

## Mini Review

# Audience Response System (Clickers) in Team Based Learning: The Good, the Bad and the Feedback

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## Abstract

Team Based Learning (TBL) is a student-centered instructional strategy which provides students with opportunities to apply their knowledge through a series of activities comprising of individual work, team work, its application to problem-solving task based assignments with immediate feedback to the students by faculty. TBL is a newly introduced instructional strategy at our institute. It is a once weekly activity which forms core instructional strategy in year one. Providing feedback to students is an essential component of TBL which leads to healthy and interactive discussion. Initially we were using scantrons for scoring readiness assurance tests which was leading to ineffective feedback and discussion and infrastructure overload on assessment office. This was also time consuming and lacked the utility of display of student performance in the form of bar graphs. We switched to using an Audience Response System (ARS) in which students used “clickers” produced by Turning Technologies to record student responses in readiness assurance tests and provide immediate feedback to the students at the end of team readiness assurance tests instantaneously in the same session. This also led to improved discussion when compared with Scantrons. Our method also resulted into reduced turnaround time for compiling continuous assessment results and reduced load on faculty and assessment office.

**Keywords:** Team based learning; Feedback; Discussion; Audience response system; Scantrons

## Brief Report

Team based learning TBL is a student-centered instructional strategy which provides students with opportunities to apply their knowledge through a series of activities comprising of individual work, team work, its application to problem-solving task based assignments with immediate feedback to the students by faculty [1]. The major benefit of TBL is that it incorporates the effectiveness of small group learning into large group format leading to a high degree of interaction among learners, while at the same time the tutors retain control over content delivered in the session and its mode of delivery [1-4].

Traditional TBL consists of three stages comprising of advanced student preparation based upon faculty provided session objectives, assessment by i-RAT (individual readiness assurance test) and t-RAT (team readiness assurance test) followed by immediate feedback and discussion by faculty and peers. This is followed by application exercises consisting of group based problem solving in the context of provided clinical scenarios [1-4]. Previously we were using standard Scantrons (bubble sheets) for scoring the i-RATs but we have now switched to audience response systems (Figure 1).

Audience Response System (ARS) is an electronic system in which a device known as clicker is used to respond to questions presented in a PowerPoint format transformed into Turning Technologies format [5]. ARS is also referred to as Classroom Response System (CRS) or Student Response system (SRS) in different articles. Clickers have an alpha-numeric pad, which allows participants to answer

anonymously in a real time MCQ slide that is part of the Power Point presentation [6].

In this paper we aim to describe the usage of clickers in TBL and how it improved the discussion and feedback in team based learning.

Alfaisal University, college of medicine is an eight-year-old private, non-profit and research-based institute with an integrated hybrid curriculum [7]. In the academic year of 2013-2014, the Curriculum Committee decided to introduce TBL as a core instructional strategy in the first-year of the medical school. Students are exposed to weekly



Figure 1: Turning technology clickers with radio frequency receiver.

two-hour long TBL session throughout the entire extent of Year-1, which includes seven organ-systems based teaching modules. Two hundred first-year medical students are randomly divided into sixteen TBL groups -. These groups remain the same students throughout the academic year.

Each TBL session is composed of three phases; pre-class preparation, readiness assurance tests, and clinical application exercises. Objectives for the week's TBL are posted by faculty on to the MOODLE TM (Learning management software) accessible to the students and faculty. This is followed by phase two, the readiness assurance tests, which are divided into two separate stages i-RAT (individual Readiness Assurance Test) and t-RAT (Team Readiness Assurance Test). The cumulative scores for both i-RATs (60% weight) and t-RATs (30% weight) and application exercises (10% weight). All TBL session scores in a block constitute 10% of the overall summative grade of the respective module.

The rationale for changing from Scantrons to clickers was that by using Scantrons for scoring i-RATs and t-RATs there was ineffective feedback and discussion and infrastructure overload on assessment office for processing of Scantrons after every TBL session with 200+ students in each session. This also resulted in increased turnaround time of compilation of continuous assessment results (TBL scores). The item analysis from Scantrons was also not being used by the faculty to assess item difficulty and discrimination index due to increased turnaround time. Scantrons also lacked the utility of display of student performance in the form of instantaneous bar graphs for resource faculty to provide immediate feedback.

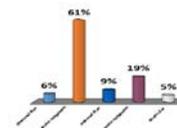
We switched to using the Audience Response System (ARS) in which students used "clickers" produced by Turning Technologies LLC (Youngstown, OH, USA) to record student responses in readiness assurance tests. In order to improve student participation, clickers were purchased by the university and were distributed to students at the start of each TBL sessions and collected at the end of each session. All clickers have unique identification matching it to each specific student. All multiple choice questions were converted into Turning Technology software format. This polling presentation for i-RAT is started and questions are displayed on the screen. Students are required to sit in an examination pattern on previously allocated seats. Students are expected to answer each question within a specified time period without the option of going back to previous questions by pressing appropriate choice on their clickers. 'First response only' option was activated in the software to record the first option submitted by students. Students were informed that they do not have the option of changing the recorded option.

After completion of i-RAT, all the clickers are collected except those of the designated group leaders. The polling presentation for t-RAT is started after the students sit in group format. The students start discussing the various options in the questions and arrive at the answers *via* consensus and now only group leaders' answers *via* "clickers" are recorded. This is where the weak students benefit the most during team based learning [2- 4].

At the end of t-RAT the faculty displays student performance in the form of a bar chart for each item from i-RAT polling results and all the items are discussed with intragroup, intergroup and faculty mediated interaction. An example of an MCQ question for i-RAT

**Q.2. During a brawl, a 21-year-old man was kicked hard in the anterior abdominal wall by heavy boots with steel toecaps. He later complained of nausea and severe pain in this region. He was taken to the hospital. On examination, the physician observed extensive bruising and swelling of the anterior abdominal wall on the right side, immediately inferolateral to the umbilicus and confirmed a hematoma. Which of the following arteries can be involved in this case?**

- A. External iliac
- B. Inferior epigastric
- C. Internal iliac
- D. Superior epigastric
- E. Testicular



**Figure 2:** An example of an MCQ for i-RAT and t-RAT with student performance histograms respectively.

### GIT Block – TBL-1

#### Clinical Scenario Answer Sheet

#### Clinical Scenario 1:

Amir, a busy businessman, has been periodically suffering from epigastric pain. He would generally take some antacid tablets for relief, but their effects were short-lived. He went to see his physician and described his situation: "The pain usually starts a couple of hours after I eat. However, when I drink milk or have a little bit to eat I feel better, but the pain comes back in a couple of hours. Further, the pain sometimes wakes me up at night". Dr. SA asked him if he was taking any NSAIDs. Amir said that he was not. Dr. SA prescribed a proton pump inhibitor (omeprazole) and recommended an *H. pylori* breath test.

**Box 1:** An example of a clinical scenario.

and t-RAT with student performance histogram is given in (Figure 2). An example of a clinical scenario is given in (Box 1).

#### The good

Switching from Scantrons to clickers led to immediate feedback on student performance. The displaying of student performance on the screen was able to increase student participation and engagement in discussion and also immediate clarification of concepts. The use of clickers led to decreased workload on the assessment office as initially Scantrons were being processed in that office. This also led to improved turnaround time. Both the students and faculty were able to see the student performance and were able to assess item difficulty.

In a survey conducted among the students to evaluate the educational effectiveness of the ARS and use of class time, more than 70% of the students strongly felt that clickers had a positive impact on their learning and beneficial use of class time.

#### The bad: what problems were encountered with the use of clickers?

Although the overall experience with this method was quite satisfactory, the students reported problems including weak signal of clickers due to weak batteries and non- registration of answers. Additionally student survey also revealed that students felt more anxiety with using clickers as there was no option to change their answers. However they were far more satisfied with seeing the instantaneous test statistics- in the form of bar graphs reflecting student performance. The first time cost of purchasing the clickers and software license may seem excessive but when compared to the cost of 200 + Scantrons every week, it is actually cheaper in the long

run. It is also important to note that Faculty will also require training on the software and IT support.

## Discussion and Lessons Learnt for Application

A review of literature does not reveal any significant reports describing the use of clicker methodology in team based learning in medical education [8]. Present study showed that first-year medical students perceived TBL as an aid in terms of enhancing their thinking and critical reasoning skills. Our usage of audience response system in a class of 200+ students demonstrated increased student participation and engagement in discussion and also immediate clarification of concepts. We also report that this should be a preferred method as it also leads to decreased workload on assessment office for the processing of Scantrons. It also facilitated the faculty in getting a better idea about the quality of the items submitted with a decreased turnaround time.

An argument can be made for comparison of ARS with web based systems like Top Hat™, Turning Point cloud™, Nearpod™ and ExamSoft™ but the problem with web based systems is that students can take photographs of the questions through their electronic devices compromising the pool of questions in TBL and also more importantly there is no option to conduct t-RATS on these web based systems [9-12].

## Conclusion

Switching from Scantrons to clickers led to immediate feedback on student performance. The displaying of student performance on the screen was able to increase student participation and engagement in discussion and also immediate clarification of concepts.

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