Perception of Team-based Learning in Pathology Course among Fourth Year Medical Students Faculty of Medicine, University of Kassala, Sudan (2014 – 2015)

Abuelgasim Osman Karoum

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Dedication

To

My parents

My wife Sumia and my family

My pathology teacher at University of Khartoum

My professor of medical education at faculty of medicine / EDC – University of Gezira
Acknowledgement

- I would like to thank those who taught us the basics of health profession education at Education Development and research centre in Faculty of Medicine University of Gezira and all centre staff.

- I especially thank Professor Mohammed Al Mokhtar and Dr. Wail Neuri director of the centre for helping and directing me in this work.

- I would like to recognize my outstanding dean secretary at Faculty of Medicine Kassala University Siham Abu Awa for helping me a lot in preparation for typing, photocopy and preparation of in-class activities of team-based learning.

- I appreciate the role of fourth year medical students patch 20 Faculty of Medicine Kassala University for their accountability and punctuality, which encourage me to continue implementation of team-based learning.
ABSTRACT

Team-based learning (TBL) is a teaching and learning strategy, in which 5-8 small groups of students interact in class to form cohesive learning team. It is student-centered but instructor led-strategy. The main difference between TBL and the problem based learning is the former is team focus while the later problem focus. In TBL all groups directed by single instructor while in PBL each group directed by instructor. In academic year, 2014-2015 a trial of team-based learning introduced in four modules of general pathology course and two modules of systemic pathology course, for the fourth year medical students in Faculty of Medicine Kassala University. Student’s perception toward team-based learning assessed at the end of the year using Team-Based Learning Student Assessment-Instrument (TBL-SAI). The student’s perception assessed about their preparation for class and contribution to the team. The student preference to lecture or team-based learning also assessed. The questionnaire also assessed the student’s satisfaction with team-based learning. The aim of this study was to assess the student perception towards their accountability of TBL, their preference of TBL or lecture and their degree of satisfaction of TBL. Ninety-two (76.7%) of the students show high accountability towards preparation, working in team and team learning. 76 (63%) of students think that they contribute positive to their team learning. More than 60 % of the students prefer team-based learning to lecture. They thought that their attention level is far less in lecture than in TBL activities. They thought that they able to recall material better when TBL used than by lecture. Sixty-four (53.3%) of the student thought that TBL activities are an effective approach to learning and they learn better in team setting. We recommend further researches about TBL like impact on student performance and professional practice. Training of the staff about TBL. We recommend application of TBL in other courses and other departments. Comparison of TBL with other small group learning. WE conclude that the students satisfied with TBL and preferred TBL to lecture.
رأى الطلاب فى تجربة ادخال التعليم المبني على الفريق فى كورس علم الامراض لطلاب المستوى الرابع بكلية الطب - جامعة كسلا, السودان 2014 – 2015

ابوالقاسم عثمان كروم محمد

مستخلص الدراسة

التعليم المبني على الفريق استراتيجية تعليمية تدريسية يقسم الطلاب فيها إلى مجموعات صغيرة 5 – 8 طلاب يكونون فريق تعليمي متجانس. و وهي طريقة محورها الطالب ولكن توجه بواسطة الاستاذ. يختلف التعليم المبني على الفريق عن التعليم المبني على حل المشكلات بان الأول يركز على الفريق بينما الثانى يركز على الفرد. كل الفصل يوجه الاستاذ واحد في حالة التعليم المبني على الفريق بينما كل مجموعة تحتاج إلى استاذ في حالة التعليم المبني على حل المشكلات.

في العام الدراسي 2014 – 2015 تم ادخال طريقة التعليم المبني على الفريق في تدريس بعض مواد علم الامراض لطلاب المستوى الرابع بكلية الطب جامعة كسلا كتجربة. في نهاية العام الدراسي تم استطلاع رأى الطلاب في هذه التجربة في ثلاث محاور رئيسية. أولا حول مسؤولية الطلاب في التحضير قبل الدراسة داخل الفصل ورأيهم في المشاركة في نشاط وتعليم الفريق. ثانيا تفضيلهم للتعليم المبني على الفريق أم التعليم عن طريق طرق المحاضر. ثالثا رأيهم عن تجاربهم في التعليم المبني على الفريق.

تم استجواب جميع الطلاب بواسطة مؤشر رأي الطلاب في التعليم المبني على الفريق وهو عبارة عن استجاوار مكون من 33 سؤال حول رأي الطلاب في هذه الاستراتيجية التعليمية وحول مسؤوليتهم عن التحضير والمشاركة في نشاط الفريق وعن تفضيلهم للدراسة عن طريق التعليم المبني على الفريق أم عن طريق المحاضرات. 92 (76%) من الطلاب اكدوا مسؤوليتهم التامة عن التحضير للاجتماعات داخل الفصل و 63 (63%) راضين عن مشاركتهم الإيجابية في تعليم الفريق. أكثر من 60% من الطلاب يفضلون التعليم المبني على الفريق على التعليم عن طريق المحاضرات. 64 (53.3%) من الطلاب يرون أن استراتيجيتهم التعليم المبني على الفريق استراتيجية جيدة للتعليم الطبي. من هذه الدراسة نوصى بادخال استراتيجية التعليم المبني على الفريق في بقية الأقسام وتدريب الأساتذة وتوفر المعينات الاستراتيجية لهذا النوع من التعليم. كما نوصى بمتابعة هذا النهج في التعليم في مجموعات صغيرة مع غزارة من تدريس المجموعات الصغيرة. من كل ذلك نصّرنا أن غالبية الطلاب بيدون مسؤوليتهم عن تحسين خبر فريق ومشاركتهم الفعالة في تعليم الفريق. كما أن غالبية الطلاب يفضلون التعليم المبني على الفريق عن التعليم بواسطة المحاضرات. غالبية الطلاب يرون أن استراتيجيتهم التعليم المبني على الفريق استراتيجية جيدة للتعليم الطبي.
# ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>COME</td>
<td>Community Oriented Medical Education</td>
</tr>
<tr>
<td>GRAT</td>
<td>Group Reassurance Test</td>
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<td>IFAT</td>
<td>Immediate Feedback Assessment Technique</td>
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<td>IRAT</td>
<td>Individual Reassurance Test</td>
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<td>LBL</td>
<td>Lecture Based Learning</td>
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<td>PBL</td>
<td>Problem Based Learning</td>
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<td>RAT</td>
<td>Reassurance Test</td>
</tr>
<tr>
<td>TBL</td>
<td>Team Based Learning</td>
</tr>
<tr>
<td>TBL-SAI</td>
<td>Team-Based Learning Student Assessment Instrument</td>
</tr>
<tr>
<td>TRAT</td>
<td>Team-Based Reassurance Test</td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>No.</th>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chapter (1)</td>
<td>1</td>
</tr>
<tr>
<td>1 - 1</td>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>1 - 2</td>
<td>Problem Statement</td>
<td>2</td>
</tr>
<tr>
<td>1 - 3</td>
<td>Rationale of the study</td>
<td>3</td>
</tr>
<tr>
<td>1 - 4</td>
<td>Objectives</td>
<td>3</td>
</tr>
<tr>
<td>1 - 5</td>
<td>Hypothesis</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Chapter (II) Literature Review</td>
<td>4</td>
</tr>
<tr>
<td>2 – 1</td>
<td>Definition and scope of Team-Based Learning</td>
<td>4</td>
</tr>
<tr>
<td>2 - 2</td>
<td>Design and implementation of Team-Based Learning</td>
<td>5</td>
</tr>
<tr>
<td>2 - 3</td>
<td>Implementation of Team Based Learning</td>
<td>7</td>
</tr>
<tr>
<td>2 - 4</td>
<td>Factor facilitate Team Based Learning and Inhibitors</td>
<td>8</td>
</tr>
<tr>
<td>2 - 5</td>
<td>Team Based in Health Education</td>
<td>9</td>
</tr>
<tr>
<td>2 - 6</td>
<td>Students Perception of Team Based Learning</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>Chapter (3) Methodology</td>
<td>13</td>
</tr>
<tr>
<td>3 - 1</td>
<td>Study area</td>
<td>13</td>
</tr>
<tr>
<td>3 - 2</td>
<td>Study Population</td>
<td>14</td>
</tr>
<tr>
<td>3 - 3</td>
<td>Study Design</td>
<td>14</td>
</tr>
<tr>
<td>3 - 4</td>
<td>Ethical consideration</td>
<td>14</td>
</tr>
</tbody>
</table>

## Tables of contents

<table>
<thead>
<tr>
<th>No.</th>
<th>Contents</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chapter (4) Results and Discussion</td>
<td>15</td>
</tr>
<tr>
<td>4 – 1</td>
<td>Results</td>
<td>15</td>
</tr>
<tr>
<td>4 - 2</td>
<td>Discussion</td>
<td>27</td>
</tr>
</tbody>
</table>
Limitation of the study

Chapter (5) conclusion and recommendation

Conclusion

Recommendation

References

Appendix

Team-Based Learning Students Assessment Instrument

LIST of TABLES

Table (1) Preference of the students for lecture based learning or Team Based Learning 21
## List of Figures

| Fig (1) | 16 |
| Fig (2) | 17 |
| Fig (3) | 17 |
| Fig (4) | 18 |
| Fig (5) | 18 |
| Fig (6) | 19 |
| Fig (7) | 19 |
| Fig (8) | 20 |
| Fig (9) | 23 |
| Fig (10) | 23 |
| Fig (11) | 24 |
| Fig (12) | 24 |
| Fig (13) | 25 |
| Fig (14) | 25 |
| Fig (15) | 26 |
| Fig (16) | 26 |
CHAPTER ONE

INTRODUCTION

Introduction:

Medical education is always changing. The recent trends and innovation in medical education strategy is student centred and small group learning. The students must have critical thinking in interpretation of knowledge they achieve and able of its application.

Three important methods of instructions present in medical education worldwide curricula, lectured-based, problem-based and combination of lectured-based and small group learning.

Team-based learning (TBL) is a teaching and learning strategy. It is an active learner centred but instructor led learning strategy. TBL depends mainly on well group forming and individual and group accountability of the students. The instructor define the objective clearly for the students for outclass individual learning. In-class activities started with Readiness Assurance Test (RAT) solved first by individual student (IRAT) then by the team as a group (GRAT) and group score generated. Then the students have feedback by given the correct answers with intergroup discussion (feedback can be by scratch). At this stage, the teams have the opportunity to write appeals about their wrong answers. Then all the teams work on application exercise. All the teams solve same challenging specific clinical problem. All teams declare their answers simultaneously. Peer evaluation is an important part of TBL in which the student evaluates each of their team member for his contribution to their team product.

During the last decade of the last century many schools of medicine established in the peripheral states of Sudan during the higher education revolution. Due to severe shortage of faculty and increasing number of student’s intake in newly established faculty of medicine, teaching depend on crash courses by visiting teacher. Due to the international trends of innovation in medical education and change from the traditional passive lecture based learning to small group active learning, Al Jazeera University Faculty of Medicine adopted successfully problem-based and community oriented medical education (PBL & COME). In Faculty of Medicine Kassala University, we cannot apply PBL for many logical reasons.

Team-based learning is an active learning and teaching strategy. It is very suitable for health professional education (HPE) because of many reasons. TBL is small group active learning and student centred. It motivate self and life-long learning. In TBL, the students
have the opportunity to gain skills of working in team. Working in team is very important for nowadays health professional education (working in team, learning in team). Others professional competencies such as communication, interpersonal skills, team work and applying knowledge to real case problems, also gained by TBL (Emily H et al 2012). TBL activities is a sort of higher learning exercise and discussion, need revision of previous knowledge and kept in memory for longer time. TBL need less faculty one expert instructor can direct a large class. TBL foster the student to come to the class in time and come prepared. TBL activities keep the students attention throughout the in-class activities. TBL activities assess and evaluate students learning frequently and provide feedback for them. TBL help the instructor to get frequent feedback from the students and identify the complex issue to clarify. IRAT, GRAT and application problem solution are important feedback about the students’ performance. Unlike other small group, learning TBL is feasible, suitable, and applicable in limited resource countries (Karoum 2013). Although successful implementation and continuation of TBL depends on faculty, administration / curriculum development and the students but the student role is the backbone. The student satisfaction and accountability of TBL is the corner stone in successful implementation of TBL. This study tried to assess the student’s perception and satisfaction of TBL. The study also tried to assess the student’s perception towards TBL activities. The study assessed the student’s accountability toward coming prepared. The study assessed the idea of the students and their accountability about teamwork. The study tried to know the students preference for lecture or TBL. This study assessed the student’s satisfaction with TBL and their experience with TBL activities.

PROBLEM STATEMENTS:

In effective TBL the students should show accountability for outclass preparation and for their team learning. The students should prefer TBL than LBL. The students are important stakeholder in implementation of TBL; hence, their satisfaction with this strategy is very important. Knowing the students perception of TBL is important for successful implementation of TBL.

RATIONALE OF THE STUDY

- Exploring and assessment of student’s accountability for their learning and team learning.
- Exploring and assessment of the student’s accountability for better preparation and for active participation in in-class activities.
- Exploring and assessment of the student’s preference for lecture or TBL.
- Exploring and assessment of the student’s satisfaction with their experience with TBL.
OBJECTIVES

General Objectives:

To assess fourth year medical students perception towards team-based learning for pathology course at Kassala University.

Specific objectives:

1- To assess the students accountability to pre-class preparation by the number of students whom agree or strongly agree with the pre-class preparation.

2- To assess the students accountability towards participation and assisting in their group learning by the number of students show accountability for team learning.

3- To determine the number of students who agree or strongly agree to points that in favour team-based learning and those in favour of lecture based leaning.

4- To identify the student’s satisfaction with team-based learning by the number of students satisfied with their experience of team-based learning.

HYPOTHESIS

From the student’s experience of TBL, we expect the students to show accountability towards pre-class preparation, teamwork participation and their team learning. The students prefer TBL to the lecture. The students satisfied with TBL. By this study, we either accept or reject this hypothesis.
CHAPTER TWO
LITERATURE REVIEW

2- 1- Definition and scope of team-based learning:

Team-based learning (TBL) is small group active learning in large group education setting. It is instructor directed learning in which the instructor focus on what the learner should be able to do. In TBL, the student is accountable for his / her learning, out class preparation and in class collaboration with his team members. The student accountable for his / her team performance and development. By TBL activities, the student will gain the skill of teamwork, collaboration with team member (communication skills) and problem solving and decision making (Koles 2005, Koles 2010, Levine 2004, Shellenberger 2009, Thomas & Bowmen 2011).

The basic principles of TBL are, proper group forming, student’s accountability for their learning and group working, frequent feedback and proper team assignment (Larry K Michaeles and Parmelee in TBL in HPE).


TBL as an active learning result in positive learning outcome in general and particularly provide students with skills of teamwork and engaging the students within the classroom. It is found that TBL improve student academic performance, especially academically weaker student (Chung EK 2009, Koles 2005, Koles 2010).

Steps of Team-Based Learning:

TBL steps, pre-class preparation, readiness assurance and application of key concepts.

Step (1): Pre-class preparation:

The student reads outclass assigned information given to him / her. The student guided by the instructor to where to get this information, book chapter, lecture power point, hand out or net sites. The student expected to master the contents and be able to use them during TBL class session. Preparatory materials assigned by the instructor should be very
specific and precise. Instructor should avoid student frustration in case of inappropriate assigned materials. The material assigned to the students before classroom session start with a reasonable time. The preassigned materials, accompanied by specific and clear learning objectives. The student is accountable to master the content before in class session started and come prepared (Parmelee DX 2012).

Step (2): Readiness assurance:

In this step, all students take a short quiz of 10-20 questions (multiple-choice questions). This is the individual readiness assurance test (RAT). Then the team retakes the same test to solve it as a team with discussion. This is the team reassurance test (TRAT). Then the team will have immediate feedback. The feedback can be in form of scratch technique (IF-AT) or other way. The principle of reassurance test (RAT) is to make sure that all students master the pre-class materials and ready for application of these information in a real problem. RAT should well written and covered the contents and should not be too difficult or too easy. The results of both IRAT and TRAT considered in grading (Haidet P, Fecile ML 2006).

Appeals:

Once the team completes the GRAT posted their answer to all class. The team has the opportunity to review the pre-class assignment and find items missed or answer which they think not correct and write these as an appeal to discuss it later. The rules of appeal include, initiation by the team, argued in writing with documentation. Successful appeal given credit (Parmelee DX 2012)

Facilitator feedback or clarification:

The facilitator review the RAT and discuss the complicated issues. Review the objectives and try to find items that require more time to discuss them during his feedback.

Step (3): Application of key concepts:

Students engaged in solution of a real life clinical problem. Ideal problem challenges and need skills of the entire team to solve. Proper application problem characterized by that it is significant problem and all the teams take the same problem, with specific choice and simultaneous team reports (Parmelee DX 2012).

2- 2- Designing and implementation of Team-Based Learning:

For proper and effective implementation of TBL, the course should well designed. Find a reasonable textbook. Divide the course in small units. Prepare assignment that cover the contents. Prepare RAT and create a clinical problem for each unit. In the beginning of the
Designing Team-Based Learning Course:

Backward Design:

To design TBL course or unit it is important to do backward design with the following steps.

Step (1): Situational factors:

- What is the level of the students? What others courses they had? The general curriculum design. What their competences are?
- Learning objectives. What do you want learners to be able to do at the end of the course?
- Assessment activities. State assessment process by which you make sure the students are ready for the course (RAT) and they achieve the objectives (application process).
- Pre-class prepared materials (Parmelee DX 2012).

Step (2): Learning objectives:

Create learning objectives. Learning objectives based on, what you need the students to be able to do at the end of each module. The objectives match with RAT and application process (APP). It should be relevant. It is better to be in categories of application analysis and syntheses according to Bloom’s Taxonomy (Dean X 2010).

Step (3): Application activities:

Create a significant clinical problem that match with objectives. The solution of the problem by specific choice. All the teams have the same problem and report their solution simultaneously. Assignment promote higher-level learning have different levels. Lower level, not challenging and not need team talent example list the possible diagnosis (make list). Intermediate level relatively challenging but still do not need team cooperation, example which diagnosis is most likely in this patient (make choice). High level, require high level of cognitive skills and need the whole power of the team example which indicator (from five) is most critical to make a correct diagnosis in this case (make specific choice) (Dean X 2010).

session, give a short lecture discussing the general concept and the contents. Identify the objectives clearly. Introduce peer evaluation at the mid and the end of the course. You can do formative and summative exam for the course (Dean X. 2010).
Step (4): Reassurance activities:

Write RATs that are foundation to the application problem. Make sure RATs match TBL objectives.

Step (5): Preparation / Learning materials:

Identify and / or develop the preparation materials. First, write proper RATs, then, identify the pre-class preparation materials. Pre-class preparation materials include short textbook, lecture notes, hand out etc. (Dean X 2010).

Step (6): Colleague / peer review:

Request one or more colleague to review your TBL module. Share the first draft with your colleagues. Peer review can take place course committee or curriculum committee.

Step (7): Piloting:

Pilot your TBL module before goes live. Piloting the TBL module to the students give a valuable feedback from the students. You can use students from another class for piloting. Instead of piloting, you can get feedback from the student’s impression of the exercise of the first module (Ruth L & Patricia H 2014).

2- 3- Implementing Team-Based Learning:

Step (1): Team formation:

Team formed by the facilitator. Distribute the available resources as equal as possible. The team start heterogeneous by time become homogenous. Team of less than five loose talent for challenges, and team more than eight difficult to become cohesive. Transparency when forming the groups is important. Make sure the team is large enough to compensate for absences. Finally keep the team together for a long time (the whole year) (Dean X 2010).

Step (2): Orientation:

Orientation of the students, especially for students first time experience TBL or small group learning. Orientation can be by lecture or mini-TBL session. Educate students about peer assessment (Dean X 2010).

Step (3): Incentive structure:

A particular incentive structure established so that student held responsible for both their learning and their team learning and development. The incentive for pre-class preparation is the IRAT. Incentive for teamwork through the grades of the team (GRAT).
These grades incorporated in the formative and summative exam. In the summative exam, individual work (30 – 70%), teamwork (30 – 70%) and peer evaluation (5 – 10%).

Step (4): Appeals:

   It is in time between RAT and the application process. The important of appeals is to help the students to review materials that they missed. It can be for the item that were confusing for them or an answer that they think is not right.

Step (5): Students peer assessment / Evaluation:

   It is a core component of accountability. It provide students feedback about their interpersonal and communication skills (Michaelsen LK et al in TBL for HPE chap.2 2008). The basic principles of peer evaluation are:

   1- It is a sensitive type of evaluation. It is acceptability and performance by students varies.

   2- Taught the students about the procedure of evaluation.

   3- Do both informative and summative peer evaluation.

   4- Use both quantitative and qualitative evaluation.

   5- Should not administer too often. (Dean X 2010)

2- 4- Factors Facilitate Success of Team-Based Learning and inhibitors:

   • Participation of faculty:

      The more faculty and administrator agree or try to introduce TBL will lead to more success. Stakeholder not understanding TBL act as active or passive inhibitor. It is not wise to force faculty to implement TBL. It is important to develop comprehensive orientation for faculty; staff and students before TBL course begin (Dean X 2010).

   • Organization and coordination:

      Organization and coordination with other department and curriculum committee is important for successful implementation of TBL (Dean X 2010).
• **The right room:**

Large enough classroom accommodate all groups. Better if the student found it easy to face each other’s. Lecture theatre is not comfortable but they can sit on the desk to face each other.

• **Facilitator vs lecturer:**

Facilitator listen to the students and then direct them. Students often better teacher than faculty. Try to let the team explain to the other teams. During the frequent feedback, the facilitator will know the students week points and complex issue (Ruth L & Patricia H 2014).

• **Too much too often:**

Too many reassurance test (RAT) overwhelmed the students. RAT is not the essential part of TBL. It is just to help the student to solve the problem. Frequent peer evaluation prevent team cohesion. Formative and summative peer evaluation is enough (Dean X 2010).

• **Poor incentive structure:**

The course director should put clear incentive for the student’s individual accountability and their accountability towards teamwork. TBL is never an option. The student is both accountable for his individual learning and his team learning and development (Ruth L & Patricia H 2014).

• **Poor application exercise:**

Application exercise is very important in TBL success. It should be specific, choice category and aligned with higher learning goals (Ruth L & Patricia H 2014).

**2- 5- Team-based Learning in Health Professions Education:**

Since introduction of TBL in health professions education (HPE) approximately 2001, it is widely spread in medical schools in USA and Canada and then worldwide. Nasim Bahramifarid and his colleagues published a review article investigating the applications of TBL in medical education. He selected the most prevalent themes in the applications and effects of TBL in medical education. He discussed six major themes; 1) experimental TBL approach; 2) student experiences and perceptions of TBL; 3) students examination performance; 4) faculty impressions; 5) peer evaluation in TBL; 6) TBL in gross anatomy. (Nasim 2012).
Experimental TBL approach:

TBL introduced in basic medical sciences, pre-clinical and clinical sciences. TBL introduced in pre-clinical sciences, in a first year intensive course. Also used as a tool in problem-based learning (PBL) in the first year (Wiener 2009). TBL introduced in pathology for 2nd year compared with case based group discussion (CBGD) system. The result of the study showed that there was equivalent academic performance of the students in the two system (Koles P 2005). Until 2007 TBL, implemented in over 40 courses in ten American medical institutes (Searle 2003). In study of evaluation of the state of TBL two years later in the same schools, done by Thompson and his colleague, showed that TBL continued in all these schools except one and more courses added (Thompson 2007b). In clinical courses TBL introduced in psychiatry and internal medicine (Levine 2004). TBL also introduced in paediatrics and other health care professional (Haidet 2006, Rider 2006).

Student experience and perception of TBL:

Most of the students in schools that implement TBL, regard TBL more effective, enjoyable and engaging than conventional didactic learning strategy (Levine 2004, Chung 2009). In study of anatomy and embryology, 83% of 97 students subjected to TBL, agreed or strongly agreed that TBL promote their learning (Nieder 2005). In general, most of the students satisfy with their experience in TBL. Although in a seven weeks course of evidence based medicine. The students initially devalued TBL (Hunt 2002). The students assess teamwork and peer contribution more favourable in courses that implement TBL in pathology, gross anatomy and embryology, microscopic anatomy and psychiatry clerkships (Koles 2005, Vassan 2008, Levine 2004). In medical gross anatomy and embryology, the students favour TBL irrespective of final grades, but high performing students found it more positive than lower performing students (Nieder 2005).

Student examination performance:

Student in the lowest academic quartile benefited from TBL, while students in the higher quartile performed as before. The course failure in TBL lower compared with previous years (Nieder 2005). Students’ performance in evidence-based medicine improve by TBL, when compared with other previous teaching techniques (Hunt 2002, Tai 2008). In ten American schools using TBL, the students’ performance equal or better than other teaching methods (Searle 2003, Thompson 2007b). In gross anatomy and psychiatry, the students’
performance significantly better than on previous examinations. No satisfying significant
difference in performance of the students in internal medicine clerkship.

Faculty impression:

In many American institutes that implement TBL in their curricula, reported a high
degree of faculty satisfaction with TBL (Searle 2003). Faculty of gross anatomy and
embryology strongly support introduction of TBL (Nieder 2005).

Peer evaluation in TBL:

Many studies regarding peer evaluation in TBL found it the most controversial aspect
of TBL (Seidel 2001). Many studies observed that many students were initially resist
introduction of TBL due to adapting peer evaluation (Thompson 2007b). In medical gross
anatomy and embryology, the students reluctant about adapting peer evaluation and require
team members assessed independently of comparison to one another (Nieder 2005). Nieder
and his colleague concluded that student’s satisfaction of peer evaluation decreased by time.
This may be due to its impact on grade (Searle 2003). Few studies indicate significant
correspondence between peer evaluation, and both RAT and exam scores (Vasan 2008).

Team-Based Learning Versus Problem-Based Learning in medical education:

Both TBL and PBL involve group of students trying to learn and apply clinical knowledge
together. The main difference is that in PBL, the problem is the focus (trigger learning issue)
and in TBL, team is the focus. Other difference, in TBL all group directed by single
instructor while each group need an instructor in PBL. In TBL, there was frequent and
specific feedback more than PBL (Emily H 2012).

2- 6- Students Perception of Team-Based Learning:

In the literature, there are many studies about student’s perception, prospection and
attitudes towards team-based learning. In study at university of North Florida assessing the
students of physical therapy perception of team-based learning used in gross anatomy. The
overall experience of students was positive. It was very positive in item of accountability.
The students preferred TBL than tradition didactic lecture. The students thought TBL
provided them with successful academic performance and proved their learning outcome. The
students was satisfied with TBL (Beven 2014).
In Penang Malaysia, the students of first year of the diploma in business completed a course of TBL. The majority of the students agreed that TBL enhanced their learning process and helped them perform better academically. TBL improved student’s soft skills. The majority of the female students needed complete lecture before pre-class preparation, while males need more freedom. The majority of the students preferred choosing their teammates. The students preferred the team to be composed of different gender (Anitha2013).

In study, comparing the student’s perception to TBL between United Kingdom students and Pakistani students. Students of both cultures showed positive response towards TBL. TBL aided their future professional carrier. The found that TBL was effective way of learning and increased their productivity. Pakistani students showed more preferring for TBL than UK students (Raja2012).

In study comparing the changes in student’s attitudes about TBL process between the first and second year. The study done in pre-clinical curriculum at Boon shot School of Medicine USA. The study demonstrate changes in student’s attitudes about working within team, their sense of professional development and towards satisfaction with peer evaluation. Satisfaction with peer evaluation declined from first to second years. This means the more often the students asked to complete peer evaluation, the less meaningful to them (Dean X 2009).

In a study of students perceptions of team-based learning at College of Pharmacy, Qassim University, Kingdom of Saudi Arabia. The study, compared student’s perception of TBL between students taught by lectured based strategy and new entrance students (first time introduced to TBL. There were significant differences between the two group’s responses to the following questions: Learning more in courses, improving their course grade, clinical reasoning skills (ability to think through a problem and developing more respect for the opinion of other. More than 70 students satisfy with TBL and prefer to keep with TBL rather than to convert back to LBL. Eighty percent of the students found that TBL is valuable experience. Regarding peer evaluation, only 50% of the students satisfy with it, the rest unsure of its meaning (Ahmad A2014)

In study comparing student’s perception of TBL vs Traditional LBL, at Cedarville University School of Pharmacy and at Manchester University College of Pharmacy, found that when students first subjected to TBL and then followed by LBL have more positive perception for TBL than when they first subjected to LBL. Students had two TBL courses followed by one
course LBL prefer TBL; While students had LBL courses followed by one TBL course prefer LBL. From this finding, timing of TBL in the curriculum and quantity of course may affect student’s perception of TBL (Tracy R2015).

The outcome of literature review is that TBL provide favourable learning outcome. The students agreed that TBL activities were beneficial and faculty were satisfied. TBL is an effective learning strategy, increase students engagement actively and discussion in classroom and improve their academic performance (Britta MT 2007, Anitha S 2013).
CHAPTER III
METHODODOLOGY

Study area / settings:

Faculty of medicine university of Kassala established 1990. The faculty has two large lecture theatres one for 1000 students and other for 500 students. There were two other theatres each can occupy 200 students. There was a large well-equipped dissecting room for 100 students. There were four laboratories each for 50 students (physiology, biochemistry, microbiology and pathology). There was pathology museum contain fixed surgical specimens and many lustrations. The students use Kassala hospital service laboratories for training.

The curriculum was traditional lecture-based. The first year general sciences. The second and third year the students study the basic medical sciences (anatomy, physiology and biochemistry). In fourth year, the students study pathology, microbiology, pharmacology and introduction to clinical medicine. Curriculum development planned to be at 2015.

Pathology divided into two courses. General pathology (36 credit hours) and systemic pathology (36 credit hours).

Trial of implementation of TBL:

In academic year 2014 – 2015 TBL introduced as a trial four modules of general pathology and two modules of systemic pathology.

The students divided into 20 groups (5 – 8 students) depending on their performance in the basic medical sciences examination. The students oriented about TBL by lecture and TBL session.

TBL session started by the first step a short lecture in which the instructor identify the general concept and highlight the objectives. The instructor guided the students to the information they need to read and where to find them. The second step is the students out class reading and preparation. The third step is the in-class activities, started by IRAT 15 minutes, followed by GRAT 30 minutes. Then feedback and intergroup discussion for twenty minutes. The students given ten minutes to write appeals. After a short break, the students engaged on application problem for one hour. Then the groups present their solution. We cannot do that simultaneously, we ask one group randomly to read their solution. We repeat this for more groups to reach different solutions. Then inter group discussion. At the end, the
instructor rap up and explain the arising misunderstanding. The instructor revised the objectives and make sure all are covered.

We meet many challenges. At start few students come late, we allow only five minutes then we close the door. By time, the students become more punctual and more accountable. Electricity failure make intergroup dissection and feedback difficult. In the theatre, the students found difficulty to face each other but later they manage that. Difficulty in distribution of the assignment and hand out overcome by electronic distribution using smart mobile.

**Study population:**
All fourth year medical students (143) enrolled in this study

**Inclusion criteria:**
All students whom attend and complete at least three modules and respond to questionnaire

**Exclusion criteria:**
Students who did not attend or complete three modules and those not respond to the questionnaire were excluded.

**Study design:**
This is a descriptive case study university based.

**Sample size and sampling technique:**
One hundred and twenty students of fourth year medical students out of 143 included in the study.

TBL-SAI is a validated survey questionnaire developed and validated especially to assess the student’s perception of TBL. The instrument developed by Mennenqa HA 2012 (Mennenqa HA 2012). The questionnaire explained and demonstrated for the students. The questionnaire distributed for the students to fill innominate (Annex).

**Data collection methods:**
At the end of the year, the questionnaire distributed to the students. One hundred and twenty students participate in the study.
Data analysis:

We used SPSS version 15 statistical program to analyse the data collected by using TBL-SAI (the questionnaire).

Ethical consideration:

Ethical approval obtained from combined ethical committee from Faculty of Medicine and Ministry of Health Kassala state. Prior to participation, all students asked consent to the use of their anonymous responses. No student names associated with any of the surveys. All research materials handled exclusively by the principal investigator.
CHAPTER IV
RESULTS AND DISCUSSION

RESULTS
Using TBL-SAI, the student’s perception to TBL assessed. Three important areas assessed were, accountability, preference for LBL or TBL and the student’s satisfaction with TBL.

Forty-two (35%) of the students, agreed and 37 (30%) strongly agreed that they spend time studying before class in order to be more prepared. 46 (38%) agreed and 46 (38%) strongly agreed that they prepare for class activities to do well. 49 (40.8%) agreed and 27 (22.5%) strongly agreed that they contribute to their team members learning. Only 11 (9.2%) agreed and six 1-8(5%) strongly agreed that their contribution to the team is not important. Forty-six (38.3%) agreed and 18 (15%) strongly agreed that their team members expect them to assist them in their learning. Fifty-two (43.3%) agreed and 18 (15%) strongly agreed that they are accountable for their team learning. 41 (34.2%) agreed and 27 (22.5%) strongly agreed that they are proud of their ability to assist their team in their learning. Forty-eight (40%) agreed and 36 (30%) strongly agreed that they need to contribute to the team learning Figs (1 to 8).

Twenty-three (19.2%) of the students agreed and 25 (20.8%) strongly agreed that during traditional lecture they often find themselves thinking of non-related things. Forty-two (35%) agreed and 17 (14.2%) strongly agreed that they easily distracted during traditional lecture. Only 10 (8.3%) agreed and 10 (8.3%) strongly agreed that they easily distracted during TBL activities. Thirty-seven (30.8%) agreed and 27 (22.7%) strongly agreed that they more likely to fall asleep during lecture than during class that use TBL activities. Twenty-eight (23.3%) agreed and13 strongly agreed that they are pored during TBL activities. Twenty (16.7%) agreed and 11 (9.2%) strongly agreed that they talk about non-related things during TBL activities. Forty-five (37.5%) agreed and 40 (33.3%) strongly agreed that they easily remember what they learn when working in team. Thirty-three (27.5%) agreed and 30 (25%) strongly agreed that they remember material better when the instructor lecture about it. Forty-three (35.8%) agreed and 41 (34.2%) strongly agreed that TBL activities helped them recall past information. Forty-five (37.5%) agreed and 25 (20.8%) strongly agreed that it is easier to study for tests when the instructor has lectured over the material. Forty-one (34.2%) agreed and 29 (24.2%) strongly agreed that they remember information longer when they go
over it with team members during the GRAT used in TBL. Fort-six (38.3%) agreed and 28 (23.3%) strongly agreed that they remember material better after the application exercise used in TBL. Forty (33.3%) agreed and 07 (5.8%) strongly agreed that they can easily remember material from lecture. Eleven (9.2%) agreed and 08 (6.7%) strongly agreed that working with my team members they found it difficult to remember what we talked about during class. Fifty-two (43%) agreed and 23 (19.2%) strongly agreed that they do better on exam when they used TBL to cover the material. Twenty (16.7%) agreed and 11 (9.2%) strongly agreed that after listening to lecture, they find it difficult to remember what the instructor talked about during class see table (2).

Thirty-three (27.5%) of the students agreed and 24 (20%) strongly agreed that they enjoy TBL activities. Forty (33.3%) agreed and 27 (22.5%) strongly agreed that they learn better in team setting. Forty (33.3%) agreed and 24 (20%) strongly agreed that they think TBL activities were an effective approach to learning. Seventeen (14.2%) agreed and 11 (9.2) strongly agreed that they do not like to work in team. Forty-one (34.2%) agreed and 19 (15.8%) strongly agreed that TBL activities are fun. Nineteen (15.8%) agreed and 08 (6.7%) strongly agreed that TBL activities are a waste of time. Forty-five (37.5%) agreed and 22 (18.3%) strongly agreed that they think TBL will help them improve their grade. Forty-nine (40%) agreed and 25 (20.8%) strongly agreed that they had a positive attitude towards TBL activities. Fifty (41.7%) agreed and 25 (20.8%) strongly agreed that they had a good experience with TBL see Figs (25 to 33).
Medical student’s response for accountability to pre-class preparation and contribution to team learning for trial of TBL in pathology course 2014 – 2015 (n 120)

Fig (1)
Spend time by students for preparation before class

Fig (2)
Feeling of the students regarding preparation for class
Fig (3)
Contribution of students to team member learnings

Fig (4)
Opinion of students about importance of contribution to the team
Fig (5)
The degree of expectation of team-members about individual assistance in their learning

Fig (6)
Accountability of students for team learning
Fig (7)
Proudness of students of their ability to assist in their team learning

Fig (8)
The desire of students to contribute to team learning
# Preference for LBL or TBL (n 120)

## Table (1)

<table>
<thead>
<tr>
<th>Items</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Agr. + Stron.</th>
</tr>
</thead>
<tbody>
<tr>
<td>During traditional lecture, I often find myself thinking of non-related things</td>
<td>17 (14.2%)</td>
<td>33 (27.5%)</td>
<td>22 (18.3%)</td>
<td>23 (19.2%)</td>
<td>25 (20.8%)</td>
<td>48 (40%)</td>
</tr>
<tr>
<td>I am easily distracted during traditional lecture</td>
<td>9 (7.5%)</td>
<td>23 (19.2%)</td>
<td>29 (24.2%)</td>
<td>42 (35%)</td>
<td>17 (14.2%)</td>
<td>59 (49.2%)</td>
</tr>
<tr>
<td>I am easily distracted during TBL activities</td>
<td>28 (23.3%)</td>
<td>51 (42.5%)</td>
<td>21 (17.5%)</td>
<td>10 (8.3%)</td>
<td>10 (8.3%)</td>
<td>20 (16.6%)</td>
</tr>
<tr>
<td>I am more likely to fall asleep during lecture than during classes that use TBL activities</td>
<td>21 (17.5%)</td>
<td>14 (11.7%)</td>
<td>21 (17.5%)</td>
<td>37 (30.8%)</td>
<td>27 (22.7%)</td>
<td>64 (53.5%)</td>
</tr>
<tr>
<td>I get bored during team-based activities</td>
<td>20 (16.7%)</td>
<td>29 (24.2%)</td>
<td>30 (25%)</td>
<td>28 (23.3%)</td>
<td>13 (10.3%)</td>
<td>41 (33.6%)</td>
</tr>
<tr>
<td>I talk about non-related things during TBL activities</td>
<td>31 (25.8%)</td>
<td>33 (27.5%)</td>
<td>25 (20.8%)</td>
<td>20 (16.7%)</td>
<td>11 (9.2%)</td>
<td>31 (25.9%)</td>
</tr>
<tr>
<td>I easily remember what I learn when working in team</td>
<td>8 (6.7%)</td>
<td>13 (10.3%)</td>
<td>14 (11.7%)</td>
<td>45 (37.5%)</td>
<td>40 (33.3%)</td>
<td>85 (70.8%)</td>
</tr>
<tr>
<td>I remember material better when the instructor lecture about it</td>
<td>8 (6.7%)</td>
<td>26 (21.7%)</td>
<td>23 (19.2%)</td>
<td>33 (27.5%)</td>
<td>30 (25%)</td>
<td>63 (52%)</td>
</tr>
<tr>
<td>TBL activities help me recall past information</td>
<td>5 (4.2%)</td>
<td>9 (7.5%)</td>
<td>22 (18.3%)</td>
<td>43 (35.8%)</td>
<td>41 (34.2%)</td>
<td>84 (70%)</td>
</tr>
<tr>
<td>It is easier to study for tests when the instructor has lectured over the material</td>
<td>0.5 (4.2%)</td>
<td>12 (10%)</td>
<td>33 (27.5%)</td>
<td>45 (37.5%)</td>
<td>25 (20.8%)</td>
<td>70 (58.3%)</td>
</tr>
<tr>
<td>I remember information longer when I go over it with team members during the GRATS used in TBL</td>
<td>11 (9.2%)</td>
<td>19 (15.8%)</td>
<td>20 (16.7%)</td>
<td>41 (34.2%)</td>
<td>29 (24.2%)</td>
<td>70 (58.4%)</td>
</tr>
<tr>
<td>I remember material better after the application exercise used in TBL</td>
<td>0.5 (4.2%)</td>
<td>15 (12.5%)</td>
<td>26 (21.7%)</td>
<td>46 (38.3%)</td>
<td>28 (23.3%)</td>
<td>74 (61.6%)</td>
</tr>
<tr>
<td>I can easily remember material from lecture</td>
<td>13 (10.8%)</td>
<td>26 (21.7%)</td>
<td>34 (28.3%)</td>
<td>40 (33.3%)</td>
<td>07 (5.8%)</td>
<td>47 (39.1%)</td>
</tr>
<tr>
<td>Working with my team member I find it difficult to remember what we talked about during class</td>
<td>22 (18.3%)</td>
<td>44 (36.7%)</td>
<td>35 (29.2%)</td>
<td>11 (9.2%)</td>
<td>08 (6.7%)</td>
<td>19 (15.9%)</td>
</tr>
<tr>
<td>I do better on exams when we used TBL to cover the material</td>
<td>0.7 (5.8%)</td>
<td>16 (13.3%)</td>
<td>22 (18.3%)</td>
<td>52 (43.3%)</td>
<td>23 (19.2%)</td>
<td>75 (62.5%)</td>
</tr>
<tr>
<td>After listening to lecture, I find it difficult to remember what the instructor talked about during class</td>
<td>18 (15%)</td>
<td>30 (25%)</td>
<td>41 (34.2%)</td>
<td>20 (16.7%)</td>
<td>11 (9.2%)</td>
<td>31 (25.9%)</td>
</tr>
</tbody>
</table>
Interpretation of Table (2)

Preference for LBL or TBL

- Thinking of non-related things 59 (49.2%) during lecture while 31 (25.9%) only in TBL.
- Easy distraction during lecture 59 (49.2%) and during TBL activities only 20 (16.6%).
- Falling asleep during lecture more than during TBL activities 64 (53.5%).
- Remember material better from lecture and from TBL, LBL 47 (39.1%) when using TBL 85 (70.8%).
- Read and doing better for exam, lecture 70 (58.4%) and by TBL 75 (62.5%).
- Effect of GRAT compared with application in remembering material. GRAT 70 (58.4%) and in application 61 (50.8%)
Student’s satisfaction with TBL

Figs (25 – 33)

Fig (9) Enjoyment of TBL activity by students

Fig (10) Better learning of the students in a team setting
Fig (11)
Student’s opinion about effectiveness of TBL activities

Fig (12)
Student’s opinion about funny activities of TBL
Fig (13)
Student’s opinion about time waste regarding TBL activities

Fig (14)
Effect of TBL in improving students grades
Fig (15)
Positive attitudes of students towards TBL activities

Fig (16)
Good experience of students about TBL
DISCUSSION

Assessment of student’s perception towards team-based learning activities is important for the academic to formulate constructive TBL strategy as well as assessment method to be included in the curriculum (Anitha S & Muthukumaran 2013). In this study, we investigated student’s perception towards their accountability in TBL. The study investigated whether the students preferred TBL or LBL. The study also assessed the general satisfaction and acceptability of the students to TBL.

The participants showed a high accountability towards TBL. More than 60 % of the students agreed that they spend time studying to be prepared for the in-class activities. This mean that more than 50% of the student were accountable for preparation for TBL. Seventy percent of them did that to do well during the in-class activities. This almost the same findings of student’s perception in two US universities in school of pharmacy (Tracy et al 2015)

As regard the student’s accountability towards their team learning, 60 % agreed that they were accountable. Most of the students agreed they learn better in a team setting than when they read individually. In study comparing student perception of TBL between Pakistani and UK students, they found that students of both cultures response that TBL are effective way to learn and improved their ability to learn new things (Raja et al 2012). From these findings, it is obvious that the students were accountable for pre-class preparation and towards their participation in their team learning. In this study the students first time experience small group learning and showed a reasonable accountability for their team learning. In the study, the students thought that TBL activities are an effective approaching of learning. These results do not differ much from that of the students of physical therapy in United States (Beven2014). There are obvious differences in the learning environment between the two countries. In the study, the students showed more accountability for pre-class preparation than Malaysian students did (Anitha 2013).

In this study, students were not familiar with teamwork and this the first time they experience learning in groups. Their only experience of group learning from few seminars carried during the basic medical sciences. These seminars done in a large group and there is no individual accountability and in many times they divided the topic between them. This may explain why few students preferred lecture-based learning.
In the subscale, which compared the student preferring TBL or LBL, 40% of the students, thought of non-related things during the lecture. In TBL activities, the student motivated to pay attention throughout the different activities. This mean that student preferred TBL activities to lecture. In study of pharmacy student perception of TBL in two university in UK, the student at both universities agreed that TBL assisted them with critical thinking, problem solving and examination preparation (Tracy R, et al 2015). More than 60% of the students agreed that they easily distracted during lectures. The student agreed that distraction was not easy during TBL activities. Seventy percent of the students agreed that they remembered material better and for longer time when discussed during TBL activities. This also in favour of TBL. More than 65% of the students agreed that they fall asleep during lectures and not during TBL activities. For all these reasons, our students preferred TBL to lecture-based. Same as in study of student perception towards TBL in Zimbabwe, in which the majority of the students (94%) agreed that TBL more stimulating than lectures (Jacob Gray et al 2014). The students remembered material better when learned by TBL than by lecture. The anatomy students in US medical students view TBL favourably irrespective of their examination grades (Nagaswami S, et al 2009).

In this study 70% of the students agreed that solving application problem helped them to recall past relevant information. In Brazil students of biostatistics found TBL very attractive since it, encourage them to develop new skills, formulate and answer questions and create opportunities to understand and recall material (Angela Tavares 2015).

About 60% of the students agreed that they remembered information longer, when they went over during GRAT. During GRAT, the students discussed materials from different points of view and each member tried to advocate his idea. During discussion, information will be arranged logically and this help longer remembering. More than 60% of the students agreed that they remembered material better after discussion during application exercise. To solve application problem, the students need apply higher thinking and retrieve past information. This why they remembered information for long time. The instructor feedback during application exercise also help remembering information for longer time. These findings showed that the students easily remembered and retrieved materials better when covered by TBL than by lecture. These were the same findings in many other studies (Beven L 2014, Dean X 2009, and Jacob G 2014).
More than 60% of the participants thought that TBL would help them to do better in exam. That means it was easier for the students to remember and recall materials covered by TBL than by lecture. From these findings regarding comparison between TBL and LBL, it is clear that TBL is far better at approaching learning than LBL. The students overcome the lecture drawback when applying TBL. Our results do not differ much from other findings in the literature (Ahmmad A et al 2014, Anitha S 2014, BevenL 2014, Dean X 2009, Jacob G 2014, MiKieman 2003, Tai BC & KohWP 2008 and Tracy R et al 2015).

Regarding students' satisfaction with TBL, the majority were satisfied. More than 50%, not only satisfied but they enjoyed the TBL activities. More than 90% of the students of Zimbabwe satisfied with TBL more than in this study. The explanation of this may be in Zimbabwe TBL applied in clinical course (Jacob G 2014). The students enjoyed the process of learning from each other’s. They had the opportunities to explain their understanding of the subjects. They had a valuable knowledge from the frequent feedback in TBL process. Same as Malaysian students (Anitha S 2014). More than 50% of students in this study agreed that they learned better in a team setting, in spite that they had no experience with other small group learning, such as problem-based learning (PBL) and had limited experience with seminars. More than 60% of the students agreed that they had a good experience with TBL and showed a positive attitude towards its activities.

Generally, the students in this study satisfied with their experience with TBL. Most of the students are accountable for the pre-class preparation, in class activities and participation in their team learning. They had generally positive attitude towards TBL. Our results same with other students’ perception towards TBL worldwide.
LIMITATIONS OF THE STUDY

- The study done only in department of pathology and one school.
- Duration of TBL was short and limited.
- Comparison between active learning and passive learning.
- This was the first experience of the students with small group learning.
- Group forming depend only on the result of basic medical sciences examination.
CHAPTER (V)

CONCLUSION AND RECOMMENDATION

CONCLUSION

- Eighty-two (68 %) of the students showed good accountability towards pre-class preparation.

- Seventy-six (63 %) of the students were accountable for contribution to their team member learning. They contribute and assist in their team member learning.

- The students thought that they learned better in team setting rather than lecture.

- They payed better attention during TBL activities than during lecture.

- They recalled and remembered material better when learned by TBL than by lecture.

- Sixty-four (53 %) of the students found TBL activities, effective approach to learning. Fifty-seven (47.5 %) enjoyed and like working in team. They were generally satisfied with TBL.

RECOMMENDATION

- Further researches about TBL (effect of TBL on student academic performance and on professional practice).

- Training of the staff seminars, workshops and attending TBL sessions in other schools implementing TBL inside and outside Sudan.

- Trial of implementation of TBL in other courses, basic sciences and clinical.

- Comparison of TBL with other small group learning ( PBL, SGD, CBL)

- We recommend further study comparing TBL with lecture regarding relation to inputs, processes, outcome and perception.
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Tai BC, Koh WP. Does team learning motivate student’s engagement in an evidence-based medicine course? Annals Acad. of Med. 2008; 37 (12); 1019-1023.


Appendix (1)

Team-Based Learning Student Assessment Instrument (TBL-SAII)

**Accountability Subscale**

This subscale assesses student preparation for class and contribution to the team. The scale for the items is as follows:

- 1 = strongly disagree
- 2 = Disagree
- 3 = neither disagree or agree (neutral)
- 4 = Agree
- 5 = strongly agree

1. I spend time studying before class in order to be more prepared. 1 2 3 4 5
2. I feel I have to prepare for this class in order to do well. 1 2 3 4 5
3. I contribute to my team members’ learning. 1 2 3 4 5
4. My contribution to the team is not important. 1 2 3 4 5
5. My team members expect me to assist them in their learning. 1 2 3 4 5
6. I am accountable for my team’s learning. 1 2 3 4 5
7. I am proud of my ability to assist my team in their learning. 1 2 3 4 5
8. I need to contribute to the team’s learning. 1 2 3 4 5

**Preference for Lecture or Team-Based Learning Subscale**

This subscale assesses student ability to recall material and student attention level in lecture and team-based learning.

The scale for the items is as follows:

- 1 = strongly disagree
- 2 = Disagree
- 3 = neither disagree or agree (neutral)
- 4 = Agree
- 5 = strongly agree

1. During traditional lecture, I often find myself thinking of non-related things. 1 2 3 4 5
2. I am easily distracted during traditional lecture. 1 2 3 4 5
3. I am easily distracted during team-based learning activities. 1 2 3 4 5
4. I am more likely to fall asleep during lecture than during classes that use team-based learning activities. 1 2 3 4 5
5. I get bored during team-based learning activities. 1 2 3 4 5
6. I talk about non-related things during team-based learning activities. 1 2 3 4 5
7. I easily remember what I learn when working in a team. 1 2 3 4 5
8. I remember material better when the instructor lectures about it. 1 2 3 4 5
9. Team-based learning activities help me recall past information. 1 2 3 4 5
10. It is easier to study for tests when the instructor has lectured over the material. 1 2 3 4 5
11. I remember information longer when I go over it with team members during the GRATS (Group Readiness Assurance test) used in team-based learning. 1 2 3 4 5
12. I remember material better after the application exercises used in team-based learning. 1 2 3 4 5
13. I can easily remember material from lecture. 1 2 3 4 5
14. After working with my team members, I find it difficult to remember what we talked about during class. 1 2 3 4 5
15. I do better on exams when we used team-based learning to cover the material. 1 2 3 4 5
16. After listening to lecture, I find it difficult to remember what the instructor talked about during class. 1 2 3 4 5

**Student Satisfaction Subscale**

This subscale assesses student satisfaction with team-based learning.

The scale for the items is as follows:

1=strongly disagree
2=Disagree
3=neither disagree or agree (neutral)
4=Agree
5=strongly agree

1. I enjoy team-based learning activities. 1 2 3 4 5
2. I learn better in a team setting. 1 2 3 4 5
3. I think team-based learning activities are an effective approach to learning. 1 2 3 4 5
4. I do not like to work in teams. 1 2 3 4 5
5. Team-based learning activities are fun. 1 2 3 4 5
6. Team-based learning activities are a waste of time. 1 2 3 4 5
7. I think team-based learning helped me improve my grade. 1 2 3 4 5
8. I have a positive attitude towards team-based learning activities. 1 2 3 4 5
9. I have had a good experience with team-based learning. 1 2 3 4 5

Please add any comments you may have about your experience with team-based learning.

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