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## **Problem based learning and team based learning efficiency among postgraduate nursing students in RAK medical and health Science University: A cross sectional study**

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### **Abstract**

Teaching strategies in the field of medical education has undergone tremendous changes in the last few years in order to help increasing the level of student learning. As the traditional problem based learning (PBL) requires intensive resources, there was a need to develop new technology like team based learning (TBL) to boost students desire for active learning. Hence, the present study was developed to compare the efficacy of TBL and PBL among postgraduate nursing students in RAKMHSU. Two similar questionnaire were developed to record Students feedback on TBL and PBL. Overall results of the present study showed that students benefited significantly from PBL sessions when compared to TBL sessions especially regarding learning domain. Students reported that PBL is still their preferred learning method. Proper formulation and integration of both PBL and TBL in the medical education process is needed in order to maximize their mutual benefits.

**Keywords:** TBL, PBL, postgraduate nursing

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### **Introduction**

Medical education teaching strategies has tremendously progressed in the last few years to help students to achieve a higher level of learning <sup>[1]</sup>.

The traditional problem based learning (PBL) is proven to be effective however this method of teaching requires intensive resources including many tutors for a small number of students <sup>[2-3]</sup>.

TBL is one of the recently introduced method in the field of medical education <sup>[4]</sup>. It was first introduced by Larry Micheleson in a business school in in 1970 <sup>[5]</sup>. The reason behind using TBL is to augment active learning process, improve problem-solving skills, and encourage teamwork among medical students <sup>[6]</sup>. In addition, TBL is an active learning technology where students can increase their knowledge through discussions within small groups <sup>[7]</sup>. Moreover, TBL does not need many tutors and has the advantage to encourage students for active learning process and to develop a sense of responsibility towards their colleagues in the same team <sup>[8, 9]</sup>.

TBL is composed of three consecutive phases: 1) preparation phase where the students study alone guided by the learning objectives sent by the Preassigned faculty member, 2) in phase two students will be able to demonstrate their acquired knowledge through two multiple choice questions tests: individual readiness assurance testing (iRAT) and team readiness assurance testing (tRAT), and 3) students team will complete assignments to apply the concepts that they gained in phase one and two <sup>[10, 11]</sup>.

PBL share some features with TBL as being conducted in small student groups, encourages active learning process and helps in

problem solving. Nevertheless, TBL's exceptionality is that it is considerably less demanding in terms of faculty resources. It is typically conducted in one large classroom where the students are divided into small groups. Moreover, one instructor can conduct a TBL session for more than 100 students <sup>[12, 13]</sup>.

Reviewing the literature, we did not find any study comparing the impact of TBL and PBL on learning process among postgraduate nursing students in RAKMHSU therefore the current study will be the first to undercover such effect.

### **Methodology**

#### **Sampling and participants**

This descriptive cross sectional study included all the postgraduate nursing students registered in RAKMHSU for the academic year 2018-2019 (total n=31).

#### **Study materials and data collection procedure:**

TWO identical questionnaire comparing PBL and TBL were distributed to student participants following the completion of their teaching courses. Each questionnaire was constructed through adopting a three-level modified model of the Kirkpatrick's learning and training evaluation theory <sup>[14]</sup>. This model could evaluate the three most important levels of educational evidence including: reaction, learning, and behavior through quantitative questions. Quantitative questions were scaled from 1 to 5 depending on level of agreement (with 1 corresponding to least agreement and 5 relating to highest agreement).

Moreover three qualitative open-ended questions were added: such questions would accommodate any additional opinions or suggestions from the students.

### Data analysis

SPSS statistical software was used to examine the relationship between the different components of the questionnaire. Whereas Wilcoxon and Mann-Whitney *U*-test was performed to rate the three domains of the quantitative questionnaire. Comparative analysis was implemented using proper statistical methods to clarify the obtained results. All the mean values were represented as means  $\pm$ SD. open-ended questions were analyzed using directed content analysis. The main themes for the analysis were structured based on the subthemes of the three domains. Similar domains were then merged together <sup>[15]</sup>.

### Ethics approval

The RAKMHSU Ethics Committee approved the study. Verbal consent for participation was obtained from participants to enable us to include their data from this study and to insure confidentiality

### Results

#### Student questionnaire

In total, 24/31 of students completed the two questionnaire regarding their PBL and TBL Experience.

#### Responses of the students on the learning domain of the TBL and PBL questionnaire

Here students found that PBL was significantly better than TBL in almost all aspects of learning domain. They ranked immediate correction of mistakes and concepts as the greatest advantage of both TBL (3.37 $\pm$ 0.19) and PBL (2.79 $\pm$ 0.23); while they reported that TBL fail to prepare them for the module exam and gave it the lowest score (2.88 $\pm$ 0.34) while they reported that Being part of a TBL group did not improve their thinking process with the lowest average score (2.5 $\pm$ 0.01).

In PBL students benefited significantly from Immediate feedback was helpful and found it useful with an average of (3.25 $\pm$ 1.9) in comparison to an average of in TBL (2.79 $\pm$ 0.32). (Fig1). In addition the students reported that being part of a PBL group significantly improved their problem solving abilities with an average score of (3.37 $\pm$ 1.23) in comparison with an average of (2.63 $\pm$ 0.45) in TBL. (Fig1)

#### Responses of the students on the reaction domain of TBL versus PBL questionnaire

The students highlighted the value of small group size students during both TBL and PBL by giving them the highest average score (3.50 $\pm$ 1.20), 3.23 $\pm$ 0.45 respectively. Meanwhile the students did not notice any improvement in TBL as time passed and gave it the lowest average score (3.12 $\pm$ 0.05) (Fig.2) whereas in PBL the students gave the lowest average score to usefulness and contribution of a subject specialist (2.65 $\pm$ 0.98). (Fig2)

In TBL, students benefited significantly from the interactivity of the session with an average of (3.2 $\pm$ 1.12) in comparison to an average of in PBL (2.70 $\pm$ 0.34). (Fig 2).in addition the students reported that they found that the presence of the subject specialist in TBL and his contribution in the discussion was significantly

valuable and useful with an average of (3.41 $\pm$ 1.12) versus an average of (2.65 $\pm$ 0.98) in PBL (Fig 2)

#### Responses of the students on the Behavior domain of the TBL and PBL questionnaire

Overall perception of students regarding changes in their behavior with respect to introduction of TBL was significantly satisfactory in comparison to PBL.

The students perceived that with introduction of TBL sessions, their self-evaluation process had improved and they gave it the highest average score of 3.67 $\pm$ 1.23 while they found that PBL helped them to respect other opinions with an average score of (3.58 $\pm$ 0.45).(Fig3) Nevertheless, they reported that PBL session did not help them to study on daily basis and they gave it the lowest average score of (2.87 $\pm$ 0.0) (Fig 3) While they did not feel that TBL had a greater impact on improving their communication skills (3.05 $\pm$ 0.23).In addition students found that TBL sessions helped them significantly to analyze clinical scenarios (3.45 $\pm$ 1.45) in comparison to PBL (2.88 $\pm$ 0.08),(Fig3)

#### Analysis of qualitative responses regarding TBL and PBL

As for the qualitative analysis, it compared three themes regarding TBL and PBL: 1) they are an effective tool for learning perceptions and correcting mistakes, 2) they offer an exclusive self-assessment method by providing students with the chance to study frequently, and 3) they enable integration of theory with clinical application. Table 1 outlines percentage of these aforementioned themes.

### Discussion

This study was conducted to undercover perception of postgraduate nursing students towards PBL and TBL during their various studying blocks. Results of our research showed that students benefited from both TBL and PBL in different perspectives, favoring PBL to be the best tool to gain better learning outcome in medical education.

Our students admitted that PBL sessions improved their learning and knowledge in comparison with TBL. Most of our students strongly agreed that PBL had smoothed their way for reading diverse and recent bibliographic sources. Similarly, other studies reported that students following curriculum based PBL benefited from the use of the library and were more confident in their self-determining information-seeking skills <sup>[16, 17]</sup>. Relevant studies have also reported that students experiencing PBL have better abilities to identify their own learning concerns, <sup>[18]</sup> to interact efficiently with other participants, <sup>[19]</sup> and to experience a tendency to explore new concepts that made learning interesting <sup>[20]</sup>.

Students reported that group discussion offered during the PBL sessions was extremely important as it allowed them to get better understanding of concepts and helped them to undercover their misconceptions <sup>[21]</sup>. Group discussion has been reported to give students broader opportunities for clinical reasoning, and the opportunity to discuss their individual clinical experiences. In addition results from a previous study reported that group discussion, where previous knowledge is triggered, may have a positive influence on learning <sup>[22]</sup>. In addition, our students explained that PBL helped them in terms of preparation for examinations and assessments when compared to TBL. This observation may be because during PBL, students are encouraged

to design and monitor their own learning, as they are not given pre-reading tasks like in TBL. Moreover, during a PBL session, they are encouraged to generate their own questions for additional self-directed learning which will promote long lasting learning skills<sup>[23]</sup>. Results from fifteen studies conducted in China showed that introduction of PBL resulted in a significant increase in students' theoretical examination scores in Preventive Medicine<sup>[24]</sup>. In another study conducted in Turkey, medical students with a PBL based curriculum scored significantly higher than the traditionally tutored group<sup>[25]</sup>.

Our Students also reported that being part of a PBL group improved significantly their thinking process as compared to TBL. Other studies reported similar results as implementation of PBL encourages students to think critically in the form of questioning and discussing problems<sup>[26]</sup>.

Majority of students in the present study reported that PBL sessions improved their problem solving abilities compared to TBL sessions. Similarly 70.4% of medical students in a study done in Malaysia strongly agreed that PBL boosted their problem-solving abilities<sup>[27]</sup>. This demonstrates the fact that PBL helps in improving practical application of concepts learned.

The PBL process does not concentrate on problem solving with a defined solution, but it permits the development of other necessary skills and characteristics. This includes knowledge achievement, enriched group cooperation and communication<sup>[28]</sup>. In the current study students reported that immediate feedback offered during PBL sessions was extremely helpful (as compared to TBL sessions), as it allows them to recognize their weaknesses and correct them. Also immediate feedback promote discussion and challenge answers between students.

As for reported benefits from TBL Sessions, our students reported that working in small groups in TBL (compared to larger groups in PBL) increased significantly their participation in the session and improved their peer learning. They found that the iRAT and tRAT are motivating and engaging. Moreover in other related studies, students reported that small Groups size in PBL motivated them to prepare for the session and engage in discussions<sup>[29, 30]</sup>. Interestingly, Burgess *et al.* reported that

although students appreciated the clinical reasoning and discussion in PBL, they reported that large group size hindered their learning<sup>[9]</sup>.

Another reported TBL benefit from our students was the fact that TBL sessions were more interactive than PBL and they declared that is due to availability of self-study readings given before TBL session. In a similar study students mentioned that they felt more enthusiastically engaged during TBL session due to two important key elements, including the smaller group size, and the team readiness assurance tests<sup>[31]</sup>.

Our study revealed that students significantly appreciated the availability of subject specialists during TBL sessions in comparison to PBL and they explained that this render TBL an enriching educational experience. In addition, they reported that the feedback was more accurate and clinically relevant when an experienced senior clinician is their TBL facilitator. Also, they felt that providing clinical relevant scenarios by TBL facilitators who were clinicians led to better learning, and an augmented understanding of the integration and relevance of the basic science concepts. Such result has been reported in another study, which demonstrated that students prefer the systematic guided approach in learning where the specialist facilitator plays a crucial role in the organization of the discussions<sup>[32]</sup>. Nevertheless, in PBL, students found the variability of clinical expertise of their facilitators, and lack of guidance hindered their learning progress within groups.

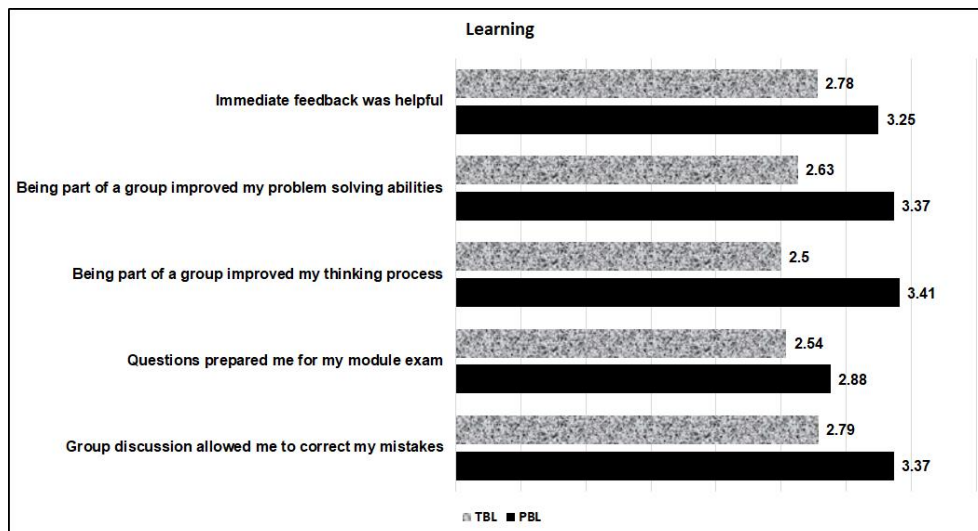
Excellence in communication is critical for health care and patient safety, mainly within

Increasingly complex healthcare systems. Our students founded that their communication skills improved significantly after PBL sessions (compared to TBL sessions) as PBL rely upon the ability of students to work together in order to identify and analyze problems, and/or generate solutions. However, they did not feel that TBL had a greater impact on improving their communication skills.

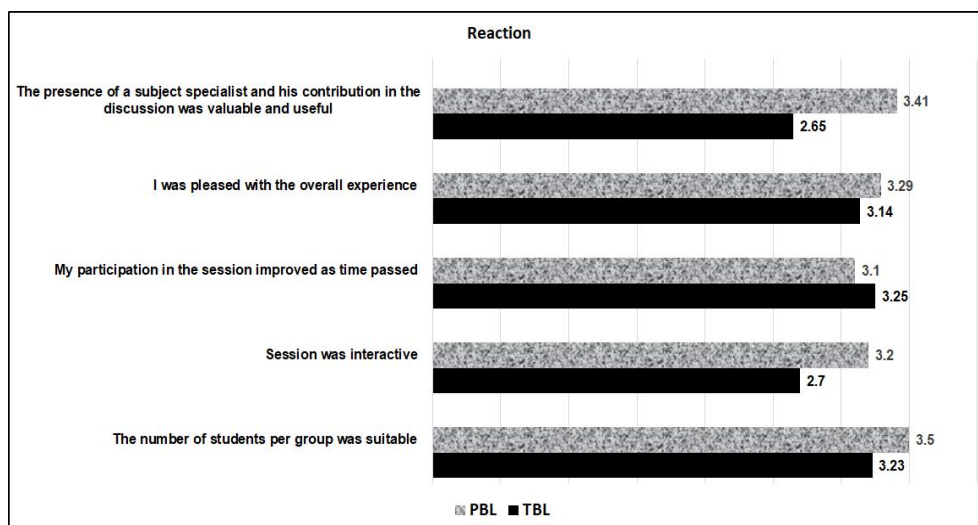
## Tables and figures

**Table 1:** Qualitative data from direct insert analysis

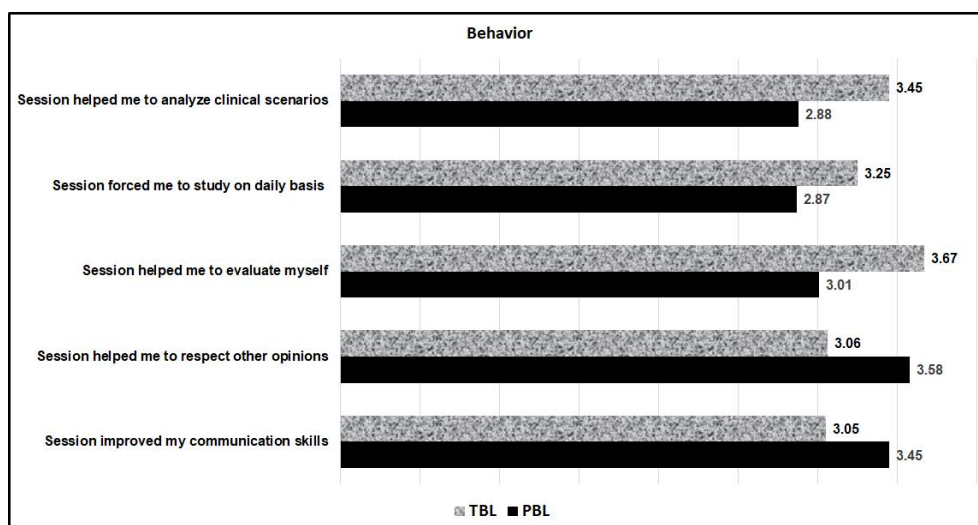
Theme	Percentage in PBL	Percentage in TBL
group discussion as a means to understand concepts and correct mistakes	62.5 % (n=24)	37.5% (n=24)
Session represents a means for students to study on daily basis	20.9% (n=24)	79.1% (n=24)
Advantage in preparing students for clinically oriented exam questions	33.3% (n=24)	66.7% (n=24)



**Fig 1:** Illustration of the responses of the students on the learning domain of the TBL and PBL questionnaires. Mean scores and standard deviation of the responses made by the students on each question of this domain are also given.



**Fig 2:** Illustration of the responses of the students on the reaction domain of the TBL and PBL questionnaires. Mean scores and standard deviation of the responses made by the students on each question of this domain are also given.



**Fig 3:** Illustration of the responses of the students on the behavior domain of the TBL and PBL questionnaires. Mean scores and standard deviation of the responses made by the students on each question of this domain are also given.

## Conclusions

Based on observations of the postgraduate nursing students involved in the study, implementation of PBL in our institution has resulted in more positive outcomes in the three assessed domains (reaction, learning, and behavior), when compared to TBL. Students reported that their learning competencies have shifted from knowledge to the ability to solve complex problems, communicate and collaborate effectively. We will continue to modify

TBL and PBL based on students' evaluations and feedback, as we believe that both are needed to promote and maintain an effective learning environment for our students. However, whether TBL precedes PBL or both methods have to be introduced simultaneously merits further investigation.

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