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Team-Based Learning on Teaching Medical and Health Terminology

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Abstract
This study aimed at evaluating the effectiveness of TBL teaching and learning Medical and Health Terminology subject. The TBL session has been undertaken in two phases, commencing with the Individual Readiness Test (IRT), and followed the Group Readiness Test (GRT). The outcomes indicated the significance of scoring between the two phases for both components, which are suggestive of TBL implementation, showing a positive response from students. The statistical analysis has also revealed score differences between the Medical and Health Terminology subjects, according to student background. TBL should advocate and actively promoted in all issues for the Health Administration program.

Keywords: Team-Based Learning, Academic Performance, Universiti Teknologi MARA

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1.0 Introduction

Team-Based Learning (TBL) is one of the recent educational approaches that has gained academic attention and interest in the teaching of many academic disciplines, particularly business and medicine (Vasan et al., 2008). It is known as a student-centred learning style, which requires fewer resources compared to other active learning techniques (Fatmi et al. 2015). TBL module consists of three phases (Michaelsen et al. 2004). The first phase is the individual preparation phase. During this session, students learn book chapters, articles or digital resources, according to the learning objectives, described by the instructors. The second phase is the readiness assurance phase which includes individual readiness assurance test (iRAT) and team readiness test (tRAT). In iRAT, students engage in a particular closed-book knowledge test to evaluate their understanding of the learning materials. The format of the test usually consists of 15 to 25 multiple-choice questions. The same test is administered to the students in small groups of 5–7 students (tRAT). During the tRAT, students discuss and debate the answers with their team members, and the instructors then reveal the correct answers. Meanwhile, the third phase is the application phase, in which that the small groups involved in an application activity, designed to develop problem-solving, cooperative decision making and facilitate learning through elaboration, discussion and debate (De Vries et al. 2018).

The relevance of TBL given tertiary level education is quite apparent, with many professions expecting work to be more productive and efficient when done in teams. The recent years have displayed an increasing practice of TBL in the medicine/health disciplines to encourage the importance of small-group teaching in a large group setting (Najdanovic-Visak, 2017). The exercise has been used as a teaching method in over 60 health science professional schools in the US and other countries (Suno et al., 2013). However, there are only a few publications on the topic sourced from Asia, while there is only one study from India (Khogali, 2013). Unfortunately, it is also less practised in a widespread manner in the higher education landscape in Malaysia. To our knowledge, only the Faculty of Medicine, Universiti Kebangsaan Malaysia, and Faculty of Education, Universiti Putra Malaysia have adopted TBL so far (Suno et al., 2013). TBL

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is considered as one of the best teaching techniques because it enables the work task to be performed well with the help of the whole team. Presently, TBL has been successfully adopted in various contexts, including medicine or health, to promote the teaching conducted on the minimum number of students working in a group (Najdanovic-Visak, 2017). TBL has been widely utilised as a teaching technique in over 60 health science professional schools in the US and other countries (Suno et al., 2013). Apart from that, several studies on TBL has been established in several parts of Asia and one study from India (Khogali, 2013). Concerning this study, it should be noted that TBL is not widely practised in Malaysian tertiary education. According to the data, TBL has only been adopted by the Faculty of Medicine, Universiti Kebangsaan Malaysia and Faculty of Education, Universiti Putra Malaysia (Ismail, 2016). It has thereby begged the issue of ineffectiveness in teaching health/medicine subjects. Despite the excellent response from students regarding the use of TBL intervention in health subjects, little is known about the efficiency of TBL in teaching Medical Terminology and anatomical concepts. Hence, this study has been conducted in UiTM to evaluate the effectiveness of the TBL approach in teaching Medical and Health Terminology subject.

2.0 Literature Review

TBL has been regarded as a teaching technique that inspires and establishes various vital independent skills, such as communication, problem-solving and leadership skills. Both students and teachers have been known to benefit from the exercise, as it elevates student satisfaction and enjoyment in learning, while also allowing teachers to manage student learning activities (Vasan et al., 2008). Besides, TBL enables students to work collaboratively in teams to solve high-intensity problems and "burning questions". As a result, they demonstrate a high level of engagement in the TBL session (Levine et al., 2004; Chung et al., 2009). Its design is tailored to ensure students benefit from the collaborative form of learning in permanent teams (Michaelsen & Sweet, 2008). This is due to such team-learning activities capabilities to control the process of information exchange regarding issues discussed in the team (Van Offenbeek, 2001).

Several studies demonstrated the successfulness of the TBL implementation in medical and health sciences education. TBL enhanced the visual, aural, writing and kinetic learning styles in order to reinforce the knowledge and allow longer retainment, which is especially vital in basic sciences (Ismail, 2016). A study done by Balwan et al. (2015) found that TBL leads to in an active engagement, facilitated group learning, and increased student and faculty's satisfaction. Likewise, TBL displayed better knowledge achievement, particularly among academically poor students than passive lectures. TBL was also regarded as an efficient strategy for educating knowledge in neurological settings and neurological emergencies in undergraduates (Tan et al. 2011).

Meanwhile, in nursing education, integrating TBL intervention exhibited better progress and constancy in the nervous system inspection knowledge than traditional didactic lecture-based instructional strategy (Hemmati et al. 2015). In India, the TBL approach showed a positive educational outcome among medical students concerning knowledge achievement, student's involvement, engagement and teamwork (Doshi, 2017). Likewise, Punja et al. (2014) found that the TBL method improved student engagement with course content enhanced their understanding of course content and believe that it will help them accomplish better in their final exams. Furthermore, a study in Brazil found a positive perception of the TBL session among nutritional sciences students. They believed that TBL provided nutritionists with better technical training, critical judgment, and communication skills (Jaime et al. 2018). Many pieces of evidence reported the principle advantage of TBL over other methods. A comparative study by Jafari et al. (2014) in Iran found that there were significant knowledge attainment and student's satisfaction with TBL as an instructional method in neurology than conventional lecture.

Moreover, another study suggested that TBL as a comprehensive application in medical education (Chung et al. 2019). Meanwhile, Koles et al. (2005) found that TBL as equally effective in helping students with lower academic performance and the best student of the year (Wiener et al. 2009). A comparison study of team-based and mixed active-learning methods revealed that students rated good satisfaction score with both teaching methods; however, student grades were significantly higher in the TBL session (Zingone et al. 2010).

Effective learning in the higher institution has been hindered by challenges like traditional lecture setting, conducted in a large stage and subsequently discouraging active learning among students. This has spurred the rising efforts among academicians to incorporate various forms of student-active learning, which includes in-class, and blended learning like TBL and Problem Based Learning (PBL)(Yuretich & Kanner, 2015). Furthermore, TBL approach is also cost-effective strategy as this approach allows a single facilitator to conduct multiple small groups simultaneously in the same classroom, as an instructional intervention that can be used for groups as large as 200 (Haque & Majumder, 2017) (Boonshoft school of medicine).

Limited information about the TBL implementation in Malaysian's education system. According to the review by Haque & Majumder, (2017), Universiti Kebangsaan Malaysia (UKM) is one of the universities in Malaysia that is actively introducing TBL strategy beside traditional lecture and another active teaching technique (Salam et al. 2014). It was shown that the attitudes from facilitators towards TBL implementation have been very affirmative and constructive. A study in the same setting revealed that applying TBL to medical genetics course has increased student's score in a group readiness test and final examination, consequently, makes this intervention as an effective strategy (Ismail et al. 2016). Another study in Malaysia showed a similar positive perception towards TBL among the students; however, facilitators should be trained appropriately to the methodological criteria of the TBL method (Samad et al. 2014).

3.0 Methodology

This section discusses the specific methods by which the research and analyses were conducted. The present study was performed on a total of 42 undergraduates who are in the second year of Health Administration course (BM235) from Universiti Teknologi MARA, Puncak Alam Campus (UiTM). Team-Based Learning (TBL) was applied in a 4-credit Medical and Health Terminology course which involved several study contexts, namely anatomy and physiology of the human body systems as well as developing and translating numerous medical terminologies. It is crucial to note that this course is a core program subject and can only be taken in the third semester. Furthermore, most of them do not possess any knowledge related to the study of science, which may complicate the understanding of the course. According to the results obtained by the students in their final examination, it can be concluded that they are terrible in memorizing and fail to understand the syllabus context fully. Hence, TBL is highly recommended to overcome several issues related to this course which include high failure rate in every semester, struggle to understand the subject, and lack of content experts who are skilful to teach the subject. The present study has chosen to investigate the implementation of TBL on the topic of Musculoskeletal System. The whole purpose of the topic is to develop and translate medical terminologies as well as to illustrate the anatomical structure specific to the Musculoskeletal System

Prior to TBL intervention, the participants were assigned to watch online lectures and images/video on YoutubeTM that are relevant to the topics. Following it, they were asked to develop a mind map and submit it on i-learn (UiTM e-learning platform). Moreover, the participants were asked to answer a set of questionnaires during TBL intervention in order to evaluate their level of understanding about the subject. On top of that, the whole learning objective was explained to the participants before conducting the test. The test was divided into two phases, namely Individual Readiness Test (IRT) and Group Readiness Test (GRT). IRT was first conducted by providing a duration of 20 minutes to the participants to complete the questions. Meanwhile, the second phase which refers to GRT required the participants to be assigned into groups (five students per group) to allow them to discuss their answer for a set of questions under a duration of 40 minutes (Ismail, 2016). Finally, the effectiveness is only calculated provided that there is a notable variance in the score between IRT and GRT marks.

4.0 Results

Table 1 illustrates the notable variance in the score between IRT and GRT for both elements. The results are divided into two parts as follows: Part A (build and translate medical terminology) and Part B (describe anatomical structure of the musculoskeletal system). As can be observed in Table 2, score of both Part A and Part B differed by previous educational background of the students, in which that students who have previous science education scored higher than students who have no previous education in science. On top of that, group learning such as TBL has been successfully realized as a more outstanding option to teaching compared to individual performance. This data is in accord with a recent study performed by (Nieder et al., 2005) which discovered that group scores were greater by the average of 16% in comparison to individual average score. It is now well established from a variety of studies that TBL is very beneficial in the teaching and learning process for science/health courses (Armstrong et al., 2007)(Bowen, 2000)(Ismail, 2015). The emphasis of TBL is on the importance of being an active participant instead of only acting as a silent rider in the effort of developing interdependent and enduring competence among the students. Another benefit of TBL is that it allows students to share their knowledge with each other (Najdanovic-Visak, 2017). TBL is further expected to urge the students to always plan ahead before class, utilize interactive mediums such as exploring online informative video related to the subject to enhance their grasp of the knowledge and increase to the self-esteem of the weaker students to participate in discussion. Moreover, these elements are deemed crucial to ensure everything is professionally conducted (Oldland et al., 2017). This study supports that group learning technique provides more benefits in comparison to the conventional way of conducting a lecture despite the fact that the contexts of health/medical education seem to concentrate on a fixed scientific approach (Vasan et al., 2008). The expected outcome seems to hope that TBL can add to the current interest of students regarding interactive learning by varying their views about the appropriate learning techniques. However, it is important to consider that time allocation may pose some influence the scores obtained. For example, the conventional way of lecturing takes only 1 hour, while TBL technique usually requires longer duration of lecture up to 1.5 to 2 hours. Hence, this enable the students to have a longer discussion about the matter at hand which greater their chance to achieve higher scores. Apart from that, TBL has been proven as a well-developed strategy that can carry the achievements of small group teaching in large student groups (Morris, 2016).

On the other hand, academicians have argued about the possible consequences of sports/active conduct on one's academic outcomes (Fredricks, 2012). Several studies stated that sporting activities have been determined to influence the academic scores of tertiary level students. The results of this study demonstrate that students equipped with fundamentals science teaching tend to score higher than those who do not. It was discovered that most of these students were enrolled in the Sports Science course, which strengthen the previous assumption because most of them actively took part in the sports activities and various sports. Hence, the result of analysis corroborates the idea that sporting activities highly contribute to the achievement of performance goals (Muñoz-Bullón et al. 2017). The present study appears to be the first study performed to determine the maximum capability of TBL in enhancing the academic outcomes of non-science background students in UiTM. With regard to the research methods, the major limitation of this study refers to the small number of respondents chosen from a single course participating in this study, hence, the results are not allowed to be generalized

Table 1: TBL Score

Part	Score [Mean (SD)]			
	IRT	P value	GRT	P value

Part A	11.23(3.73)	P<0.05	14.75(2.80)	P<0.05
Part B	14.52(3.86)		18.81(2.12)	

One Sample T-test, significant at P<0.05

Table 2. Score According to Previous Educational Background

Previous educational background	Score [Mean (SD)]			
	IRT	P value	GRT	P value
Science	11.23(3.73)	P<0.005	14.75(2.80)	P<0.005
Management/social sciences/Art	14.52(3.86)		18.81(2.12)	

One Sample T-test, significant at P<0.05

5.0 Conclusion

Today, graduate competencies have changed from knowledge to the ability to solve complex problems, communicate and collaborate effectively. In many occurrences, insufficient and lack of information about effective teaching techniques is a major challenge to achieving a good level of education, increasing student learning and satisfaction. TBL is widely used in more than 100 medical schools worldwide. TBL lead to in better pre-class preparation, immediate feedback on progress, and smaller group size. Besides, TBL is also being used in faculty development programs. Several studies have provided empirical evidence of favorable learning outcomes associated with TBL. In TBL, class time is shifted away from learning facts and toward problem solving based learning. More outcome-centered studies of TBL are required to provide objective evidence of this active learning strategy's effectiveness in medical education. Although the implementation of TBL requires time and effort in view of course material preparation and teaching team readiness, our findings suggested that the teaching team has perceived to be well-prepared and positive regarding team-based learning and did not identify any major difficulties. Therefore, TBL has displayed a positive response from the students. In addition, our results also suggested that TBL is an effective teaching strategy for teaching medical terminology for students with no basic or previous science education. However, further study should be conducted to measure potential benefits for long-term learning, such as performance in examinations administered several months after a TBL module or implementation on comprehensive examinations assessing knowledge gained from several courses in which TBL was used.

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