

Perspective of medical students towards experimental biochemistry

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A B S T R A C T

Objective: The simple curriculum of Medical science has the complex biochemical theories which are hard to grasp. To address this problem, practical knowledge and change in approach to study is relevant to have a better foundation in clinical years; where this information has to be applied.

Methodology: Modifications were made in experimental biochemistry and genetics to focus on more applied knowledge through experiments and problem-based learning. A seven-item questionnaire to check the students' perspective of biochemistry was distributed among second year students, 89 out of 104 responded.

Results: 42 were males and 47 were females. The results were positive between 60% and 70% for all the items. 70% was highest, which was for component, which they still hope for better courses in the future.

Conclusion: Numerous strategies have been applied to promote teaching results and increase the effectiveness of teaching to undergraduate clinical students in biochemistry.

Keywords: Biochemistry, teaching methods, medical students, integrative medicine

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Introduction

Inside the simple curriculum of Medical science, the complex biochemical theories are hard to understand. Incorporating practical knowledge in these theories is important for bridging the gap between basic sciences and clinical work. This emphasis is for every subject that has been part of the syllabus including one of the least focused basic science subjects - biochemistry. From advancements at the molecular level to their application in the clinics and integration in the curriculum; biochemistry and Medicine are inseparable.¹

Hence, the importance of sound and practical knowledge in the education of clinical college students has become inevitable to ignore especially in Biochemistry.² Genetics is an integral part of Biochemistry. The research and advancements in genetics make it impossible to ignore in clinical medicine.³

Biochemistry is considered to have minimum relevance in practical life of a physician.^{4,5} Upcoming physicians need to be equipped with the necessary skills and knowledge which is required in their clinical practice. In terms of medical treatment, it will also be beneficial for their transition in the fields of genomics, molecular biology and Bioinformatics.⁶

The Biochemistry and genetics have major elements of rote memorization and among students' the concept-based learning methodology is usually ignored in the majority of colleges.¹ Most students focus on simply memorizing chemical pathways or rare disorders for professional examinations. It is also one of the least studied subjects as its practical importance is not emphasized. Also, physicians who have been taught through this conventional system, lack competency

compared to the ones who were taught through the newer teaching or learning approaches.⁷

Although, in the past three to four decades, crucial changes have been made in the biochemistry curriculum across the globe.⁷ However, the rate of progress required to standardize teaching has not been seen in Pakistan. Considering the difficulties faced in the experimental biochemistry and genetics teaching techniques, in past 4 years, Shifa College of Medicine has designed an integrated teaching methodology which has improved instructors' delivery of Biochemistry contents to students. The primary aim of this study was to determine the perceptions of medical students towards the introduction of this new teaching approach. Our objective is to evaluate new students' attitude after introduction and implementation of improved strategies in teaching of experimental Biochemistry.

Material and Methods

This study was conducted in Shifa College of Medicine after approved by an Institutional Review Board. The focus was on experimental techniques and practical labs of first year students. The integration was possible for around 70% of the course. After successful integration and changes made in experimental Biochemistry and genetics curriculum; we evaluated perceptions of the same students at the start of the second-year session at our institute. The new curriculum is summarized in Table 1. A questionnaire was distributed in the class of 104 students. The questionnaire had seven items which are shown in Table 2. Data was analyzed using SPSS 21 and Microsoft Excel 2016.

Results

Out of 104 students, 89 students responded to the questionnaire. Among them, 42 were males and 47 were females. The results have been summarized in Table 3. Overall, in all seven categories, the most positive feedback was that they will expect for more interesting courses in the future which was 70 %. However, 8 % amongst students disagreed with it. According to 59 % of students, the integrated methodology was interesting and practical. 23 % were neutral and 16 % were disappointed with this. Their attitude towards biochemistry in improving their theoretical knowledge as mentioned in item 5 has

been positive of about 67 %, while lesser had neutral attitude and disagree with it, that being 20 % and 10 %, respectively. This has been further helped by practical to improve their grasp in basic knowledge; which is 68% almost equal to mentioned earlier.

In practical knowledge, the approach of practical to each individual is better for 69% of students, even though the confidence that the skills improved is relatively low of around 19%. The most significant tool, is if they think it will help them in future years is only positive for around half of the class. 32% were unsure and 15% disagreed.

Discussion

In the present curriculum of medicine, biochemical theories are as backbone on which further knowledge has been built. The need to find the most effective way to deliver the content is a huge challenge. Throughout the past few years, many changes have been made to achieve this goal. Conventional approaches focused more on theoretical and abstract knowledge and that's how practical skills are taught. Usually, teachers provide students with answers. Conceptual thinking and skills need to tackle a problem were not encouraged.⁸ As the education system improved, more focus is on practical based knowledge. An effective approach to build a medical community equipped with knowledge in biochemistry and modern genetics is a foundation made by providing the basics of these fields in a student's undergraduate and preclinical years. Moreover, it should be supplemented with evidence-based practices that are standardized.⁹ It effectively helps to implement the knowledge in their clinical years.

One of our approach was to prioritize learning through practical skills and problem-based learning. The lectures were being linked with practical knowledge or rationale of why this topic is important. Hence, it helps students to understand the importance and increase their ability to grasp the concept easily. This approach has been proven to be effective in the James A. L. Brown study.¹⁰ In one study, students of second, third and final years were engaged in discussion to recall anatomy and physiology. The percentage of students that can recall anatomy were 65.7% and physiology were 65.3%. While, this percentage was comparatively low for biochemistry of about 40%.¹¹ According to Afshar et al. study, most

common problems with biochemistry were that it is repetitive, content had been from outside the required basic text, and irrelevant from examination point of view. All of these factors make it more difficult to retain the relevant information. It has been a struggle for medical students to understand how to study and to differentiate the relevant material from irrelevant.¹ According to study conducted by Alam A, only 19% students retain biochemistry course.¹²

In our practice, efforts have been made to minimize unrelated courses and integrate each topic with the importance and rationale in the curriculum through problem-based approach. So, to decrease such issue even within each topic, that has to be studied. Lijan You et al study has been targeting to teach Biochemistry with a more practical approach and it has shown to have very positive feedback with above 90%. Our study has shown results better than we expected, but the achieved target was lower compare of our study compare to this study; that is between 60% and 70%.¹³

Shifa Tameer-e-Millat University (STMU) has tried to adapt international clinical education curriculum inside the subsequent 5-year developmental plan. The BP Koirala University of Health Sciences in Nepal and India is known for its academic excellence. It has three main focus that a system of studies should be centered to students, it should be practically based and integrated in Phase I, which is in basic sciences years.¹⁴ The same pattern has been encouraged by our institute. Within the future, we will continue to modify teaching techniques to have a better future in the field of experimental biochemistry and genetics. Certain advices have been summarized in Table 4 to improve teaching.^{15,16}

Table 1: Integrated Clinical Biochemistry Content

Clinical Biochemistry Integration themes	Integrative Biochemistry Modules
Principles of Biomedical Sciences	Essentials of Medicine Introduction to use of Laboratory facilities/ Equipment (Centrifuge, PH Meter, Pipetting, Micro Lab, Elisa, Chromatography HPLC/GC, Spectrophotometer), Collection and Preservation of Clinical Specimen, Basic Techniques and Fundamental Information Cell Structure and Function / Genetics

	DNA Extraction, Gel Electrophoresis, Gel Documentation
Foundations of Clinical Medicine I-II	Hematology Photoelectric Calorimeter, Plasma Protein Estimation, Liver Function Test, Plasma Bilirubin Estimation Locomotor System Estimation of Uric Acid Respiratory PH meter Cardiovascular System Total Plasma Cholesterol Estimation, Lipoprotein Estimation Nutrition and Metabolism Basal Metabolic Index, Basal Metabolic Rate, Total Caloric Requirement, History Taking, General Physical Examination, Fluids/Preparation of Solutions, Parenteral Nutrition, BMI Calculation & Growth Charts Gastrointestinal System Salivary Amylase, Liver Function Test, Bilirubin Kidney, Ureter, Bladder Serum Creatinine, Creatinine Clearance Test, Chemical Analysis of Urine Normal and Abnormal Specimens, Urine Microscopy, Uric Acid, 24 Hours Urinary Protein, Electrolyte Estimation, PH meter Endocrine and Reproduction Blood Glucose Estimation, Oral Glucose Tolerance Test, Urine Analysis
Future Plans: Core Rotations of Clerkship	Laboratory Medicine plays a significant role in the diagnostic process used daily during clinical experiential rotations.
Clinical Electives Course	Applied biochemistry and laboratory medicine are included in presentation/disease specific sessions

Table 2: Items of questionnaire

Integrated Experimental biochemistry is interesting and practical
Integrated experiments improve my understanding in biochemistry lectures
The procedures of individual experiment are great
Experimental classes improve my operation skills
Experimental classes expand my scope of knowledge
Biochemistry courses are indispensable for my future clinical practice
I expect more interesting courses in the future

Table 3: Students perceptions regarding Experimental Biochemistry Teaching

Question Items	Strongly Agree % (n)	Agree % (n)	Neutral % (n)	Disagree % (n)	Strongly Disagree % (n)
Integrated Experimental biochemistry is interesting and practical	26.4 (24)	33 (30)	23.1 (21)	9.9 (9)	7.7 (7)
Integrated practical improves my understanding in biochemistry lectures	27.5 (25)	40.7 (38)	19.8 (20)	3.3 (6)	7.7 (2)
The procedures of individual practical are great	28.6 (26)	40.7 (37)	19.8 (18)	3.3 (3)	7.7 (7)
Biochemistry improves my practical skills	18.7 (17)	31.9 (29)	33.0 (30)	13.2 (12)	3.2 (3)
Biochemistry classes expand my scope of knowledge	28.6 (26)	38.5 (35)	22.0 (20)	5.5 (5)	5.5 (5)
Biochemistry courses are indispensable for my future clinical practice	25.3 (23)	27.5 (25)	31.9 (29)	11.0 (10)	4.4 (4)
I expect more interesting courses in the future	35.2 (32)	38.5 (35)	17.6 (16)	4.4 (4)	4.4 (4)

Table 4: Tips to enhance quality during our teaching Process

Students	Evaluate Material to ensure it is for the caliber of an undergraduate medical student
	Standardize experimental and clinical skills all over the institutions
	Activate the enthusiasm for learning among students
Teachers	Actively prepare for the class
	Enrich the teaching Resources
	Build up communication and understand struggle of even below average student
	Approach to be: problem-based learning

Conclusion

Several techniques with a focus on experimental knowledge and problem-based learning had been utilized in integrated curriculum at STMU. Positive perspective of students has been between 60% and 70%. The purpose is to have a relevant and stronger grasp in clinical biochemistry and genetics to build a strong foundation in their clinical years. Within the study, we are able to improve our teaching methods. Although, there always room for modifications that will be considered in future.

References

- Afshar M, Han Z. Teaching and learning medical biochemistry: perspectives from a student and an educator. *Med Sci Edu.* 2014; 24(3):339-41. DOI: <https://doi.org/10.1007/s40670-015-0120-z>.
- Yu L, Yi S, Zhai J, Wang Z. Approaches to enhance the teaching quality of experimental biochemistry for MBBS students in TSMU, China. *Bioch Molec Bio Edu.* 2017; 45(4):360-4. DOI: <https://doi.org/10.1002/bmb.21050>
- Noble D. Differential and integral views of genetics in computational systems biology. *Interface Focus.* 2010; 1(1):7-15. DOI: <https://doi.org/10.1098/rsfs.2010.0444>
- Watmough S, O'Sullivan H, Taylor D. Graduates from a traditional medical curriculum evaluate the effectiveness of their medical curriculum through interviews. *BMC Med Edu.* 2009; 9(1):64. DOI: <https://doi.org/10.1186/1472-6920-9-64>
- Clack GB. Medical graduates evaluate the effectiveness of their education. *Med Edu.* 1994; 28(5):418-31. DOI: <https://doi.org/10.1111/j.1365-2923.1994.tb02553.x>
- Wolyniak MJ, Bemis LT, Prunuske AJ. Improving medical students' knowledge of genetic disease: a review of current and emerging pedagogical practices. *Adv Med Edu Pract.* 2015; 6:597. DOI: <https://doi.org/10.2147/AMEP.S73644>
- Leung WC. Competency based medical training. *Bri Med J.* 2002; 325(7366):693. DOI: <https://doi.org/10.1136/bmj.325.7366.693>
- McRae MP. Using clinical case studies to teach biochemistry in a doctoral program: a descriptive paper. *Creative Edu.* 2012; 3(7):1173. DOI: <https://doi.org/10.4236/ce.2012.37174>
- Hatala R, Guyatt G. Evaluating the teaching of evidence-based medicine. *J. Am Med Ass.* 2002; 288(9):1110-2. DOI: <https://doi.org/10.1001/jama.288.9.1110>
- Brown JA. Evaluating the effectiveness of a practical inquiry-based learning bioinformatics module on undergraduate student engagement and applied skills. *Bio Mole Bio Edu.* 2016; 44(3):304-13. DOI: <https://doi.org/10.1002/bmb.20954>
- Gupta S, Gupta AK, Verma M, Kaur H, Singh K. The attitudes and perceptions of medical students towards basic science subjects during their clinical years: A cross-sectional survey. *Int J Appl Basic Med Res.* 2014; 4(1):16. DOI: <https://doi.org/10.4103/2229-516X.125675>

12. Alam A. How do medical students in their clinical years perceive basic sciences courses at King Saud University?. *Ann Saudi Med.* 2011; 31(1):58-61.
DOI: <https://doi.org/10.4103/0256-4947.75780>
13. Yu L, Yi S, Zhai J, Wang Z. Approaches to enhance the teaching quality of experimental biochemistry for MBBS students in TSMU, China. *Bioch Mol Bio Educ.* 2017; 45(4):360-4.
DOI: <https://doi.org/10.1002/bmb.21050>
14. Purl D. SIS (Structured Interactive Sessions): These are UNCLE (Unconventional learning exercises): 2002; 17(2):52-9.
15. Nair SP, Shah T, Seth S, Pandit N, Shah GV. Case based learning: a method for better understanding of biochemistry in medical students. *J Clin Diagnostic Res.* 2013; 7(8):1576.
DOI: <https://doi.org/10.7860/JCDR/2013/5795.3212>
16. Yan Q, Ma L, Zhu L, Zhang W. Learning effectiveness and satisfaction of international medical students: Introducing a Hybrid-PBL curriculum in biochemistry. *Bioch Mol Biol Edu.* 2017; 45(4):336-42.
DOI: <https://doi.org/10.1002/bmb.21046>