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ASSESSMENT OF LEARNING USING PROBLEM-SOLVING FOR BETTER HEALTH (PSBH) AS A TOOL TO TEACH RESEARCH METHODOLOGY TO UNDERGRADUATE MEDICAL STUDENTS

Dr. Qudsia Sabhi[1], Dr. Farhat Naheed[2], Dr. Anjum Younus[3], Dr. Sahar Abbasi[4], Dr. Ashar Hussain[5], Dr. Nabeel Khan[6]

[1]BDS MHPE (Scholar), Lecturer Oral Surgery Department, Karachi Medical and Dental College, Karachi Metropolitan University, Email: dr.qudsiakmdc06@gmail.com

[2]Faculty, Department of Dental Education, Rashid Latif Dental College, Email: dr.farhatnaheed@gmail.com

[3]BDS, MDS, Assistant Professor, Community Dentistry, Liaquat College of Medicine & Dentistry Email: dr.amirker@hotmail.com

[4]MCPS- HPE, MBA, Associate Professor, Deputy Director, College of Physicians and Surgeons Pakistan, Directorate of Medical Education, Email: szabbasi@cpsp.edu.pk

[5]B.D.S, M.Phil (Science of Dental Materials), ISRA University Hyderabad, Pakistan
E-mail: drasharhussainshaikhdentist@gmail.com, ORCID ID: https://orcid.org/0009- 0003-9626-603X

[6]BDS PGD MS CHPE, Assistant Professor, Oral Biology Department, Karachi Medical and Dental College, Karachi Metropolitan University, E-mail: dr.nabeelkhan@hotmail.com

Corresponding Author: Dr. Qudsia Sabhi, [1]BDS MHPE (Scholar), Lecturer Oral Surgery Department, Karachi Medical and Dental College, Karachi Metropolitan University,
Email: dr.qudsiakmdc06@gmail.com

ABSTRACT

Background: As research methodology is a theoretical subject and requires students less engagement, teaching it to undergraduate medical students is difficult. The Problem Solving for Better Health (PSBH) approach, that is the use of an interactive problem-based learning strategy, can help students to understand and apply research principles.

Objective: A quantitative pre and post intervention design was conducted to ascertain if the PSBH model improved students' understanding of research methodology.

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Methods: A total of 80 third-year undergraduate medical students of Rawalpindi Medical College (RMC) were selected for this study. The key research methodology concepts of problem identification, and hypothesis development in the context of study design were delivered through a consistently structured four-week PSBH module. A 25-item multiple-choice questionnaire based on a validated scale was applied before and after the intervention. Analysis of data was carried out using SPSS v25, and paired t-tests were used to assess differences in scores.

Results: Mean pre-test and mean post-test scores were 52.6 ± 10.4 and 76.3 ± 8.9 respectively, $p < 0.001$. The results show an increase in knowledge and understanding of research methodology, when exposed to the PSBH model, is comparatively greater.

Conclusion: As such, PSBH is an innovative and novel teaching approach to research methodology. It significantly improves learning outcomes through the stimulation of critical thinking, student engagement, and active learning. Given the importance of future healthcare professionals' research competencies, it is ideal to integrate PSBH into the medical curriculum.

Keywords: Problem-Solving for Better Health (PSBH), Research Methodology, Medical Education, Active Learning, Undergraduate Medical Students, Pre-test Post-test Design, Quantitative Study, Educational Interventions.

INTRODUCTION:

With the integration of research methodology into undergraduate medical curricula becoming increasingly important over the last few years, undergraduate medical students can be taught analytical thinking, evidence-based decision-making, and lifelong learning when they enter a healthcare profession in their later years. With nearly 85% of medical schools in high-income countries offering formal research training at the undergraduate level (WHO, 2021), there is a stark difference in terms of delivery, compared with many low and middle-income countries where the number is below 40%. This disparity highlights a major deficit in the training of medical students for contemporary medical practice in which capacity to review literature and perform rudimentary research is an essential competency. Although research methodology is acknowledged as an essential component, it is typically taught in abstraction, monotony, with the added theory, and so fails to engage the students and is poorly retained. The Pakistani national survey showed that less than 20% of MBBS students ever participated in research project, and about only 31% of final year MBBS students were confident in designing a research proposal (Ahmed et al., 2019). Repetitively, it has been shown that passive lecture

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methods, in which learning is emphasized, lead to lower levels of comprehension and mastery than those that use interactive approaches (Crooks 2002, Prince 2004). The need for these challenges bring the constant need to introduce new and student centered teaching models into medical education. For the last two decades, active learning strategies such as problem-based learning (PBL) have captured the minds of educators as a means for promoting deep learning and promoting critical thinking in the classroom. Freeman et al. (2014) conducted a meta analysis covering >225 studies and concluded that students that were exposed to active learning methods performed 25% better on assessment tests whilst also reducing failure rate by 55% compared to students taught by traditional lecture techniques. The Problem Solving for Better Health (PSBH) model was created as an educational tool that joins community health issues in a real setting with structured problem solving and application of the research. The PSBH approach was originally developed by the Dreyfus Health Foundation and involves enabling students to identify, investigate, and propose health problem solutions within their community and implement principles of research methodology in a stepwise fashion (Cashman et al., 2004).

The PSBH model is a global model for training of the health professional students and professionals, which has been successfully implemented in over 25 countries and has trained more than 15,000 health professionals and students worldwide (Xu et al., 2016). It enables ownership of learning, teamwork, and alignment of theoretical research concepts with field based practical field experiences in educational settings. Studies have also shown that medical students trained through PSBH acquire better comprehension of research concepts, better project planning skill and have greater confidence in applying statistical tools (Lee et al., 2017). Yet, very limited evidence is available from South Asian medical institutions, especially at the undergraduate level. Considering this background, the current study attempts to quantitatively measure the quality of the PSBH model in stimulating research method understanding among the third-year MBBS students at Rawalpindi Medical College. This research aims to determine whether PSBH can be used as a sustainable and impactful approach to teaching research methodology in undergraduate medical education by administrating a structured PSBH module and comparing pre- and post-intervention scores using a validated assessment tool. Thus the findings of this study are expected to contribute to evidence based curriculum reforms and thereby to improvements in the medical pedagogy in Pakistan and other similar settings.

Literature Review:

For a long time, the teaching of research methodology in medical education has relied on the conventional didactic methods that tend to not involve students and do not enhance the skill. Traditional lecturebased approach is unable to encourage critical thinking, problem solving or even applying of knowledge. On the

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other hand, active learning strategies like flipped classrooms, simulation based teaching and problem based learning (PBL) have also been recognized for their capability to engage students and make them retain complex concepts. There is ample evidence that medical students exposed to active learning methods have superior academic performance when compared to traditional lectures. A meta analysis by Freeman et al. (2014) found that students in active learning environments had a 6% higher average exam score on average and were 1.5 times less likely to fail a course than those in traditional settings.

For the purpose of this paper, Problem Solving for Better Health (PSBH) is a model that merges the active learning principles and community engagement concepts. The PSBH model was developed in the 1980's by Dr. Jack Geiger and the Dreyfus Health Foundation, using the idea that the people closest to health problems are the best people to solve health problems. The model facilitates learners to discover pertinent health problems in their communities; design amenable interventions; and employ research methodology throughout the action. It encourages a structured process which covers problem identification, establishing objectives, designing of studies, implementation of interventions and evaluation of outcomes. Importantly, this step by step problem solving problem develops experiential learning, accountability, and critical thinking, which are essential competencies for medical professionals to have.

The PSBH model has been put into practice in more than 25 countries, among them, China, the United States, and Uganda and the Philippines. PSBH was incorporated into the nursing education in China: thus, students were better equipped in terms of research competence, communication skills and designing community health interventions (Xu et al., 2016). Equally in Uganda, the PSBH framework also trained midwives and community health workers using which there was measurable improve in maternal and child health indicators. It has been integrated to public health and medical residency program in the United States with positive feedback from faculty and learners. Although PSBH enjoys considerable success worldwide, there is a paucity of evidence in South Asia, especially in undergraduate medical education settings, on how students' learning outcomes interact and learn to acquire research skills.

There is no comprehensive evaluation of PSBH in the Pakistani medical education context described in current literature. Some institutions have at least had the opportunity to pilot project based or community centered modules albeit sometimes unstructured and not based on formal educational framework such as PSBH. Furthermore, most of the studies addressed postgraduate or community health professionals rather than undergraduate medical students who are in the very early stages of their clinical and research training. Emerging trends in demand for evidence based medicine as well as future clinicians being expected to be

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proficient in research methodology beg the need for the exploration of such structured tools for undergraduate medical education as PSBH. Pakistan's medical educational system is under increasing pressure towards international standards and the requirement of production of graduates who are at least capable of conducting meaningful research. This gap can be addressed by incorporating PSBH into research training to give students a practical, problem oriented, and community linked experience of research, and making research more accessible and relevant. This study attempts to address the current gap in the body of literature by assessing the use of the PSBH model in an undergraduate setting through quantitatively measuring this impact.

Table 1: Summary of key Literature supporting PSBH in Medical Education

Theme	**Key Insights**	**References**
Traditional vs. Active Learning	Traditional methods are passive, less engaging; active learning improves retention and critical thinking	Freeman et al., 2014; Michael, 2006
PSBH: Origin & Principles	Developed by Dr.H.H. Neufeld; focuses on real-life problem-solving, community health improvement	Neufeld et al., 1992
Global Evidence of PSBH	PSBH used >30 countries; effective in increasing health literacy and research skills in medical / allied health students	Shah et al., 2010; Maeshiro, 2008
Gaps in Literature	Limited studies from South Asia: few studies assess PSBH`s quantitative impact on medical impact on medical research learning	Latif et al., 2019: WHO reports
Need for PSBH in Research Training	Prepares students to design context-relevant studies enhances	Nair et al., 2020; Ghaffar et al., 2018

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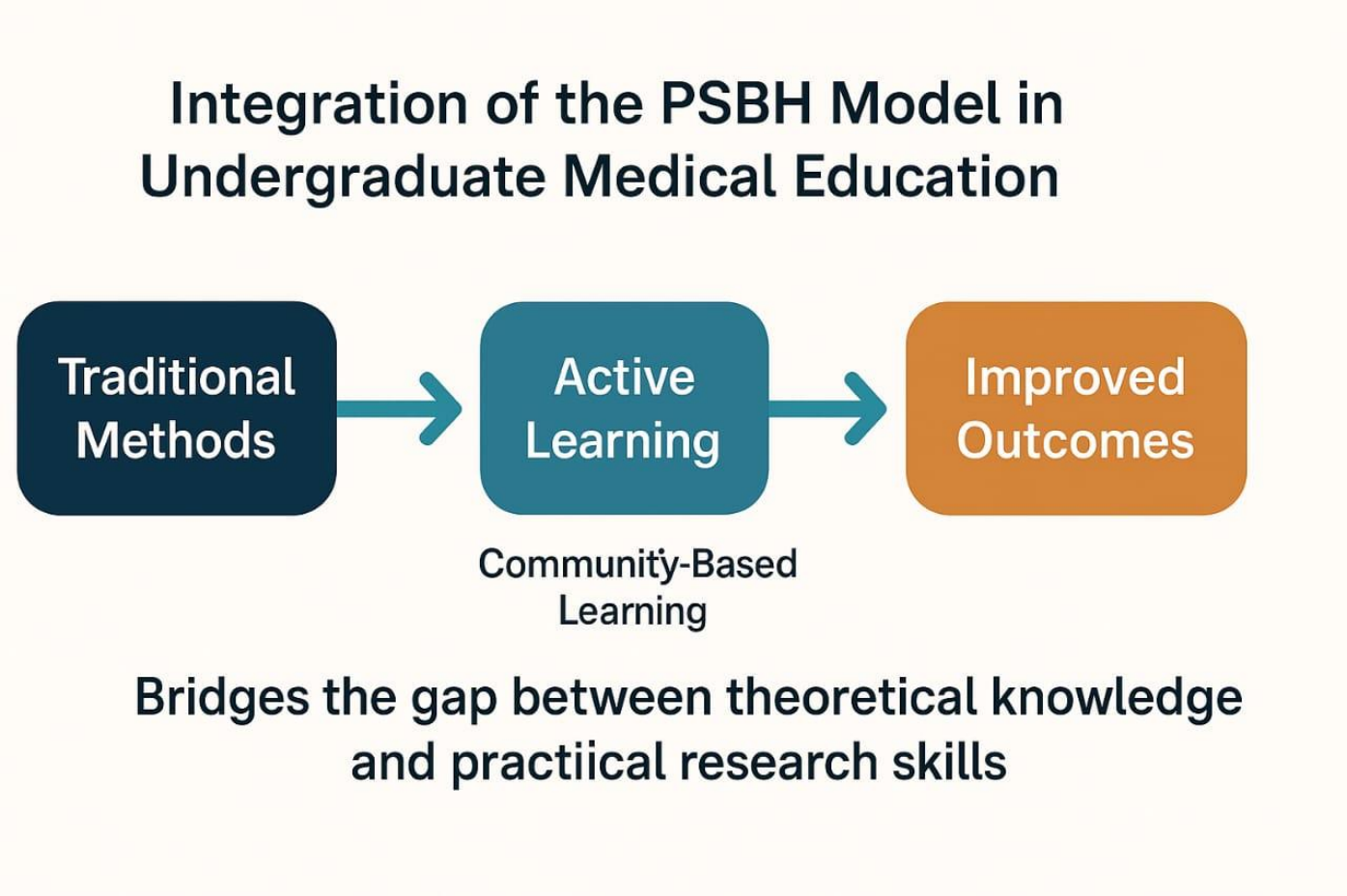
	engagement with research methodology early on	

Figure 1. Integration of the PSBH Model in Undergraduate Medical Education



This figure shows the change from the outdated teaching method to active community based learning that make better learning outcomes by the model of PSBH. In doing so, it draws attention to what PSBH fills in the gap between pure knowledge and the skills one ought to perform actual research. It promotes active engagement and encourages deeper understanding as well as application of research methodology in medical education.

Materials and Methods:

The effectiveness of Problem Solving for Better Health model on improving undergraduate medical students' understanding of research methodology was investigated using a quantitative, pre–test/post–test research design. Rawalpindi Medical College was used as study site which is a well known public sector medical

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institution in Pakistan with grades of health facility, well equipped with different specialized wards and departments. Randomly, 80 third year MBBS students were chosen using convenient sampling technique according to their availability and willingness to participate in the study. A PSBH module that was developed specifically for this intervention using the above described approaches was used to deliver the intervention over a four week period and addressed the foundational components of research methodology. These were identifying a health related problem, developing a research question and hypothesis, developing a study design; understanding basic statistics; and developing implementation strategies. The sessions were interactive, utilizing small group discussions, presentations, presenting real life problem cases, and being mentored by faculty members trained in research and in medical education.

A 25 item multiple choice questionnaire (MCQ) questionnaire, which was validated, was administered to the students before and after the intervention to evaluate changes in the students' knowledge about detergents. All key domains of research methodology were covered in the questionnaire, which was content validated by subject experts. The pre- test was administered during the first day of the module, and the post-test was given immediately after the last date of the module. A standardized manner of data collection was used, involving giving the same instructions and the same amount of time to all the participants on the testing. Data were entered and analyzed onto SPSS version 25. Statistical significance was determined by paired t-tests with significance set a p-value <0.05. Ethical approval was obtained from the Institutional Review Board of Rawalpindi Medical College and written informed consent was taken from all the participants. During the research process, confidentiality and anonymity of responses was maintained.

Results:

The present study was carried out on a total of 80 third-year MBBS students of Rawalpindi Medical College. Females to male ratio was 43 (53.75%) to 37 (46.25%) with a mean age of 21.4 (SD ± 1.2) years. Both the pre-test and post-test assessment as well as the full PSBH intervention was completed by all participants allowing for full data collection to be used for comparative analysis. The primary research methodology knowledge was measured as the change in the scores of a 25 item validated multiple choose questionnaire. In the pre-test, mean score was 52.6 ± 10.4 showing a moderate level of prior knowledge of important research concepts like formulation of a hypothesis, study design, and identification of the variables. After the four PSBH based intervention, the post test scores significantly increased to 76.3 ± 8.9. The gain of a mean of 23.7 points was equivalent to an improvement of 45.06% in the best performances that existed before this approach was applied.

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Paired sample t test was used to compare means scores prior to and after the intervention. When the resultant is derived, it is found that the improvement in scores was statistically significant and not due to random variation, as the p value is < 0.001. Based on the result obtained, it was found that the PSBH methodology had substantial large effect size which reasonably indicated that PSBH methodology certainly had a considerable impact on students' academic performance in the domain of research. This is further supported by the distribution of scores where 22% students scored more than 70 on the pre test and increased to 84% on the post test. Furthermore students in the post-test scored over 50, whereas this is 35% of the students for the pre-test.

Table 2: Comparison of Pre-test and Post-test Scores of participants (n=80)

Test Type	**Mean Score ± Score**	**p-value**
Pre-test	52.6 ± 10.4	
Post-test	76.3 ± 8.9	<0.001

Figure 1: Bar Graph Representing the Mean pre-test and Post-test Scores

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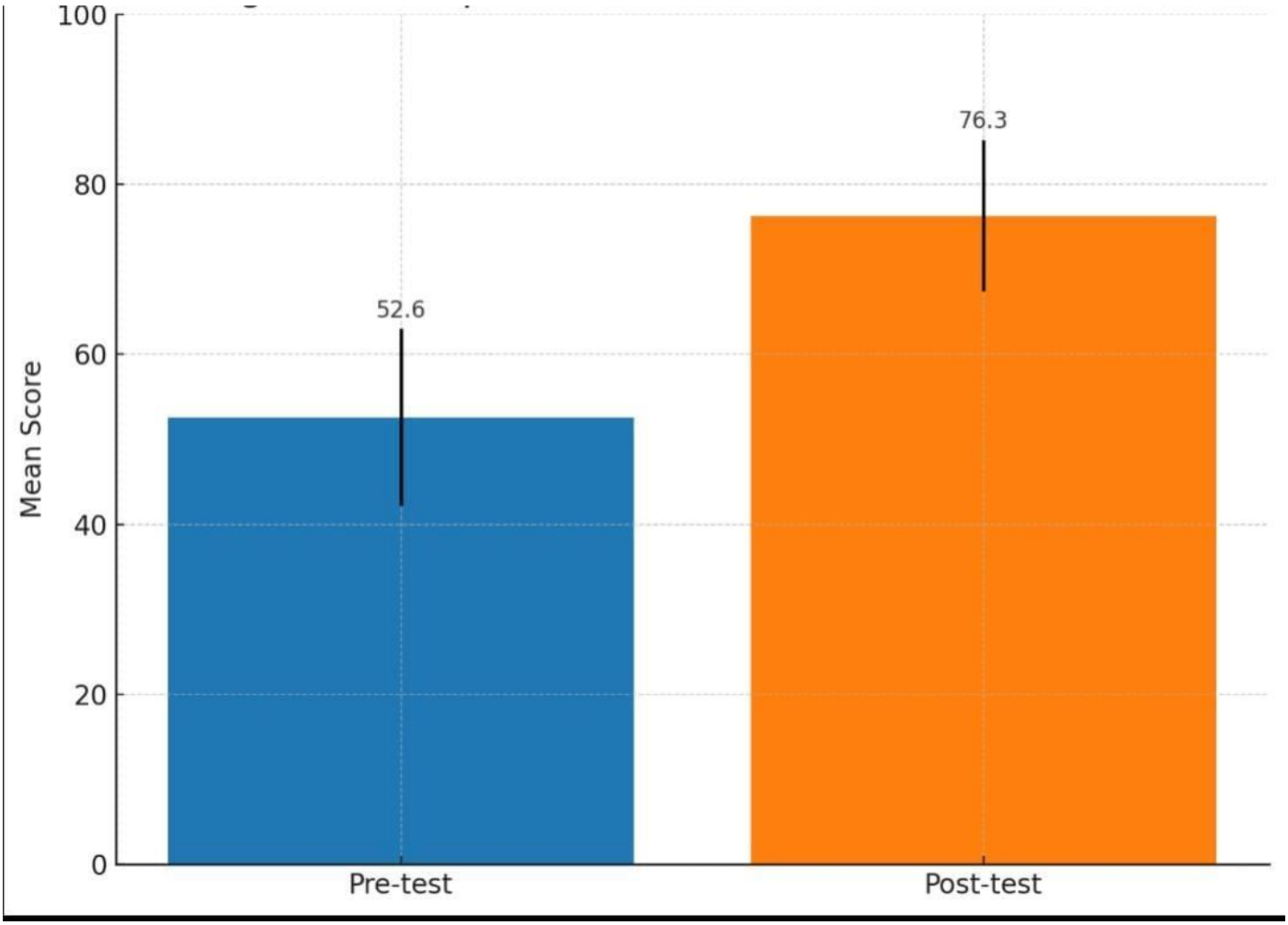

Table 3: Distribution of Students According to Score Ranges (n=80)

Score Ranges (%)	No. of Students (Pre-test)	No. Of Students (Post-test)
0-49	28 (35%)	0 (0%)
50-59	24 (30%)	6 (7.5%)
60-69	10 (12.5%)	7 (8.75%)
70-79	12 (15%)	28 (35%)
80-100	6 (7.5%)	39 (48.75%)

Interpretation

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- Before the intervention, 35% of students scored below 50%, indicating low baseline knowledge.
- After the PSBH intervention, no student scored below 50%.
- The proportion of high scorers (≥80%) increased from 7.5% to 48.75%.
- This shift clearly highlights the effectiveness of PSBH in raising students into higher performance brackets.

Discussion:

This study describes an intervention based on a structured PSBH and demonstrates statistically significant improvements in undergraduate medical students' knowledge about the research methodology. Post-test scores were marked at a mean score of 76.3 ± 8.9, which was vastly higher than the prior version of the test (mean = 52.6 ± 10.4), illustrating that PSBH was an effective approach to modelling complex research concepts like problem identification, hypothesis development, and study design comprehension. It also corresponds to the main goal of the study, which was on investigating the degrees of effectiveness of PSBH in teaching research methodology in a more interactive and learner centric manner. These results are also consistent with global literature that has previously shown the benefits of active learning strategies in medical education when compared to previous studies. In fact, as reported by Freeman et al. (2014), even after taking the instructor's experience into consideration, students who were taught through active learning performed significantly higher than those that were taught by means of traditional lectures. Furthermore, PSBH has also been successfully used in various international settings, such as in South Africa (Marais et al., 2008), China (Zhang & Chu, 2005) and in the USA (Shah et al., 2010) to enhance problem solving skills as well as associated community based health project planning skills. Evidence about the quantitative impact of this on learning of research methodology, especially in South Asian contexts, is also limited and hence the present study is a novel and relevant contribution.

The Impact of PSBH in the educative sense is found in its relevance to real world application. It helps transform the students from being passive recipients of the information to being active learners who can use the principle of research to identify and solve problems in health. It is an experiential learning model that facilitates long lasting retention as well as a deeper understanding of the research process. A second benefit of PSBH is that, through the interactive setup, teamwork, communication, and critical thinking are encouraged, all of which are aspects required of future healthcare professionals. It is different from the conventional teaching methods which are mostly based on rote memorization and passive absorption. Student autonomy, engagement and their ability to apply their knowledge to practical scenarios is encouraged. The findings of

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this study support the case that these factors lead to higher motivation and better academic performance, as indicated by the higher scores in the post-test.

The study has some limitations although it is strong. The results may not be generalizable, as this was conducted in a single institution with limited sample size. Long term retention or behavioral change may not be captured with the intervention's short duration (four weeks). Also, while the use of MCQ questions is validated, it might not grasp the depth of conceptual understanding. Finally, large, multi-center studies will be needed to confirm the utility of PSBH across different academic institutions. Longitudinal studies of retention of research skills and application in real world would be a more balanced assessment. Application of qualitative method, for example via focus groups or interviews, may similarly provide more in–depth knowledge of PSBH–based learning experiences and student feelings towards it.

Conclusion:

This work illustrates that Problem Solving for Better Health (PSBH) improves undergraduates' understanding of research methodology in the medical students. The model is evidenced as an effective learner –centered and interactive method of learning based on the notability of post – intervention test scores. PSBH fills the gap between theoretical concepts and in practice by using problem based learning to actively involve students in identifying real world problems and outline what must be learnt in order for them to be able to solve the given problem. PSBH is not only an educational tool that provides a boost to academic performance, it also develops capacities of critical thinking, collaboration, and decision-making abilities that are important and required to future medical professionals. It is structured yet flexible in terms of its framework, and its potential for use by the students to internalize core research principles in an enduring, meaningful way is ideal. Therefore, it is highly recommended to integrate PSBH into the undergraduate medical curriculum based on its positive impact. This on its own can create a generation of doctors having not just clinical competencies but also research adherence and are thus able to increase the quality of healthcare as part of evidence-based healthcare.

REFERENCES:

1. Grijpma, J. W., Mak-van der Vossen, M., Kusurkar, R. A., Meeter, M., & de la Croix, A. (2022). Medical student engagement in small-group active learning: A stimulated recall study. Medical Education, 56(4), 432–443. https://doi.org/10.1111/medu.14710

Vol. 2(2). DD. March-May, 2025
ONLINE ISSN: 3007-309X
PRINT ISSN : 3007-3081
Authors retain the copyright of this article
Journal of Medical & Health Sciences Review

2. Lakhtakia, R., Otaki, F., Alsuwaidi, L., & Zary, N. (2022). Assessment as learning in medical education: Feasibility and perceived impact of student-generated formative assessments. JMIR Medical Education, 8(3), e35820. https://doi.org/10.2196/35820

3. Moreno, G., Meneses-Monroy, A., Mohamedi-Abdelkader, S., Curcio, F., Domínguez-Capilla, R., Martínez-Rincón, C., Pacheco Del Cerro, E., & Mayor-Silva, L. I. (2024). Virtual active learning to maximize knowledge acquisition in nursing students: A comparative study. Nursing Reports, 14(1), 128–139. https://doi.org/10.3390/nursrep14010011

4. Sukrajh, V., Adefolalu, A. O., & Louw, A. J. N. (2021). Promoting active learning in medical education using the peer teaching model: Perceptions of senior medical students. SN Social Sciences, 1, 158. https://doi.org/10.1007/s43545-021-00170-1

5. Asghar, A. U. R., Aksoy, M., Graham, A. I., & et al. (2023). Developing research skills in medical students online using an active research study. BMC Medical Education, 23, 805. https://doi.org/10.1186/s12909-023-04781-5

6. Karabacak, M., Ozcan, Z., Ozkara, B. B., Furkan, Z. S., & Bisdas, S. (2024). A pilot project to promote research competency in medical students through journal clubs: Mixed methods study. JMIR Medical Education, 10, e51173. https://doi.org/10.2196/51173

7. Brooks, J. V., & Hughes, D. (2024). Flipping the expert: Faculty educator sensemaking during transition to an active learning-based curriculum. BMC Medical Education, 24, 85. https://doi.org/10.1186/s12909-024-05039-4

8. Xu, Y., Shao, Y., Dong, J., Shi, S., Jiang, C., & Li, Q. (2025). Advancing problem-based learning with clinical reasoning for improved differential diagnosis in medical education. arXiv preprint arXiv:2503.06099. https://arxiv.org/abs/2503.06099

Vol. 2(2). DD. March-May, 2025
ONLINE ISSN: 3007-309X
PRINT ISSN : 3007-3081
Authors retain the copyright of this article
Journal of Medical & Health Sciences Review

9. Hicke, Y., Geathers, J., Rajashekar, N., Chan, C., Jack, A. G., Sewell, J., Preston, M., Cornes, S., Shung, D., & Kizilcec, R. (2025). MedSimAI: Simulation and formative feedback generation to enhance deliberate practice in medical education. arXiv preprint arXiv:2503.05793. https://arxiv.org/abs/2503.05793

10. Sumpter, S. (2024). Automated generation of high-quality medical simulation scenarios through integration of semi-structured data and large language models. arXiv preprint arXiv:2404.19713. https://arxiv.org/abs/2404.19713

11. Alsubaie, M. A. (2020). Active learning strategies in medical education: A review. International Journal of Health Sciences, 14(5), 1–9.

12. Barrows, H. S. (1986). A taxonomy of problem-based learning methods. Medical Education, 20(6), 481–486.

13. Best, J. W., & Kahn, J. V. (2016). Research in Education (10th ed.). Pearson Education.

14. Bloom, B. S. (1956). Taxonomy of educational objectives: The classification of educational goals. McKay.

15. Boonyasai, R. T., Windish, D. M., Chakraborti, C., Feldman, L. S., Rubin, H. R., & Bass, E. B. (2007). Effectiveness of teaching quality improvement to clinicians. JAMA, 298(9), 1023–1037.

16. Branch, W. T. (2005). Use of critical reflection in medical education: A teaching strategy to enhance empathy. Academic Medicine, 80(10), 958–964.

17. Chacko, T. V., & Kumar, R. (2015). Introduction of small group teaching in medical curriculum: Students' perspectives. International Journal of Applied and Basic Medical Research, 5(Suppl 1), S41–S44.

18. Chen, C. H., & Lin, M. H. (2022). Effectiveness of flipped classrooms in medical education: A meta-analysis. Medical Education Online, 27(1), 2030393.

Vol. 2(2). DD. March-May, 2025
ONLINE ISSN: 3007-309X
PRINT ISSN : 3007-3081

Journal of Medical & Health Sciences Review

19. Cook, D. A., & West, C. P. (2012). Conducting systematic reviews in medical education: A stepwise approach. Medical Education, 46(10), 943–952.

20. D'Eon, M. (2006). Knowledge loss of medical students on first year basic science courses at the University of Saskatchewan. BMC Medical Education, 6(1), 5.

21. Dolmans, D. H., De Grave, W., Wolfhagen, I. H., & Van Der Vleuten, C. P. (2005). Problem-based learning: Future challenges for educational practice and research. Medical Education, 39(7), 732–741.

22. Dornan, T., Boshuizen, H., King, N., & Scherpbier, A. (2007). Experience-based learning: A model linking the processes and outcomes of medical students' workplace learning. Medical Education, 41(1), 84–91.

23. Green, M. L. (2001). Evidence-based medicine training in undergraduate medical education. Academic Medicine, 76(5), 513–520.

24. Harden, R. M., & Laidlaw, J. M. (2012). Essential skills for a medical teacher: An introduction to teaching and learning in medicine. Elsevier Health Sciences.

25. Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? Educational Psychology Review, 16(3), 235–266.

26. Johnson, D. W., Johnson, R. T., & Smith, K. A. (2007). The state of cooperative learning in postsecondary and professional settings. Educational Psychology Review, 19(1), 15–29.

27. Khan, H., Taqui, A. M., Khawaja, M. R. H., & Fatmi, Z. (2006). Problem-based learning: An instructional strategy and its effectiveness in undergraduate medical education. JPMA, 56(10), 430–433.

28. Kolb, D. A. (1984). Experiential learning: Experience as the source of learning and development. Prentice Hall.

Vol. 2(2). DD. March-May, 2025
ONLINE ISSN: 3007-309X
PRINT ISSN : 3007-3081
Authors retain the copyright of this article
Journal of Medical & Health Sciences Review

29. Kumar, R. (2019). Research methodology: A step-by-step guide for beginners (5th ed.). SAGE Publications.

30. Lea, S. J., Stephenson, D., & Troy, J. (2003). Higher education students' attitudes to student-centred learning. Teaching in Higher Education, 8(3), 321–334.

31. Lim, D. S., & Oh, E. (2019). The effect of blended learning on medical students' achievement and satisfaction. Korean Journal of Medical Education, 31(1), 35–44.

32. McParland, M., Noble, L. M., & Livingston, G. (2004). The effectiveness of problem-based learning compared to traditional teaching in undergraduate psychiatry. Medical Education, 38(8), 859–867.
33. Miles, A., Bentley, P., Polychronis, A., & Grey, J. (2001). Evidence-based medicine: Why all the fuss? This Week in Medicine, 322(7285), 1350–1351.
34. Moust, J. H., Van Berkel, H. J., & Schmidt, H. G. (2005). Signs of erosion: Reflections on three decades of problem-based learning at Maastricht University. Higher Education, 50(4), 665–683.
35. Murad, M. H., Coto-Yglesias, F., Varkey, P., Prokop, L. J., & Murad, A. L. (2010). The effectiveness of self-directed learning in health professions education. Medical Education, 44(11), 1057–1068.
36. Norman, G., & Schmidt, H. (1992). The psychological basis of problem-based learning: A review of the evidence. Academic Medicine, 67(9), 557–565.
37. Novak, J. D. (1998). Learning, creating, and using knowledge: Concept maps as facilitative tools in schools and corporations. Routledge.

38. Nunes, M. C. S., & McPherson, M. (2003). Constructivism vs. objectivism: Where is a difference for designers of e-learning environments? Educational Technology & Society, 6(2), 25–34.

39. O'Neill, P. A., Morris, J., & Baxter, C. M. (2000). Evaluation of an integrated curriculum using problem-based learning in a clinical context. Medical Education, 34(6), 430–436.

40. Prince, M. (2004). Does active learning work? A review of the research. Journal of Engineering Education, 93(3), 223–231.

Vol. 2(2). DD. March-May, 2025
ONLINE ISSN: 3007-309X
PRINT ISSN : 3007-3081

Journal of Medical & Health Sciences Review

41. Qasim, A., Saeed, M., & Ashraf, M. (2020). Comparative study of traditional and problem-based learning in medical education. Pakistan Journal of Medical Sciences, 36(5), 974–978.

42. Razzak, R. A. (2021). Implementation of PSBH in community health training. Journal of Community Health, 46(3), 437–445.

43. Richardson, D. (2013). Teaching evidence-based practice in medical education: Contextual challenges. Medical Teacher, 35(10), 787–789.

44. Rideout, E. (2001). Transforming nursing education through problem-based learning. Jones & Bartlett Learning.

45. Roberts, C. (2011). Using learner-centered methods in medical education. BMJ, 342, d2080.

46. Ross, M. T., & Cameron, H. S. (2007). Peer assisted learning: A planning and implementation framework. AMEE Guide No. 30. Medical Teacher, 29(6), 527–545.

47. Rowe, M., Frantz, J., & Bozalek, V. (2012). The role of blended learning in the delivery of problem-based learning in a South African physiotherapy curriculum. BMC Medical Education, 12(1), 1–7.

48. Sandars, J. (2009). The use of reflection in medical education: AMEE Guide No. 44. Medical Teacher, 31(8), 685–695.

49. Savery, J. R. (2006). Overview of problem-based learning: Definitions and distinctions. Interdisciplinary Journal of Problem-Based Learning, 1(1), 9–20.

50. Schuwirth, L., & Van Der Vleuten, C. (2011). Programmatic assessment: From assessment of learning to assessment for learning. Medical Teacher, 33(6), 478–485.

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51. Srinivasan, M., Wilkes, M., Stevenson, F., Nguyen, T., & Slavin, S. (2007). Comparing problem-based learning with case-based learning: Effects of a major curricular shift at two institutions. Academic Medicine, 82(1), 74–82.

52. Thomas, P. A., Kern, D. E., Hughes, M. T., & Chen, B. Y. (2016). Curriculum development for medical education: A six-step approach (3rd ed.). Johns Hopkins University Press.

53. Thistlethwaite, J. E., Davies, D., Ekeocha, S., Kidd, J. M., MacDougall, C., Matthews, P., … & Clay, D. (2012). The effectiveness of case-based learning in health professional education. A BEME systematic review: BEME Guide No. 23. Medical Teacher, 34(6), e421–e444.

54. Topping, K. J. (1996). The effectiveness of peer tutoring in further and higher education: A typology and review of the literature. Higher Education, 32(3), 321–345.

55. Trigwell, K., Prosser, M., & Waterhouse, F. (1999). Relations between teachers' approaches to teaching and students' approaches to learning. Higher Education, 37(1), 57–70.

56. Vernon, D. T., & Blake, R. L. (1993). Does problem-based learning work? A meta-analysis of evaluative research. Academic Medicine, 68(7), 550–563.

57. Wood, D. F. (2003). Problem based learning. BMJ, 326(7384), 328–330.