaking reviews aimed to re-design of the curriculum based on clients’ demands and needs. It was expected that this regular screening would replace the popular practice of continually adding on information in the old syllabus that often ends up receiving labels of ‘Crowded’, ‘Crammed’ and/or ‘Overloaded’. Ramsden¹⁶ (p 161) stressed that due to rapid advancement and wide availability of information technology; curriculum contents need to be updated regularly in order to maintain both high-quality and goal-directed learning as well as meet the growing demands and expectation of current generation of tech-expert students.

The medical science often deals with similar inquiry. The curriculum designers stress on how much of information from the basic science (i.e. light, sound, UV ray, radiation) needs to be incorporated into the curriculum if we are to initiate deep learning approaches of the students on their

Bangladesh Journal of Medical Education 2021; 12(1); Malek et al., publisher and licensee Association for Medical Education. This is an Open Access article which permits unrestricted non-commercial use, provided the original work is properly cited.

prescribed contents. The opinions from the unsatisfied intern doctors²⁶ have elevated a legitimate concern wondering where the cut-off lies that could avoid unnecessary information burden for the students. Interestingly, the opposite demand has been also found available. A very recent literature has argued that current medical science curriculum is over-crowded leaving no space to incorporate more traditional basic science topics for students' active learning in their foundation years.¹⁴ It is unclear though how much of basic science information should be enough that will build sufficient background knowledge to understand OEM lectures. Now, if the fundamental contents (i.e. basic science, elementary data science) require to be curtailed for the curriculum, the system would need to prior confirm all or most of the students possess solid background knowledge to be able to catch up with next step information to be received through syllabus. To bridge the gap, some pre-medical courses are available in developed countries that prepares candidates for easier transition into postgraduate (graduate-entry) medicine courses.²⁹ However, while questioned on its necessity for the Bangladesh medical curriculum, 78.3% teachers and 68.8% intern doctors in Mosaddek et al.²³ (Table 2, p 10) study opined that pre-medical education is not a requirement to handle the current curriculum contents.

While commenting on administering authority for medical curriculum, Mohsena et al.¹³ regretted: *"In Bangladesh, medical colleges cannot implement their own curricula, it is done centrally by the BMDC.*

Bangladesh Journal of Medical Education 2021; 12(1); Malek et al., publisher and licensee Association for Medical Education. This is an Open Access article which permits unrestricted non-commercial use, provided the original work is properly cited.

The opposite picture was observed in a Pakistani (Sultana et al.)³⁰ study where curriculum contents (PBLs) were formulated independently by the assigned faculties of own medical college. Most students in this study expressed that PBLs led to better understanding of the subject and promoted their self learning habit. Sultana et al. claimed:

"Probably this was due to the fact that PBL scenarios in RMC are designed by the trained faculty members of the college who have full command on their respective subjects/topics".

Notably, there exists ongoing controversy between traditional teacher-led-learning (TLL) against modern PBLs in relation to ensuring students' deep learning as well as successful achievement of the course's intended-learning-outcomes (ILOs).^{16, 31-33} On the other hand, plethora of literature have been also quite positive advocating for an experiential-learning-design to teach OEM-contents expecting students would learn best with confidence through the consistent, theory-led, prior knowledge-driven and a practically-oriented curriculum design.^{8, 34-38} Bangladesh hasn't been fully adopted yet¹⁷ the developed world's MBBS curriculum (i.e. Australia) that teaches medical topics principally through a structured 'Problem-based (PBLs)', 'Enquiry-based (EBLs)' or 'Case-based (CBLs)' learning model and where the cases are prepared and/or updated regularly according to concurrent national priorities.³⁹⁻⁴⁰ The lectures and tutorials are still being taken in traditional didactic format (source: personal communication

with a Com-Med teacher in Dhaka on 18.11.20).

While advocating for implementation of PBLs in community medicine curriculum at a similar country like Bangladesh, Joseph et al. study⁸ identified:

“Medical students learning Community Medicine as a subject are expected to be competent in critical thinking and generic skills so as to analyse community health problems better. However, current teaching by didactic lectures fails to develop these essential skills. Problem-based learning (PBL) could be an effective strategy in this respect”.

This PBL-structured learning was well-accepted by the students in Joseph et al. study.⁸ The same success was observed in Habib et al. study⁴¹ done in Pakistan where 79% of the medical students liked PBL sessions as they felt PBL helped them in building up communication skills, interpersonal relationship and problem solving capacity to great extent.

The ‘Experiential learning’ design for OEM-teaching:

Historically, long back the Greek philosopher Aristotle used the term ‘Phronesis (Practical wisdom)’ to demonstrate the need of gaining practical experience during learning. In his view, *“Phronesis requires actors to draw not only from scientific (Episteme) and technical (Techne) knowledge but also from maturity and experience (i.e. Prudence), to determine good and virtuous actions”*³³. Like Aristotle, the importance of ‘Excursion/field-trip’ as an integral part of

the professional education (combination of liberal and vocational education) in the higher education field has been found advised by many other experts coming from the disciplines in health and social science³³ and few other technology-based areas.³⁴⁻³⁷ The authors stressed that students must get learning opportunities through hands-on practicing skills for development of their higher order knowledge and judgement capacity. This would fit them confidently into ‘real world’ and ensure job-security following completion of their studies.

To demonstrate on contents and learning strategies in an ideal student-centred curriculum, Nelson⁴² (pp. 18-20) advised that *“A developmentalist or interactionist perspective fits the experiential approach to curriculum design, while a behaviorist perspective fits the systematic approach to curriculum design”*. He quoted developmentalist-educator John Dewey’s work (‘social Darwinism’ in 1902-1930) which was the first to advice on experiential approach that says older children and college students will learn from their ‘Occupations’ which means they learn hands-on by working as apprentices or interns. He also added interactionist-educator Piaget’s research work that suggests learning isn’t complete without experimenting and interacting with natural environment. Furthermore, he criticized the behaviourist theory identifying it as too skill-oriented and not addressing creativity and thinking skills. Nelson concluded that a thoughtful integration of goal-directed systematic-instruction methods to teach basic contents, with experiential-learning

designed to cover selective other contents, would give educators confidence that students will learn best through a consistent, practically-oriented curriculum design.

Macala⁴³ claimed that the first and final stage in Kolb's⁴⁴ '*Experiential Learning Style Inventory (LSI)*' model works well and perhaps the best environment for mature adults' learning. With same notion, Armstrong and Parsa-Parsi⁴⁵ suggested that Kolb's model can be applied to all levels of medical learners. Knowles³⁸ wrote about '*Adult learning*', advising that "*adults learn best in informal, comfortable, flexible, non-threatening settings*". Connecting this formulae to the '*Facilitated learning*' theory as described by Wells⁴⁶ tells us that rotational placements to clinically learning facilities (i.e. '*Observer*' roles in ED or Outpatient departments) can help Com-Med students to learn consultation and management skills (integrated with theoretical knowledge) of some pre-arranged OEM-cases, under an OEM-expert's supervision (if possible).

Given the current curriculum isn't ready for some time to accommodate OEM-focused site visits, applying blended-learning format could be an alternative by flipping the traditionally didactic tutorials with implementation of interactive '*Role-play*' activities under support of in-class viewing on relevant video-clips (i.e. YouTube).

Another state-of-art model is '*Simulation*' about which Palmer and Snyder⁴⁷ described: "*an interactive technique well-suited to adult learning*". The '*Simulation*' or '*Virtual reality learning*' is rapidly

becoming popular in medical, nursing and health science education.⁴⁸⁻⁴⁹ Combining theoretical knowledge with this modern approach, students gain confidence that they have practiced in the real world provided they have learned earlier in the classroom using '*case study*', '*role-playing*' or other hands-on simulation techniques. Achieving this confidence is very important for a trainee's safe practice in real time.⁵⁰ Wells⁴⁶ presented the '*peer-assisted learning*' theories postulated by Russian social constructivist Vygotsky which claims that in certain social contexts, individuals learn more by interacting with peers than they can achieve by studying alone. Therefore, introduction of regular '*Role-play*' sessions (**PBLs/CBLs**) could be thought for the tutorials. In addition to better knowledge and skills, through interactive and participative learning, the peer student-teachers would achieve motivational and attitudinal gains like improved self-esteem, adequate self-confidence and lowered anxiety. There's a popular phrase from the great philosopher Confucius: "*I hear and I forget. I see and I remember. I do and I understand*".⁵¹ Hence, PBL-supported '*Role-plays*' together with pre-arranged OEM-focused worksite visits could be considered as two essential elements for the future Com-Med curriculum in Bangladesh.

Another modern way of OEM-learning can be browsing and researching topics in OEM-case-studies software (i.e. Prognosis EHR-EMR).⁵² This software benefits students by having practical video-demonstrations on how to deal with OEM-

cases both in general practice and at hospital ED.

Inviting expert ‘Guest Lecturers’ to maximize students’ learning:

In Bangladesh, Com-Med teaching staffs who hold post-graduate qualification/s in ‘Public Health’ with ‘Occupational and Environmental Health’ subject as major/elective⁵³ are the only resource to be regarded as OEM-experts. Apart from Master of Public Health (MPH), to my knowledge there are no separate clinical/para-clinical post-graduate specialties (MD/FCPS) in Bangladesh that can train a physician to qualify as an OEM-specialist.⁵⁴ This is unlike the picture of developed countries like Australia and New Zealand where clinical fellowship training is available in OEM discipline.⁵⁵ This issue with expert workforce lack was identified in Hussain et al. study¹⁰ where the students’ expectation of their teachers was reported as: “...more sessions with senior and experienced teachers; teachers should follow the curriculum properly; and should be well prepared for class”.

There’s a common saying: “Rome was not built in a day”; so we may anticipate that non-MPH-holders in the Com-Med teaching team in Bangladesh will be expert over time through ‘Training’, ‘Learning by teaching’ and ‘Self &/or Peer evaluation of teaching’. Teachers’ clear understanding on the contents and their willingness to facilitate interactive teaching and learning would accelerate students’ positive engagement with PBLs and/or Role-plays during the sessions. However, until this confidence has been achieved amongst teachers - inviting content-expert guest-

lecturers can be a temporary fix. Monash University courses (i.e. MBBS and Bachelor of Health Sciences course) appoint expert guest-lecturers from relevant disciplines to facilitate OEM-teaching over many years (source: my observations as a Monash academic for last eight years). While describing the benefits gained from appointing ‘Guest-lectures’, Shanahan et al.⁵⁶ commented:

“The presence of occupational medicine specialists in medical schools increases the hours devoted to the discipline, expands the range of topics available and gives a greater variety of educational experiences to medical students”.

‘Teaching Evaluation’ as part of curriculum revision and re-design:

For the purpose of evaluating and rewarding teaching, literature in higher education recommends for considering combination of valid methods such as: internal and external peer-review, self-evaluations, research-based approaches and portfolios of evidence; rather than simply relying on students’ ratings on recently completed course. Ramsden¹⁶ (p 225) advised that “Teaching-evaluation should be a continuing process that should take place before, during and after the course”. Sultana et al. study³⁰ reported that their PBL-facilitators underwent through various workshops to polish their skills for PBL sessions. To assess the role of PBL-facilitators for the tutorials, Papinczak et al⁵⁷ advised that “facilitators must regularly review PBL tutorial processes and group dynamics within tutorial

settings". Bain⁵⁸ (p 166) in his popular book in higher education supported the regular assessment method of teaching-performance-appraisal saying:

"With a robust system of evaluation, we can continue to explore what the best teachers do that makes them so effective...excellent teachers develop their abilities through constant self-evaluation, reflection, and the willingness to change."

Collaterally looking through the 'Economics' lens, Murray⁵⁹ (p76) has labelled higher education students as 'Customers' while demonstrating the 'Systems' and 'Customer loyalty' model for scholarship in teaching. Murray advised that evaluation of teaching through 'both-way' feedback system leads to learning about customers' satisfaction which ultimately forecasts on financial success or failure of a course. The author added that listening to students' needs through feedback system and legitimate actions taken afterwards helps maintaining the customer-loyalty in scholarship terms. There are some successful examples available following completions of a course's revisions such as: Shanahan et al. study⁵⁵ has observed that student's satisfaction and engagement in OEM was significantly improved following re-designing of the existing curriculum based on passed students' reported experiences and expectations.

Recommendations:

- **Blended-learning design⁵:** Re-structuring OEM-teaching by replacing the didactic lecture-based one with

developed country's seminar-style design (running pre-reading supported, **student-led PBLs** consisting of in-class interactive video-based, one-on-one role-play-practice, swapping positions in turn) at least for the tutorials. If this pilot achieves inspiration and satisfaction from the audience, the other modules in Com-Med can be gradually re-designed of the same.

- **Flipped-classroom design⁵:** For extra tutorial-hours and manpower allocation constraints, the alternate way will be teaching and assessment practise using an **online** tool (i.e. LMS, Blackboard, Moodle, Cloud-based) where content will be provided through pre-recorded lectures, study guides, guided reading and other e-resources (i.e. podcasts). Teacher-student contact time will be through online discussion forums or Zoom-meeting. Drop-in (face to face) contact will be still possible at other tutorial times only for providing extra guidance to some students, through areas that they struggled to understand.
- The PBL-structured OEM modules should be written by working with relevant govt and non-govt (i.e. university, NGOs, pharmaceuticals, lawyers) experts.
- Junior teachers should acquire training on OEM-contents given by their expert colleagues. The teachers for PBL sessions need to be

Bangladesh Journal of Medical Education 2021; 12(1); Malek et al., publisher and licensee Association for Medical Education. This is an Open Access article which permits unrestricted non-commercial use, provided the original work is properly cited.

properly trained on: facilitating various software-based interactive audio-video teaching, running in-class assessments (i.e. using clickers for the polls) and providing timely electronic feedback to students.

- PBL-structured contents will avoid unnecessary information-overload and if possible, refrain from constructing assessments based on topics from basic science areas.
- A thought to invite guest lecturers/experts from relevant OEM-areas to teach and share their working experiences with students.
- A thought to invite real patients/victims (from OEM health hazards) to the class in order to listen to their lived-experiences when shared with students.
- A plan to add some pre-arranged OEM-related field trips in the curriculum (i.e. Workshops or garment factory visit to get demonstration on safety/rescue procedure, lawyer firm visit to get demonstration on work-related compensation procedure, refugee camp medical service visit, and personal-safety-training for performing medical duties during a pandemic).
- Subject to fund availability, a thought to subscribe 'Prognosis-EHR' software license to ensure

students' modern learning on OEM case managements.

- Finally, to ensure both quality-teaching and a satisfied audience, curriculum should include ongoing 'both-way' feedback-reviews undertaken on all forms of teaching.⁵⁹

Conclusion:

In busy third and fourth para-clinical years, it is important to facilitate students' learning in a comfortably situated zone where teaching ideally should be delivered by a team of content-trained teachers and assessments are designed from a contemporary content-friendly curriculum. In reality, it's equally true however that inviting and implementing a change in an existing curriculum could be experienced as financially and politically challenging⁶⁰.

Acknowledgement:

The thought for constructing this paper was originated during my participations in the prestigious 'Ottawa Conference on Medical Education' held few years ago in Melbourne and Miami. From the presentations I observed that like western developed countries, few countries have identified themselves as expert PBL-users for their medical curriculum. During recent pandemic, I thought to formally write down my idea to encourage curriculum-setters for OEM in Bangladesh to consider implementing PBLs. I am grateful to Monash University (School of Public Health & Preventive Medicine) for funding those visits and for employing me to teach OEM in the third-year MBBS course.

Competing Interests: None identified.

Funding received: None.

References

1. Goldman HR., Overview of occupational and environmental health, UpToDate, [Online], information is available at (accessed on 12.11.20): <https://www.uptodate.com/contents/overview-of-occupational-and-environmental-health>
2. Rahman AB, Chaklader MA, Muhamad F. Knowledge and awareness on disaster management among medical professionals of a selected public and private medical college hospital. *Int J Adv Med* 2018;5(6):1-5
3. Lieux EM. A comparative study of learning in lecture versus problem-based format. In: Dutch BJ, editor. *About Teaching: A Newsletter of the Center for Teaching Effectiveness*. Newark: University of Delaware; 1996. pp. 25–7.
4. Peters AS, Greenberger-Rosovsky R, Crowder C, Block SD, Moore GT. Long-term outcomes of the New Pathway Program at Harvard Medical School: A randomized controlled trial. *Acad Med*. 2000;75:470–9.
5. Kaufman DM, Mann KV. Comparing achievement on the Medical Council of Canada Qualifying Examination Part 1 of students in conventional and problem-based learning curricula. *Acad Med*. 1998;73:1211–3.
6. Gurpinar E, Musal B, Aksakoglu G, Ucku R. Comparison of knowledge scores of medical students in problem-based learning and traditional curriculum on public health topics. *BMC Med Educ*. 2005;5:7.
7. Tyler I. Toronto: Association of Faculty of Medicine of Canada, Public Health Task Group; 2009. Strengths, Weaknesses and Applicability of Teaching Methods, Report 5. An Environmental Scan of Best Practices in Public Health Undergraduate Medical Education; p. 5.
8. Joseph N, Rai S, Madi D, Bhat K, Kotian SM, Kantharaju S. Problem-based learning as an effective learning tool in community medicine: Initiative in a private medical college of a developing country. *Indian J Community Med*. Apr-Jun 2016;41(2):133-40.
9. Monash. Information on MBBS Year-3 subjects in Australia. Melbourne, Australia 2019 [cited 2020 26th Oct]; Available from: <http://www.monash.edu/pubs/2019handbooks/units/MED3062.html>.
10. Hussain MM, Talukder KH, Moazzem N, Rashid A, Hanif A, Nargis T. Evaluation of existing curriculum (2002) of undergraduate medical education in Bangladesh. *Mymensingh Med J*. 2011 Apr;20(2):226-32.
11. Kok YYK, Idris IF, Koh SQD. COVID-19: A Reminder for Medical Curriculum Review. *Advances in Medical Education and Practice*. 2020;11: 615-618.
12. Eva EO, Islam MZ, Mosaddek AS, Rahman MF, Rozario RJ, Iftekhar AF, et al. Prevalence of stress among medical students: a comparative study between public and private medical schools in Bangladesh. *BMC Res Notes*. 2015;8(1):327.
13. Mohsena M, Debsarma S, Haque M. Determining the Quality of Educational Climate in a Private Medical College in Bangladesh via the ‘Dundee Ready Education Environment Measure’ Instrument. *J Young Pharm*. 2016;8(3):266-274.
14. Bawa M, Patil S, Kinge A, Borde AN., Medical students perceptions regarding the curriculum in community medicine: A

Bangladesh Journal of Medical Education 2021; 12(1); Malek et al., publisher and licensee Association for Medical Education. This is an Open Access article which permits unrestricted non-commercial use, provided the original work is properly cited.

- cross-sectional study, *Indian Journal of Forensic and Community Medicine*, 2018;5(1):39-43.
15. Information on 'Go8' universities in Australia is available at (accessed on 28.10.20):
[https://en.wikipedia.org/wiki/Group_of_Eight_\(Australian_universities\)](https://en.wikipedia.org/wiki/Group_of_Eight_(Australian_universities))
16. Ramsden P. *Learning to teach in Higher Education*. 2nd ed. New York: RoutledgeFalmer; 2003.
17. BMDC website (bmdc.org.bd/curriculum-2012). Information on 'MBBS Curriculum Update- 2012' in Bangladesh. 2012 [accessed 2020 16th Nov]; Available from:
http://www.mmc.gov.bd/downloadable%20file/new_curriculum/The%20updated%20MBBS%20Curriculum%202012.pdf.
18. Mohiuddin AK. An extensive review of patient health-care service satisfaction in Bangladesh. *Adesh Univ J Med Sci Res*. 2020; 2(1):5-16.
19. Course information on 'Master of Occupational and Environmental Health' at Monash University is available online at (accessed on 26.11.20):
<https://handbook.monash.edu/current/courses/M6026>
20. Biggs, J. & Tang, C. *Teaching for Quality Learning at University* (3rd edition). New York: Open University Press, McGraw-Hill Education; 2007.
21. Snyder RB. *The Hidden Curriculum*. Massachusetts: MIT Press; 1973:214.
22. Phillips PS, Clarke, M. More than an education: the hidden curriculum, professional attitudes and career choice. *Medical Education* 2012; 46: 887–893.
23. Mosaddek ASM, Islam MZ, Rahman MF, Habib S, Chaudhury, Parvin R, et al. Present status of implementation of undergraduate curriculum of Bangladesh in selected private medical colleges: teachers' perspectives. *South East Asia Journal of Public Health* 2011; 1: 73-74.
<https://doi.org/10.3329/seajph.v1i1.13227>
24. Ahmed S, Hasan M, Kabir R, Arafat S, Rahman S, Haque M, Majumder MA. Perceptions of medical students regarding community-based teaching experiences: an observation from Bangladesh. *Rural and Remote Health* 2019; 19: 4614.
<https://doi.org/10.22605/RRH4614>
25. BMDC website (bmdc.org.bd/curriculum-2012). Information on 'MBBS Curriculum Update- 2012' in Bangladesh. 2012 [accessed 2020 16th Nov]; Available from:
http://www.mmc.gov.bd/downloadable%20file/new_curriculum/The%20updated%20MBBS%20Curriculum%202012.pdf.
26. Talukder KH, Hossain MZ, Hanif MA, Akther N, Perveen IA. Reviewing and Updating of MBBS Curriculum 2002: Intern Doctors' Views. *Bangladesh Journal of Anatomy* 2011;9(1):35-40.
27. Medlen P. The crowded curriculum. *ABC Premium News* [serial on the Internet]. 2010: Available from:
<https://search.proquest.com/docview/613819190?accountid=12528>.
28. Loomis AK. The Over-Crowded Curriculum. *Journal of Educational Research*. 1939;32(6):457-9.
29. Information on 'Pre-Medicine' course in Australia is available at (accessed on 20.11.20):
<https://coursefinder.uow.edu.au/smah/pre-med/index.html>
30. Sultana A, Riaz R, Tehseen I. Comparison of problem based learning with traditional teaching as perceived by the students of Rawalpindi Medical College. *Rawal Med J* 2010;35:249-253.

31. Ornstein CA, Hunkins PF. Curriculum: Foundations, Principles and Issues. 7th ed. NJ, USA: Pearson; 2017. <https://www.monash.edu/medicine/srh/monash-ruralregional-md-program/churchill>
32. Wayne Weston W. Do we pay enough attention to science in medical education? Canadian Medical Education Journal. 2018;9(3):e109-e14.
33. Dredge D, Benckendorff P, Day M, Gross MJ, Walo M, Weeks P, et al. The philosophic practitioner and the curriculum space. Annals of Tourism Research. 2012;39(4):2154-76.
34. Yamada A, Fukushima Y, Miki T, IBA T. Disaster Medicine Education and Training for Medical Student at Juntendo University. Juntendo Medical Journal. 2014;60(2):112-8.
35. Chow W-K. The Need for Fire Engineering Education in Hong Kong. Fire Science and Technology. 2012;31(2):49-62.
36. Knutsen FS, Johnsen R, Forsdahl A. Practical Training of Medical Students in Community Medicine: Eight Years Experience from the University of Tromsø. Scandinavian Journal of Primary Health Care. 1986;4(2):109-14.
37. Alkafajei MBA, Antony R, Joseph G. Community Medicine. Medical Teacher. 1983;5(4):137-43.
38. Knowles MS, Holton III FE, Swanson AR. The adult learner: the definitive classic in adult education and human resource development. 6th ed. Amsterdam; Boston: ELSEVIER; 2005.
39. A. Information on Undergraduate Monash medical curriculum is available at (accessed on 27.10.20):
<https://www.monash.edu/medicine/som/direct-entry/course-outline>
B. Information on Graduate-entry Monash medical curriculum is available at (accessed on 27.10.20):
40. Information on Graduate-entry Uni of Melb medical curriculum is available at (accessed on 27.10.20):
<https://handbook.unimelb.edu.au/2018/courses/mc-dmed/course-structure>
41. Habib F, Baig L, Mansuri FA. Opinion of medical students regarding problem based learning. J Pak Med Assoc 2006;56:430-2.
42. Nelson A. Curriculum Design Techniques. Iowa, USA: Wm C Brown; 1990.
43. Macala CJ. Sponsored Experiential Programs- Learning by Doing in the Workplace. In: Lewis HL, editor. Experiential and Simulation Techniques for Teaching Adults. San Francisco, London: Jossey-Bass Inc; 1986.
44. Kolb DA. Experiential Learning: Experience as the Source of Learning and Development. Englewood-Cliffs, NJ: Prentice-Hall; 1984.
45. Armstrong E, Parsa-Parsi R. How Can Physicians' Learning Styles Drive Educational Planning? Academic Medicine. 2005;80:680-4.
46. Wells CG. Dialogic inquiry: Towards a sociocultural practice and theory of education. New York: Cambridge University Press; 1999.
47. Palmer J, Snyder TFF. Computer Simulations Come of Age. In: Lewis HL, editor. Experiential and Simulation Techniques for Teaching Adults. San Francisco, London: Jossey-Bass Inc. 1986; 15-24.
48. Bokken L, Linssen T, Scherpbier A, Vleuten VC, Rethans J-J. Feedback by simulated patients in undergraduate medical education: a systematic review of the literature. Medical Education. 2009;43:202-10.

49. Tillander B, Ledin T, Nordqvist P, Skarman E, Wahlstorm O. A virtual reality trauma simulator. *Medical Teacher*. 2004;26(2):189-91.
50. George P, MacNamara MCM, Gainor J, Taylor SJ. An Integrated Virtual Family Curriculum to Introduce Specialty-Specific Clinical Skills to Rising Third-Year Medical Students. *Teaching and Learning in Medicine*. 2013;25(4):342-7.
51. Brainyquote.com. "Confucius Quotes". Brainy Media Inc.; 2019 [cited 2019 3rd April]; Available from: https://www.brainyquote.com/quotes/confucius_136802.
52. Prognosis. Occupational & Environmental Medicine EHR and EMR Software. San Jose, CA: Bizmatics; 2019. p. Available from: <https://prognosis.com/occupational-medicine-ehr/>
53. NSU. MPH Course and Subjects Outline in North South University. Dhaka2019 [cited 2019 1st April]; Available from: <http://www.northsouth.edu/academic/programs/master/mph.html>.
54. Information on post-graduate courses on 'Occupational & Environmental Health' in Bangladesh is available at (accessed on 23.11.20):
 - A. http://bcps.edu.bd/fellowship_subject.php
 - B. http://bcps.edu.bd/mfellowship_subject.php
 - C. <https://bsmmu.edu.bd/page/151>
 - D. <https://www.nipsom.gov.bd/faculties/#1589621498365-2ab1e697-0a8d>
55. Shanahan ME, Lindemann I, Ahern JM. Engaging medical students in occupational and environmental medicine—a new approach. *Occupational Medicine*. 2010;60:566-8.
56. Shanahan ME, Murray MA, Lillington T, Farmer AE. The teaching of occupational and environmental medicine to medical students in Australia and New Zealand. *Occup Med*. 2000; 50(4):246-250.
57. Papinczak T, Tunny T, Young L. Conducting the symphony: a qualitative study of facilitation in problem-based learning tutorials. *Med Educ* 2009; 43:377-83.
58. Bain K. What The Best College Teachers Do. Massachusetts, US: Harvard University Press; 2004.
59. Murray R, editor. The Scholarship of Teaching and Learning in Higher Education. Berkshire, UK: SRHE & Open University Press, McGraw-Hill; 2008.
60. Slavin JS, Wilkes SM, Usatine PR, Hoffman RJ. Curricular Reform of the 4th Year of Medical School: The Colleges Model. *Teaching and Learning in Medicine*. 2003;15(3):183-93.