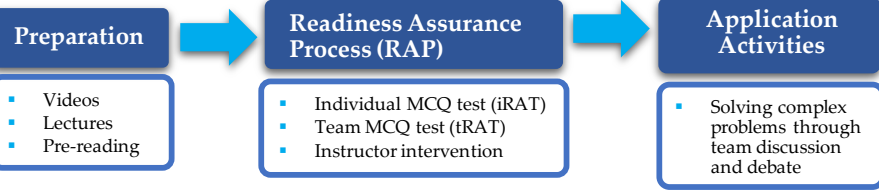


# Team Based Learning: in-person or online collaborative active learning that enhances problem solving skills

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## What is TBL?

Team Based Learning (TBL) is a structured, small group, collaborative form of learning where learners combine their knowledge to solve problems.



## In-person TBL

During *in situ* sessions students use a scratchcard (below) to obtain instant feedback on their team MCQs then work through application activities together on paper.

TBL is highly effective at facilitating active learning:

**Preparation:** requirement to prepare in advance

**Application:** problem solving

**Collaboration:** discuss potential solutions and learn from peers

Regular evaluation suggests over 90% of students find TBL useful.

**IMMEDIATE FEEDBACK ASSESSMENT TECHNIQUE (IF AT@)**  
Name 3 Test # 28  
Subject \_\_\_\_\_ Total \_\_\_\_\_  
**SCRATCH OFF COVERING TO EXPOSE ANSWER**

|     | A                                   | B                                   | C                                   | D                                   | Score |
|-----|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------|
| 1.  | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | 4     |
| 2.  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | 4     |
| 3.  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | 4     |
| 4.  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 4     |
| 5.  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 0     |
| 6.  | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | 4     |
| 7.  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | 2     |
| 8.  | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | 4     |
| 9.  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | 4     |
| 10. | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | 4     |
|     |                                     |                                     |                                     |                                     | 28/40 |

## Online TBL

To facilitate online TBL, we designed a free to use [online scratchcard](#), which was easily embedded in MS Teams and provides instant feedback during the RAP.

**Application activities** were completed on shared Power Point slides, easily monitored by the instructor.

**Shared Work**

1. The rate constant for the reaction between NO and O<sub>3</sub> is  $1.14 \times 10^{10} \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$  at  $256 \text{ K}$  and  $1.16 \times 10^{11} \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$  at  $100 \text{ K}$ . Estimate the activation energy and the Arrhenius pre-exponential factor showing full details of your working.

$$k = A \exp\left(\frac{-E_a}{RT}\right)$$
$$\ln\left(\frac{k_2}{k_1}\right) = \ln\left(\frac{A \exp\left(\frac{-E_a}{RT_2}\right)}{A \exp\left(\frac{-E_a}{RT_1}\right)}\right)$$
$$\ln\left(\frac{1.16 \times 10^{11}}{1.14 \times 10^{10}}\right) = \ln\left(\frac{\exp\left(\frac{-E_a}{RT_2}\right)}{\exp\left(\frac{-E_a}{RT_1}\right)}\right)$$
$$\ln\left(\frac{1.16 \times 10^{11}}{1.14 \times 10^{10}}\right) = \frac{-E_a}{R} \left(\frac{1}{T_2} - \frac{1}{T_1}\right)$$
$$E_a = \frac{R \ln\left(\frac{1.16 \times 10^{11}}{1.14 \times 10^{10}}\right)}{\frac{1}{350} - \frac{1}{298}}$$
$$E_a = 10.2 \text{ kJ mol}^{-1}$$
$$A = k \exp\left(\frac{E_a}{RT}\right)$$
$$A = 1.14 \times 10^{10} \times \exp\left(\frac{10200}{8.314 \times 298}\right) = 7.00 \times 10^8 \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$$

**Team 11 – TBL IRAT** **Student View**

[RELOAD THIS PAGE](#) (to see if anything has been submitted by your teammates in this session)

Welcome to TBL

Welcome to the IRAT of your TBL session!  
IMPORTANT: Please read the instructions at the bottom of this page at your first time using this system.  
Most importantly, DO NOT SUBMIT the form below WITHOUT DISCUSSING with your teammates first.

After talking to your teammates, please select your team's response for **Question Q1** below:

A  
 B  
 C  
 D

**Your team's responses**

Your responses to each of the questions is shown below, along with the number of points achieved. The correct answer is highlighted in bold.

| Q1  | Q2   | Q3   | Q4   | Q5   | Q6   | Q7   | Q8   | Q9   | Q10  | Total points (out of 40)   |   |
|---|--|--|--|--|--|--|--|--|--|--|---|
| no attempts/4 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 | no attempts/4 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 | no attempts/4 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 | no attempts/4 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 | no attempts/4 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 | no attempts/4 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 | no attempts/4 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 | no attempts/4 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 | no attempts/4 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 | no attempts/4 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 | no attempts/4 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 attempts/0 | 0 |

**Staff View**

27/10/2020 Teacher's TBL results

**Keele PHP TBL – Instructor's Page**

Class results overview for CHE-10063

Please find a summary of your teams' results below. [Reload this page](#) frequently to see the students' progress during the session.

| Team Name | Q1                     | Q2                     | Q3                     | Q4                     | Q5                     | Q6                     | Q7                     | Q8                     | Q9                     | Q10                    | Total Points |
|-----------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|--------------|
| 1         | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | 37           |
| 2         | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | 14           |
| 3         | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | 24           |
| 4         | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | Responses: 4 Points: 4 | 20           |

## Advantages:

- Highly structured
- Peer interaction
- Instant Feedback
- Accessible for staff with no prior TBL experience

*"TBL has probably been the most effective teaching tool that I have used online"* - Keele staff member

Whilst not all students enjoyed the sessions, over 70% of those surveyed found online TBL useful.