

Comparison Between Faculty Members and Students Toward Learning through Problem-Based Learning and Case-Based Learning in an Innovative Curriculum in a Regional University in the KSA

Karimeldin MA Salih*,** Suaad Elnour, Abdulelah Abdullah Sultan Albaqami*** Rajeh Omar Alaklobi**** Kamal Eldin Hussein Elhassan***** Mohammed Abbas*,***** Elwathiq Khalid Ibrahim Abdelmehmoud, Shehab Almalki***** Ahmed Y. Al-Amcei*****,* Tarig Babikir Algak Khalid***** Jaber A. Alfaiifi*

ABSTRACT

Background: Although problem-based learning (PBL) is a well-known innovative method for learning, case-based learning (CBL) was introduced as an alternative.

Aim: This study aims to compare the perception of students and faculty members toward both methods of instruction.

Methodology: A cross-sectional descriptive study where 41 students and 30 faculty members enrolled voluntarily to answer a well-structured questionnaire regarding their perception of PBL and CBL. An analysis for variances was conducted with SPSS version 25, used to reject the null hypothesis to 0.05%.

Results and discussion: The students and faculty members significantly perceived that CBL has better time management during the process (p-value of 0.022). It allows integration with other topics (p-value of 0.014) and the interaction between tutors and students (p-value of 0.010). The students disagreed that CBL needs less preparation before class (p-value of 0.036) and allows collaboration among colleagues (p-value of 0.001). At the same time, the faculty members agreed on both (p values of 0.036 and 0.001, respectively). The faculty members and students decided that CBL applies to all cases with high significance (p-value of 0.002). No significant difference was found in the faculty members' and students' perceptions toward other variances for CBL and PBL. The positive perception of the students and faculty members is following other studies.

Conclusion: Although no one method will be recommended for learning, given the different contexts of each institute, this study sheds some light on the role that could be played by learning through CBL.

Keywords: Problem-based learning, Case-based learning, Perception, Integration, Collaboration

INTRODUCTION

To cope with the global consensus on international medical education standards and offer many other learning methods, innovative curricula have adopted new methods, such as problem-based learning (PBL)¹. PBL has several advantages: it retains knowledge and problem-solving skills; allows the integration between basic and clinical science; makes

basic science digestible; and improves communication, teamwork, and self-directed learning. However, some authors have reported the disadvantages of PBL, such as time management, less provision of theoretical knowledge, and the need for experienced tutors¹⁻⁵. In PBL, every group member has a specific role, and the tutor acts as a facilitator rather than a teacher¹. The educational basis for PBL is an

* Department of Pediatrics, College of Medicine

University of Bisha, KSA.

E-mail: karimeldin641@gmail.com

** Department of Medical Education, College of Medicine, University of Bisha, KSA.

*** Department of Obstetrics and Gynecology

College of Medicine, University of Bisha

Faculty of Medicine, Omdurman Islamic University, Sudan.

**** Student, College of Medicine, University of Bisha, KSA.

***** Department of Community Medicine

College of Medicine, University of Bisha, KSA.

***** Department of Pediatrics

College of Medicine, Arabian Gulf University, Kingdom of Bahrain.

***** Department of Basic Medical Science (Anatomy Unit)

College of Medicine, University of Bisha, KSA.

***** Department of Surgery, College of Medicine,

University of Bisha, 61922 Bisha, Saudi Arabia.

***** Department of Surgery, King Abdullah Hospital, 67713 Bisha, Asir, Saudi Arabia.

***** Department of Basic Medical science (Pathology Unit)

College of Medicine, University of Bisha, KSA.

adult learning theory, which enhances thinking and problem-solving. However, many authors have failed to gather sufficient evidence of the clinical competency of PBL over other learning methods⁵.

Although PBL was well promoted in the literature, other innovative tools for learning, such as case-based learning (CBL), were considered⁶. CBL entails interaction among different disciplines per Bloom's taxonomy⁷⁻⁹. CBL was well studied, and the essential advantage is that it implements many fields simultaneously¹⁰. CBL is an innovative interactive learning process that brings thinking, understanding, recalling, analyzing, and interpreting simultaneously across different disciplines and topics^{7,11,12}. The method of CBL starts with a case given to the students. They are given time to think about it and are later asked questions about it¹².

The objectives of this study are to study the perception of students and faculty members toward CBL and PBL and to determine between the two methods the best educational strategy for learning in an innovative curriculum. The research question is as follows: What learning and instruction through CBL or PBL could be effective from faculty and students' point of view?

Problem-based learning (PBL) is the most essential innovation in medical education over the past 40 years¹. It was developed at McMaster University in response to teacher-centered and discipline-based preclinical medical education prevalent in the 1960s. Students receive teacher-determined material through lectures for reproduction in factual tests². This short-term cramming of large amounts of information organized around isolated subjects did not favor recall in the clinical years. It was neither preparing students to solve clinical problems nor to become self-directed lifelong learners. In contrast, PBL students in tutor-guided small groups attempt to resolve a real-life clinical issue by using their existing knowledge to generate hypotheses and then actively finding the cross-disciplinary expertise they need to understand the problem entirely. Hence PBL is a constructivist⁴, student-centered, and problem-based approach to medical education. It is geared to facilitate knowledge retention and application while fostering the skills desired in physicians, such as clinical reasoning, critical thinking, and self-directed learning². The PBL approach has improved physician competency in the social and cognitive domains⁵.

CBL is an educational paradigm closely related to the more common PBL. This PBL approach is andragogical (adult teaching/learning), posing contextualized questions based on "real-life" problems that may be clinical or nonclinical². CBL's main traits derived from PBL are that a case, problem, or inquiry is used to stimulate and underpin the acquisition of knowledge, skills, and attitudes. Cases place events in a context or situation that promotes authentic learning³. Cases are generally written as problems that provide the student with a patient's background or other clinical condition. Supporting information is provided, such as the latest research articles, vital signs, clinical signs and symptoms, and laboratory results. CBL allows students to develop a collaborative, team-based approach to their education. Other characteristics include hypothesis generation and the consolidation and integration of learning activities³.

METHODOLOGY

This is a cross-sectional study conducted in the College of Medicine, University of Bisha (UBCOM), in the Kingdom of Saudi Arabia (KSA), between November 1, 2019, and February 15, 2020. UBCOM was established in 2014, applying PBL, CBL, and team-based learning (TBL) as the principal methods of learning, in addition to seminars, interactive lectures, bedside teaching in hospitals, and practicals in skill labs.

The survey questionnaire was well structured and self-administered, adopted from a previous study⁶, with 12 questions related to the perceptions of students and faculty members toward PBL and CBL, including their perceptions on time management during the process, preparation before class, collaboration, and interaction among colleagues, applicability for all cases, applicability for clinical cases only, advantages over each other, integration with different topics, in-depth study, the interaction between tutors and students, independent learning, enhancements of self-directed learning, and the chance for quiet students to show themselves.

30 (64%) of the faculty members answered all the questions, but two students did not answer all the questions. A total of 41 students (100%) responded to the questionnaire, and 95% responded to all the questions^{12,13}; 30 (64%) faculty members responded and answered the questionnaire. The expected answer for these 12 variances is "agree," "neutral," or "disagree." The analysis is for students and faculty members who agree and disagree on each variance. SPSS version 25 was used to reject the null hypothesis to 0.05%. Ethical approval was granted from the research and ethical committee.

UBCOM has adopted the SPICES curriculum in which PBL is the principal instructional method. The model used in UBCOM is based on the seven steps (jumps) adopted by Maastricht¹⁴. The curriculum committee should supervise and support the implementation of PBL as a principal instructional method. There is a PBL sub-committee responsible for formulating a problem team for each problem separately from the course committee and PBL subcommittee and assigns one of the members as a team leader. The PBL subcommittee supervises the whole process of the PBL method from construction up to conduction. CBL is a learning and teaching approach that aims to prepare students with authentic clinical cases for clinical practice.

The process of the CBL implementation in UBCOM is that the title of the case would be suggested by the course coordinator in collaboration with the assigned tutor (content expert) and approved by the curriculum committee (CBL coordinator). After the approval of the title, the content expert should draft the CBL outcomes and case scenario and forward it to the course coordinator to be submitted to the CBL coordinator by the course coordinator for final approval.

The process of the CBL implementation: The case scenario should be projected for the students at the beginning of the session. The students should respond to the whole question individually before starting the discussion. After the students are distributed in the class properly to prevent cheating; the presence of a second tutor during the first 30 minutes is usually considered. The tutor will lead the discussion, stimulating students for critical discussion and deep thinking, and give feedback and a summary of the case scenario at the end of session¹⁵.

RESULTS

The students and faculty members significantly perceived that CBL has better time management during the process (p-value of 0.022). It allows integration with other topics (p-value of 0.014) and the interaction between tutors and students (p-value of 0.010). The students significantly disagreed that CBL needs less preparation before class (p-value of 0.036) and allows collaboration among colleagues (p-value of 0.001). At the same time, the faculty members agreed on both (p values of 0.036 and 0.001, respectively). The faculty members and students decided that CBL applies to all cases with high significance (p-value of 0.002). No significant difference was found in the faculty members' and students' perceptions toward other variances for CBL. For the same variance applied to PBL, neither the faculty members nor

Comparison Between Faculty Members and Students Toward Learning through Problem-Based Learning and Case-Based Learning in an Innovative Curriculum in a Regional University in the KSA

the students had a significant difference in agreement and disagreement (p-value of more than 0.05) (Table 1 and 2).

DISCUSSION

Few published articles have compared PBL with CBL. To the authors' knowledge, this is the first study to reflect the views of students and faculty members toward innovative methods of instruction such as PBL and CBL in an innovative curriculum in a newly established university in KSA. In contrast to PBL, the study reflects a positive perception of CBL in areas such as time management during the process, less preparation before class, facilitating collaboration among colleagues in class, applicability for all cases, the promotion of integration with other topics, and the allowance of interaction between tutors and students. The findings of this work agree with the opinions of students and faculty members at the University of California and Los Angeles⁶. The enhancement of collaborative learning through CBL was perceived positively by students and faculty members in this work, consistent with that of Curran et al. (2008)¹⁴. Studies among Indonesian universities and undergraduates in the Northeast University who use case-based studies in psychology perceive CBL positively, which is in harmony with this work^{15,16}. The same positive perception toward CBL aligns with the University of Western Australia (Srinivasan et al., 2007; Williams, 2005) and among pharmacology students in the Medical

College and KEM Hospital Parel and Indian medical schools^{11,13,17}. The faculty development program in UBCOM is conducted every week at the departmental level and every other week for all the faculty members—which allows updating and changing experiences among faculty members and discussing the process of learning and assessment in the institute—trains faculty members to run any instructional method in the college¹⁸.

In contrast to our findings where students negatively perceived PBL, another local study in the College of Medicine, King Saud University (KSU), KSA, showed that the students perceived PBL positively¹. Many reasons could explain such a difference. First, the curriculum at KSU is a hybrid, while that in UBCOM is innovative and integrated. Second, the sample size at KSU is more significant than that in UBCOM. Third, the study conducted at KSU examines the students' views toward PBL only, while that performed in UBCOM examines the views and perspectives of the students and faculty members toward PBL and CBL. Fourth, at KSU, both genders were enrolled in the study, in contrast to UBCOM, where only male students were enrolled. Finally, although both PBL and CBL entail learning in small groups, in our setup, the group is very small, which might affect their decisions toward instructional methods. We cannot ignore the experience of the tutor, whether he facilitates PBL or CBL, and his effect and impact on his student to their decision on any method of learning.

Table 1: Perception of students and faculty members towards instruction by CBL (N=71(41 students, 30 faculty members))

Variables	Students			Faculty members			P value
	Agree	Neutral	Disagree	Agree	Neutral	Disagree	
CBL							
Better time management during the process	15	16	9	21	8	1	.022
Less preparation before class	5	11	10	18	11	14	.036
Allow collaboration and interaction between colleagues	8	13	18	20	5	5	.001
Applicable for all cases	14	18	7	6	6	18	.002
Better for Applicable for clinical cases only	23	12	4	22	4	4	.219
Advantages over PBL	14	12	13	10	12	8	.531
Allows integration with other topics	19	9	11	24	4	1	.014
Allows study in depth	21	9	9	22	1	1	.068
Allows interaction between tutors and students	20	11	8	26	3	1	.010
Allow independent learning	25	10	4	24	5	1	.275
Enhance self-directed learning	28	6	5	27	3	0	.091
Good chance for quite a student to show himself	18	11	10	18	7	5	.404

Table 2: Perception of students and faculty members towards instruction by PBL (N=71(41 students, 30 faculty members))

Variables	Students			Faculty members			P value
	Agree	Neutral	Disagree	Agree	Neutral	Disagree	
PBL							
Better time management during the process	19	11	9	17	9	4	.459
Less preparation before class	10	9	20	9	10	11	.378
Allow collaboration and interaction between colleagues	29	8	3	23	5	2	.825
Applicable for all cases	22	7	11	14	5	11	.696
Better for Applicable for clinical cases only	15	11	14	9	7	14	.631
Advantages over CBL	18	11	10	9	13	7	.497
Allows integration with other topics	23	9	6	21	6	3	.382
Allows study in depth	19	15	6	21	5	4	.178
Allows interaction between tutors and students	27	9	4	20	4	5	.652
Allow independent learning	28	10	1	24	5	1	.508
Enhance self-directed learning	27	11	2	23	5	2	.591
Good chance for a quiet student to show himself	25	10	5	21	6	5	.760

STRENGTHS

The study attempts to consolidate on alternatives for teaching: a science environment for teaching, the nature of students, and different resources and instructors for each venue. The study adds humble work to the medical education literature, dealing with an innovative curriculum as the case in this study shows a preference for CBL.

LIMITATIONS

While the small sample might affect the generalization of the study, this may open doors for future similar studies.

RECOMMENDATION

It was apparent faculty and students had a negative perception of time management and integration for PBL, therefore: Conduction of PBL should be well prepared, with rehearsal well and planned distribution of the 2-hour conduction for the first session through the different parts of the conduction (reading silently, reading within the group, brainstorming and extracting learning outcome), making the presentation of the problem through a screen rather than hard copies will make student concentrate and think loudly. Identifying the problem itself (giving it: the title, reference number, authors' names, and reviewers' names) will lead to more commitment from those who design and conduct it. Problems banking will allow smooth running through the whole period of the course. A well-prepared problem will allow proper integration and better time management where much time directed to brainstorming and establishing the learning object necessitates faculty training. On the other hand, although students are satisfied with the process of CBL conduction, to make it more authentic, it is better to give questions in three phases (history, physical examination, management) and collect their responses after each phase. When the response of the students to CBL is through groups, rather than individuals, it will allow improving the skills of interaction, communication, and problem-solving and finally, the selected case should be from real life in hospital or primary health care.

CONCLUSION

Although no one method will be recommended for learning given the different contexts of each institute, this study throws some light on the role that could be played by learning through CBL.

Authorship Contribution: All authors share equal effort contribution towards (1) substantial contributions to conception and design, acquisition, analysis and interpretation of data; (2) drafting the article and revising it critically for important intellectual content; and (3) final approval of the manuscript version to be published.

Potential Conflict of Interest: None

Competing Interest: None

Acceptance Date: 18 April 2022

REFERENCES

1. Al-Drees AA, Khalil MS, Irshad M, et al. Students' perception of the problem-based learning tutorial session in a system-based hybrid curriculum. *Saudi Med J* 2015;36(3):341.
2. Rakhudu MA, Amaize A, Useh U, et al. Inter and intra-professional collaboration in the implementation of problem-based learning in nursing education: lesson for South Africa. *Life Sci J* 2012;9(4):344-53.
3. Azer SA, Peterson R, Guerrero AP, et al. Twelve tips for constructing problem-based learning cases. *Med Teach* 2012;34(5):361-7.
4. Hartling L, Spooner C, Tjosvold L, et al. Problem-based learning in pre-clinical medical education: 22 years of outcome research. *Med Teach* 2010;32(1):28-35.
5. Colliver JA. Effectiveness of problem-based learning curricula: research and theory. *Acad Med* 2000;75(3):259-66.
6. Srinivasan M, Wilkes M, Stevenson F, et al. Comparing problem-based learning with case-based learning: effects of a major curricular shift at two institutions. *Acad Med* 2007;82(1):74-82.
7. Krathwohl DR, Anderson LW. A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives. Longman 2009.
8. Bloom B. Taxonomy of Educational Objectives: The Classification of Educational Goals. Handbook I: Cognitive Domain. 1956.
9. Krathwohl DR. A Revision of Bloom's Taxonomy: An Overview. *Theory Into Pract* 2002;41(4):212-8.
10. Aha DW. Relating relational learning algorithms. *Ind Log Program* 1992;38(1):233-54.
11. Galgaonkar SV, Sarkate PV, Tripathi RK. Students' perception about small group teaching techniques: Role play method and case-based learning in pharmacology. *Educ Med J* 2012;4(2).
12. Russel AT, Comello RJ, Wright DL. Teaching strategies are promoting active learning in healthcare education. *J Educ Human Development* 2007.
13. Sodhi-Berry N, Iredell H. Problem-based learning versus case-based learning: Students' perceptions in pre-clinical medical education. In *Educating for sustainability. Proceedings of the 19th annual teaching learning forum* 2010;28-9.
14. Wood DF. ABC of learning and teaching in medicine: Problem based learning. *BMJ* 2003;326(7384):328-30.
15. Kjørulff, Uffe B, Rosenstand, et al. Case-based learning (CBL) - A new pedagogical approach to multidisciplinary studies. 36th SEFI Annual Conference 2008 - Quality Assessment, Employability and Innovation. red. / Flemming Fink. Brill | Sense. 2008.
16. Curran VR, Sharpe D, Forristall J, et al. Student satisfaction and perceptions of small group process in case-based interprofessional learning. *Med Teacher* 2008;30(4):431-3.
17. Hanifah S, Febrianti Y, Suraya C. Student's perception on case based learning implementation and foreign lecturer participation in medium classroom. *AIP Conf Proc* 2018;2026(1):020034.
18. Smith JS, Malkani J, Dai DY. Student Perceptions of the Case Method in Educational Psychology and Its Impact on Teaching and Learning. *Teaching Educ Psych* 2005;1(1):n1.
19. Uma SV, Shankar N. Students' perceptions about the use of case based learning during dissections in an Indian medical college. *Eur J Anat* 2017;21(3):219-23.
20. Salih KM, AL-Shahrani AM, Eljac IA, et al. Perception of faculty members of regional medical school toward faculty development program. *Sudan J Med Sci* 2019;14(3):65-77.