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# *Directive Resources in Promoting Student Confidence and Communication Skills in Team-Based Learning*

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*Team-based learning (TBL) is becoming more popular within active learning environments as its collaborative nature is deemed beneficial for promoting deep learning experiences. However, this is only effective when students fully engage in the discussions. In TBL sessions we conducted, although students appeared generally to be engaged, it was noticed that the overall discussions were often limited, which negates the collaborative nature of TBL and does not provide the supportive environment needed to promote learning. This prompted pedagogic research in how to enhance the level of discussion occurring within the teams during TBL sessions. It was deduced that students may not fully appreciate the expectations of participating collaboratively within a group, which prompted the provision of directive resources to promote students' confidence and enhance the depth of discussions. The directive resources provoked some positive changes in students' behaviours and confidence within discussions. Recommendations that have emerged from this project relate to providing more guidance on discussions and group collaborations, and the allocation of team roles. However, wider recruitment and longitudinal studies are now needed to confirm the extent of the benefits.*

## Introduction

### *Description of TBL*

Team-based learning (TBL) is a form of active learning where individuals are allocated into small groups in which they are encouraged to work collaboratively on answering a set of problems. TBL generally comprises of four phases: prior learning, readiness assurance, application activities, and evaluation and reflection.

The progressive structure of TBL enables students to ascend through multiple levels of Bloom's taxonomy (1956); the responsibility of reaching the lower levels of remembering and understanding are placed on the student, which creates more time within the classroom for

instructors to support students in extending to the higher learning levels of application, analysis, evaluation, and creation (Figure 1).

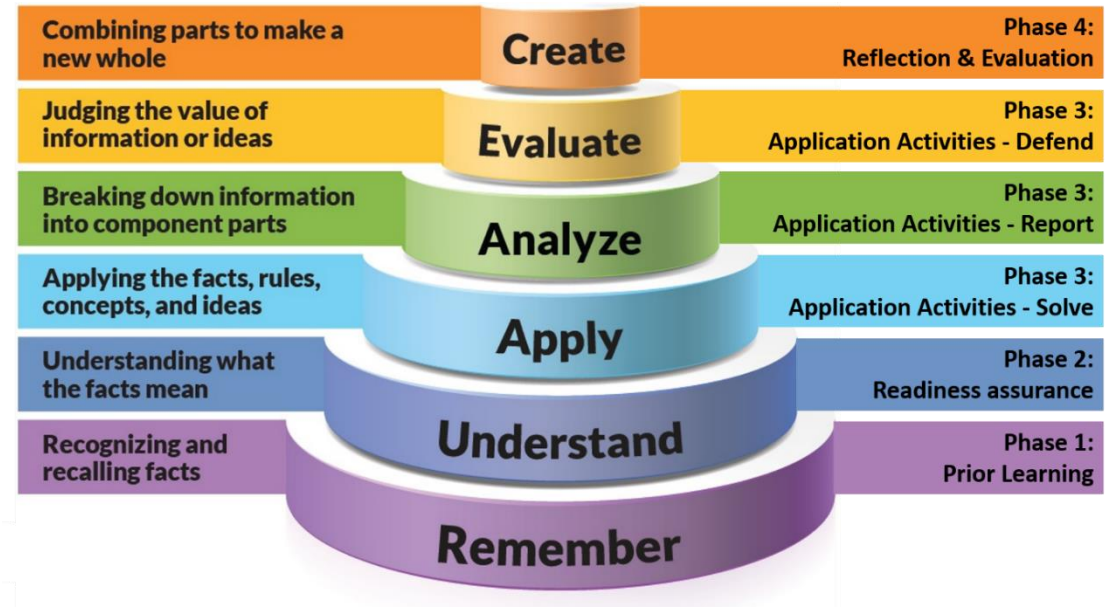


Figure 1: How the TBL Phases link to Bloom's Taxonomy. (Adapted from Shabatura, 2020)

Learners engage collaboratively by sharing and exchanging knowledge, through discussion and debate, to enhance the understanding of the entire group. The instructor acts only as facilitator to encourage students to be interdependent on one another and promote deep learning experiences (Hrynchak and Batty, 2012).

This learner-centred nature of TBL is in line with social constructivist epistemology (Vygotsky, 1978). Learners can 'try out' complex ideas within a safe environment, which enables students to learn how to take risks, identify and reconstruct inconsistencies in understanding (Michaelsen and Sweet, 2004; Pelech and Pieper, 2010), and develop their social and emotional intelligence (Mayer and Cobb, 2000).

The groups remain consistent for the duration of the course to allow students to become familiar with their team, and enable good working relationships to be established (TBLC, 2019).

### *Depiction of TBL within the literature*

Although TBL has been around since the 1970s (Michaelsen *et al*., 2008), its use is only recently growing as Higher Education progressively moves away from didactic teaching methods, though the literature search for chemistry, and particularly Foundation Year, proved limited.

Arguably the most significant benefit of TBL is the enhancement of transferable skills, such as critical thinking, self-regulated learning, teamwork, and communication, though other benefits include immediate feedback, increased attendance, and ability to deliver to large group sizes (Koles *et al*., 2010; Thompson *et al*., 2007). However, only marginal improvements in exam performance have been documented (McInerney and Fink, 2003; Koles *et al*., 2010).

### *Student confidence*

Several studies have analysed how students' confidence impacts their attainment, motivation and retention (Bell and Volckmann, 2011; Atherton, 2017), and it has been indicated that low confidence is associated with reluctance to contribute in the classroom, largely arising from a fear of appearing unintelligent to peers (Fassinger, 1995). However, there is very little literature on how to promote confidence in university students. Cuseo (1992) identifies that there is a need to help students prepare for the social and emotional demands of collaborative learning and suggests this can be achieved by providing specific instruction for effective communication skills, including: group encouragement, active listening, and consensus building. Guidance on academic team discussion is another area noted to be sparse within the literature (Haidet, Kubitz and McCormack, 2014).

### *Research overview*

TBL was embedded into a Foundation Year chemistry course to promote deeper learning experiences by encouraging collaborative learning; students worked through sets of questions in small teams to develop their understanding of key chemistry concepts and shared their prepared group responses within the session.

Although students appeared to be generally engaged within the sessions, it was noticed that there were limited discussions occurring within some teams, with students tending to stay in their comfort zones and being less inclined to offer explanations, or sometimes even demonstrate their understanding. The collaborative nature of TBL becomes redundant if students are simply stating what answer they selected with no explanation of why as this leads to an absence of meaningful discussion which would help students to build on and reconstruct their knowledge.

The pedagogic issue was how to improve the quality of the discussions to enable more effective learning to take place, both in terms of subject knowledge and skills development. The first cycle of this project involved a baseline analysis, used both to inform the interventions conducted to promote discussion, and for comparative analysis.

Directive resources were provided to support students in developing their discussions. Thus, this study aimed to evaluate the impact of the directive resources on promoting student confidence and communication skills in TBL, which was analysed within cycle two. A third cycle was used to further validate the findings (Figure 2).

## Methods

### *Ethical approval*

This research was conducted as part of an MA action research project, thereby ethical approval was granted via the University's Student Project Ethics Committee (SPEC).

### *Participants*

The study was conducted in 2019, within a Foundation Year chemistry module. Students participated in fortnightly TBL sessions throughout the semester, so were already familiar with the TBL process, and acquainted with their teammates, before taking part in the study. Before being

assigned to their permanent teams, consisting of 6-7 individuals, all students completed a short questionnaire on their previous chemistry experience and their level of confidence in applying chemistry knowledge, and this information was used to distribute a similar level of skills and ability between different teams. Although attendance at the TBL sessions was compulsory, the participation in the study was voluntary and only 25/67 (37%) individuals consented to take part.

### *Structure of TBL sessions*

Students prepared for the TBL sessions by attending the lecture and engaging with additional materials, including directed reading and practice questions. On arrival at the session, students completed an individual readiness assurance test (iRAT), comprised of ten multiple choice questions (MCQ). This was followed by a team readiness assurance test (tRAT), where students worked together on the same set of ten questions; correct answers were revealed by an immediate feedback assessment technique (IF-AT) in the form of a scratch card. The IF-AT was then used by the facilitator to discuss the concepts found to be more challenging in the style of a mini-lecture. Following this, students moved on to complete application questions in their teams, and then reported and defended their team responses to the other groups. The sessions concluded with a short plenary.

### *The Interventions*

Resources relating to collaboration (Edutopia, 2012), communication (Headlee, 2015) and preparation (Khan Academy, 2018) were provided following cycle 1, and were available a week in advance of cycle 2. In addition, a resource containing cartoons was created specifically to address the context of TBL and provided advice for getting the most from the TBL session.

### *Data collection and analysis*

The study was conducted through three cycles, each with a different intention: to inform, analyse and validate, as highlighted in Figure 2.

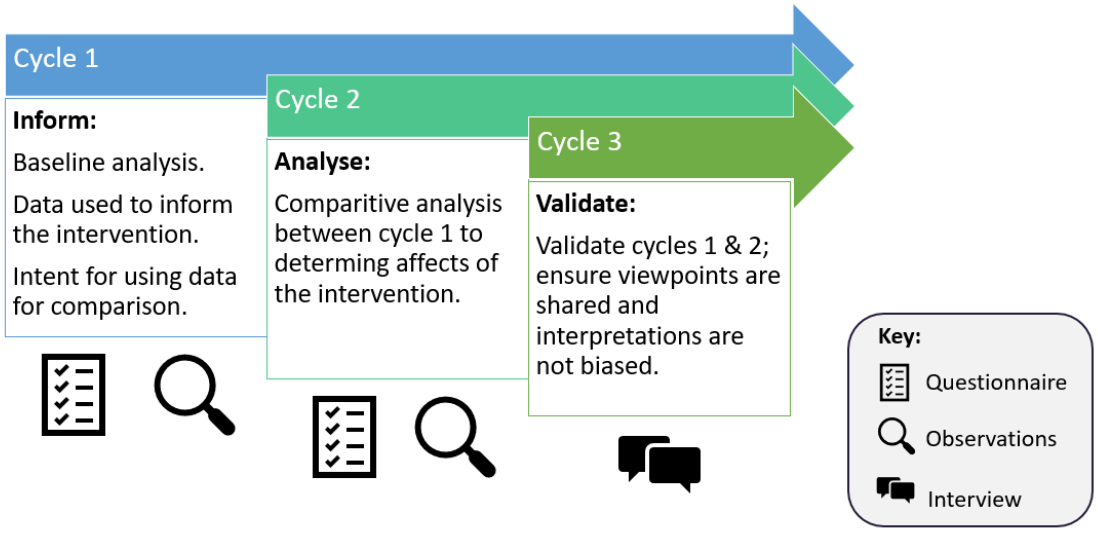


Figure 2: Key intentions associated with each cycle.

Triangulation of questionnaires, observations and a semi-structured interview was used as part of an epistemological approach to provide a more comprehensive understanding of the data set, and to increase the reliability and validity of the results (McNiff, 2016, p.205).

### *Questionnaires*

Questionnaires were used to investigate the students' perspective of TBL sessions, and the value of the directive resources. For each questionnaire, students were asked to respond to questions using Likert scales. (Note that the responses for agree and strongly agree, have been collapsed into a single nominal category when referring to the results, as have responses for disagree and strongly disagree; this was to reduce information overload and improve accessibility for the reader). There was also a section for open responses, in which students could leave further comments or suggestions.

Students were also asked to self-assess their confidence in several areas using a 10-point scale, with 10 being very confident and 0 being not confident at all. They were also asked to apply this scale to their perceived ability of their team. The data was determined to be normally distributed, so paired t-test analysis was used to identify any changes following the intervention, and 2-sample t-tests were used for comparison between individuals and their teams. Thematic analysis was applied to the free comment section, following a framework analysis (Braun and Clarke, 2006; Norton, 2009).

### *Direct Observation Methods*

Observations of team discussions were conducted during the tRAT component of the session, which was 20 minutes in length. A pilot observation was conducted to determine which behaviours to include, and this resulted in the construction of a coding sheet with the key categories: level of engagement; contribution to discussion; and depth of discussion, consisting of a total of 14 behaviours in total.

The coding sheet followed a semi-structured format, with a tick-box system to monitor displayed behaviours, and an open-ended section to capture any observations that were not predicted and that may otherwise have been unconsciously missed. Observations of each team were taken as several snapshots, each lasting around 30-45 seconds, to provide a generalised overview of how each team was perceived to be interacting.

Recording of the observations was conducted as discretely as possible to reduce the risk of the Hawthorne effect, whereby participants' awareness of being observed initiates a modification in their behaviour (Cohen, Manion and Morrison, 2011).

### *Semi-Structured Interview*

Thematic analysis was applied to the semi-structured interview transcript, following a framework analysis (Braun and Clarke, 2006; Norton, 2009) to identify discrete categories relating to the research aims.

## Results

### *Student Opinions of TBL sessions*

Student responses to the closed questions regarding students' attitudes towards learning in TBL sessions are shown in Figure 3. Notably, 76% of students indicated that they found it useful to learn from their peers (Q1.1), and 84% of students considered that they benefited from discussing solutions within their team (Q1.2), with most students (80%) stating that they would ask their team for clarification if they didn't understand a concept (Q1.3).

Around a third (36%) of students admitted that they worry about being wrong in team discussions, whereas 40% of students stated that this does not worry them (Q1.4). 72% of students indicated that they found sharing group answers less intimidating than providing their own ideas (Q1.5).

Most students (88%) found the activities to be a useful way to receive quick feedback on their learning (Q1.6) and perceived the activities to be beneficial for improving their confidence in several areas, including: working in a group (76%, Q1.7), chemistry understanding (84%, Q1.8) and in their group discussions (68%, Q1.9). In addition, 60% of students recognised that the team competition helped increase their motivation for the activities (Q1.10).

All open responses were positive, and thematic analysis revealed that the emerging themes related to 'understanding', 'thinking', 'feedback' and 'fun and engagement' (Table 1).


Figure 3: Cycle 1 questionnaire responses for attitudes towards learning in TBL sessions (n = 25).

| |
|---|
| The layout of the problems class is very useful to identify areas I'm not as confident in that I might not have realised before! |
| Team discussion is very helpful for learning and understanding. |
| The scratch card is fun and makes us think more before answering. |
| Working in a team definitely made it easier to share answers and helped to understand questions that I wasn't sure about. |

Colour key: understanding, thinking, feedback, and fun and engagement

Table 1: Sample of students' comments and suggestions from the Cycle 1 Questionnaire.

### *Self-rated Confidence*

Students' confidence levels in answering questions significantly increased when working as a team compared to completing questions independently (Figure 4A); this was shown to be significant for both cycle 1 ($P < 0.001$) and cycle 2 ($P < 0.001$).

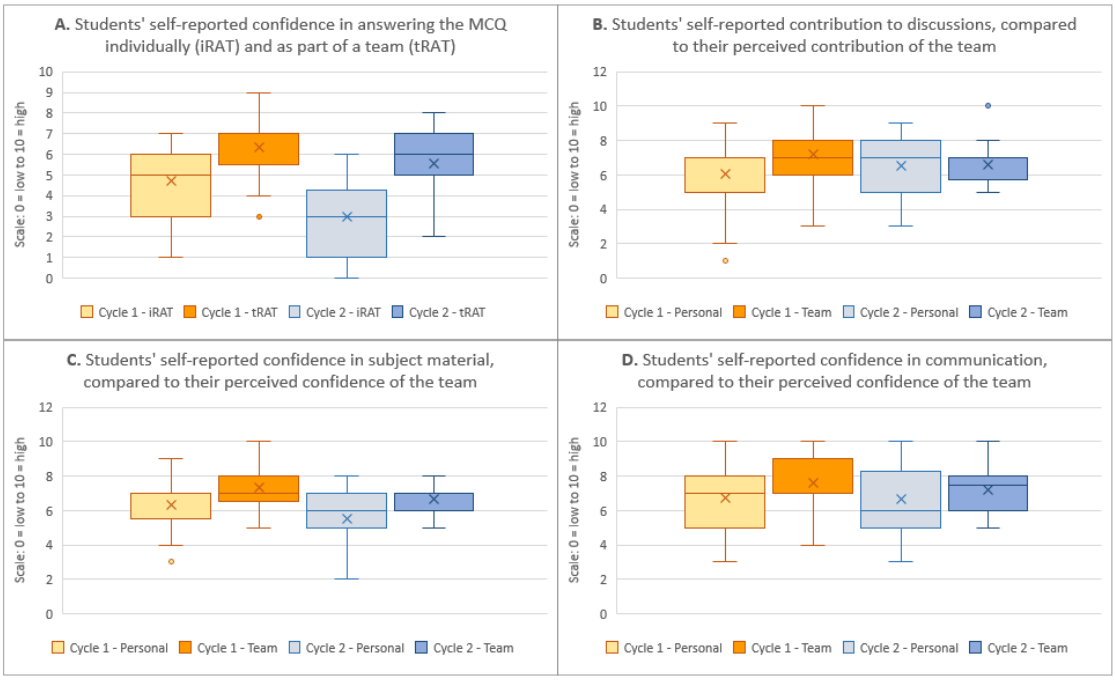


Figure 4: Comparison of confidence answering MCQ independently and as a team (A). Differences in students' self-reported abilities compared to their perception of the team, for: contributions to discussions (B), confidence in subject material (C) and confidence in communication (D).

Cycle 1 indicates that students generally rate their personal ability in TBL sessions to be lower compared to their team; this was shown to be significant for contributions to discussions (Figure 4B; $P < 0.05$) and confidence in subject material (Figure 4C; $P < 0.05$), but was not significant for confidence in communication (Figure 4D; $P = 0.111$).

Following provision of the directive resources, students indicated that they considered their contributions to the discussions (Figure 4B; $P = 0.826$) and their confidence in communication (Figure 4D; $P = 0.311$) to be more comparable to the rest of their team. However, they

still considered their confidence in subject material to be lower than their teammates (Figure 4C; P = 0.01).

### *Student Attitudes towards the resources*

Only 61% of participants accessed the directive resources. However, all participants were asked to complete the questionnaire for cycle 2. Students' opinions of how well the directive resources improved specific areas are highlighted in Figure 5.

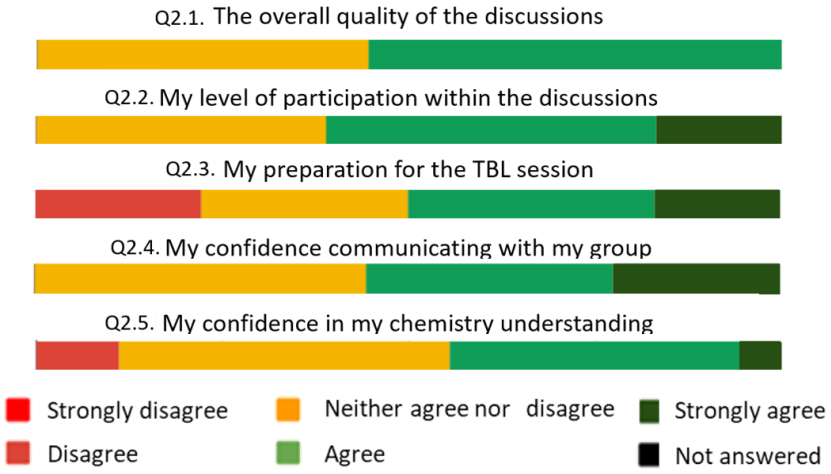


Figure 5: Cycle 2 questionnaire responses for how well the directive resources improved key areas.

56% of students stated that the directive resources improved the overall quality of the discussions (Q2.1), and 61% of students indicated that the resources improved their personal level of participation within the discussions (Q2.2); 44% and 39% respectively provided a neutral response, which coincided with those who did not use the resources personally, but nobody disagreed with these statements.

The resources improved preparation for the TBL session for 50% of students (Q2.3), 22% disagreed with this statement and 28% provided a neutral response. Confidence communicating within the group was said to be improved for 56% of students (Q2.4), 44% provided a neutral response, but only 45% stated that the resources improved confidence in chemistry understanding (Q2.5).

Thematic analysis of the open responses revealed emerging themes related to: discussions; resources; and apprehension and confidence (Table 2).

| |
|---|
| I didn't use the resources (sorry) but I think we had better discussion because others in my team did. |
| The resources given on TBL helped me to know how I can participate more in the discussions and not to be scared to share ideas. |
| The sketch was useful for showing that others have same insecurities and not to worry about saying what you think. |
| I noticed everyone's confidence improving as we complete the session compared to the beginning. |

Colour key: discussions, resources, apprehension and confidence

Table 2: Sample of students' comments and suggestions from the Cycle 2 Questionnaire.

### *Observations*

Observation of behaviours displayed during the tRAT discussions were collected using a coding sheet and are summarised for cycle 1 (Table 3) and cycle 2 (Table 4), with higher achieving teams highlighted in grey.

| Group | Time (mins) | Score /40 | Summary of Perceived Behaviours |
|---|---|---|---|
| Li | 15 | 30 | One member encouraging team, but discussions brief. |
| Be | 11 | 25 | Rushed through discussions. |
| B | 16 | 30 | Mostly stating answers. |
| C | 17 | 36 | Key facilitators. Explaining answers. Expressionate. |
| N | 12 | 24 | Mostly stating answers. Appear to be working as two groups rather than one. |
| O | 14 | 27 | Expressionate, but only brief attempts at discussing answers |
| F | 18 | 36 | Key facilitator, debating and explaining answers, but started to rush when noticed that other teams had finished. |
| Ne | 14 | 22 | Only stating answers, no further discussion. |
| Na | 16 | 38 | Key facilitator. Explaining answers |
| Mg | 20 | 40 | Key facilitator, explaining and debating answers. Expressionate. |
| Al & Cl | 19 | 30 | Group dynamics appears to be affected by merge of groups. Most members just listening. |
| Si | 14 | 24 | Rushed through answers, no discussion. |
| P | 12 | 30 | Voting on answers, but no discussion. |
| S | - | - | All members absent, which is unusual. |
| *Mean* | *15.2* | *30.2* | |

Table 3: Summary of observations during tRAT discussions for Cycle 1.

The groups who had spent longer on the discussions, scored significantly higher on the tRAT, both for cycle 1 ($P < 0.005$) and for cycle 2 ($P < 0.005$).

The highest scoring teams (C, F, Na and Mg) had members acting as key facilitators; these members initiated the discussions and ensured that explanations for the answers were provided, rather than just stating which responses were selected. These teams deliberated over answers, and discussions were also supported by team members who were less confident in their chemistry understanding asking for further clarification from their peers. In contrast, the teams who either just stated their answers with little or no explanations or rushed through their answers (Be, N, Ne and Si) were the teams who scored the lowest on the tRAT.

Unforeseen circumstances resulted in lower attendance during cycle 2, with most teams being merged to maintain group sizes of around 6 (Table 4). Observed changes to the usual level of contribution of participants are recorded in bold.

| Group | Time (mins) | Score /40 | Summary of Perceived Behaviours |
|---|---|---|---|
| Li & Be | 14 | 28 | One member attempting to explain, most team members stating answers.<br>***Li7 explaining***<br>***Be6 asking questions*** |
| B & O | 16 | 32 | Key facilitator, explaining and debating answers. Expressionate.<br>***B1 – appears withdrawn (unusual)*** |
| C | 19 | 34 | Key facilitators. Explaining answers. Expressionate.<br>***C6 asking questions***<br>***C4 explaining answers*** |
| N | 8 | 14 | Very rushed and little discussion – mainly stating answers. |
| F & Ne | 11 | 21 | Usual facilitator unavailable, discussions were rushed.<br>***F1 asking questions (EAL)***<br>F6 explaining (when prompted by Ne1) |
| Na & P | 13 | 26 | Rushed through discussions.<br>**P5 stating answers, but usually prefers to listen (EAL)** |
| Mg & Al | 18 | 34 | Key facilitator, explaining and debating answers. Expressionate.<br>***Al7 appears more confident in offering explanations.*** |
| Si & Cl | 14 | 25 | Rushed through discussions<br>**Cl5 asking questions** |
| *Mean* | *14.1* | *26.8* | |

Table 4: Summary of observations during tRAT discussions for Cycle 2. Notable changes in individuals' contributions in the sessions are highlighted in bold. Individuals are referred to by Group and member number.

### *Focus Group*

The semi-structured interview lasted 13:34 minutes, and was analysed using thematic analysis. 11 reoccurring categories were recognised with the main themes relating to: suggestions and critique; learning gains; group dynamics; and resources, as indicated in Figure 6.

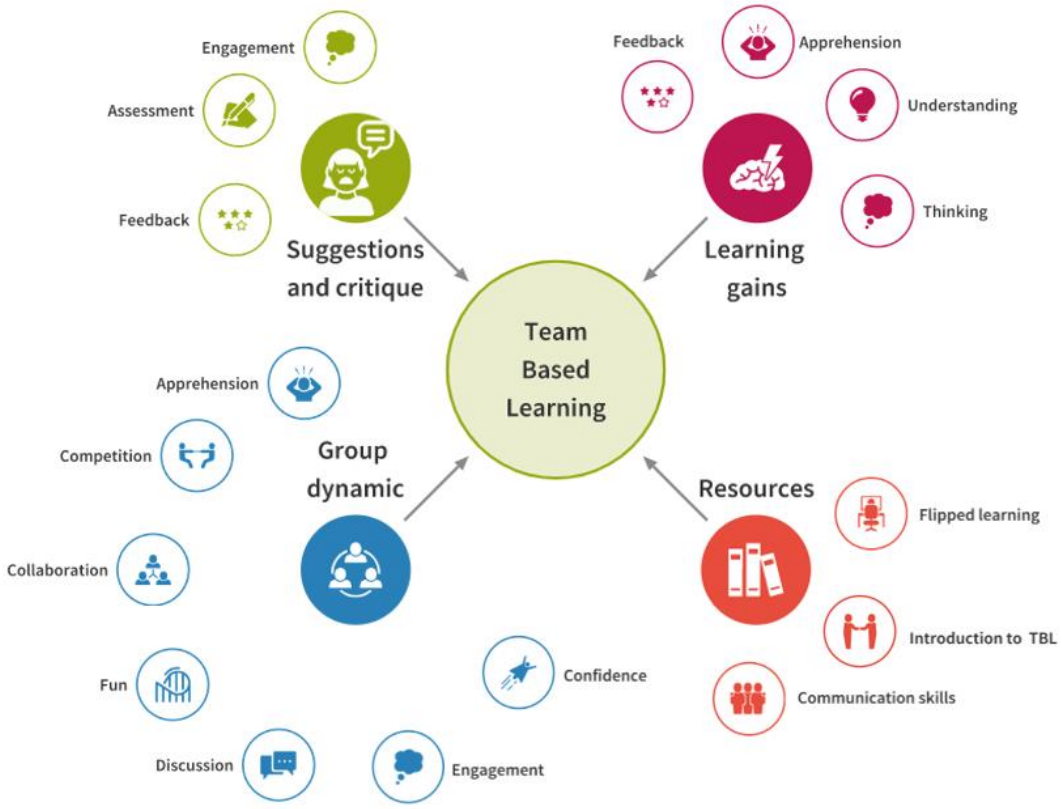


Figure 6: Thematic map resulting from the interpretation of the semi-structured interview transcript.

The themes and categories identified from the semi-structured interview were comparable to the previous cycles, with 7 of the 11 categories reoccurring from within the 'free comment' sections of the questionnaires. Specific quotes from the semi-structures interview transcript are highlighted in Table 5.

| | |
|---|---|
| Learning Gains | "trying to work it out together helped consolidate our understanding"<br>"explaining something to somebody else is the best way of reinforcing knowledge"<br>"it's good knowing if you were right or not using the scratch cards and not having to wait for results to be put up" |
| Resources | the cartoon "made me realise that not everyone admits to when they don't know … I think it encouraged me to talk more … to give more detailed answers" |
| Group Dynamics | "we're all a bit quieter to start. But then we kind of settle a bit and talk more"<br>"people talked less as they were in different groups … they didn't know each other as well" |
| Critique and suggestions | "it's difficult if your group doesn't get involved"<br>"(use) WebPA, so those who've contributed will receive higher a mark" |

Table 5: Sample of responses from the semi-structured interview.

## General Discussion

Within the TBL model, learning occurs through a process of collaboration between small teams, where knowledge and skills are socially constructed (Pelech and Pieper, 2010). However, previous observations within a foundation year chemistry course indicated that the level of discussion was limited within some teams, and so several students were not achieving the full learning benefits associated with TBL activities.

Although discussions are an essential aspect of TBL, there remains virtually no guidance for conducting academic team discussions presented within the literature (Haidet, Kubitz and McCormack, 2014). Low confidence is also mentioned as an inhibiting factor for quality discussions (Bell and Volckmann, 2011; Atherton, 2017), although there is also little literature addressing how to improve this issue.

This study therefore sought to explore methods to evaluate and promote students' performance in TBL, specifically relating to confidence communicating in a collaborative setting.

### *Attitudes towards TBL*

Students' perceptions of TBL reflected the pedagogic theories highlighted within the literature, valuing the collaborative nature of TBL, timely feedback, and associated improvements to understanding (McInerney and Fink, 2003). The competitive aspect of the activities also promoted students' motivation for a number of individuals, and it was encouraging that a large proportion of individuals considered TBL to be a useful strategy to improve their confidence in several areas.

The high number of students stating that they would ask their team members for clarification contradicts the behaviours noted through observations. Indeed, it is proposed that individuals are not always accurate in judging their own behaviours (Robson, 2002), so it is suggested that the collection of in situ data yields more authentic data compared to questionnaires. It was perceived that significantly fewer students put this ability into practice, which may correspond with a third of students admitting that they are worried about being wrong. This notion highlighted the importance of emphasising to students that being wrong is part of the learning process and that ideas are formulated through discussion; it also informed the content included in the cartoon resource.

It was intriguing that confidence in communicating within the discussions was rated reasonably highly (6.76/10), again conflicting with behaviours noted through the observations. If indeed students feel happy to communicate within their teams, it is possible that the limited discussions are due to a lack of awareness of understanding what quality discussions entail. This coincides with Cuseo's (1992) philosophy that educators need to train students for effective communication. However, students rated their personal confidence levels lower than that of their team, and it has been observed that a fear of appearing unintelligent to peers is associated with low confidence levels, which may cause students to be reluctant to contribute to discussions (Fassinger, 1995).

Students considered the subject material for cycle 2 to be more challenging compared to cycle 1, resulting in a reduction in confidence answering the MCQs independently. However, one of the key positives of TBL is that it provides a supportive environment for tackling complex concepts (Pelech and Pieper, 2010), which is reflected in the significant increase in confidence when working as a team ($P < 0.001$). Indeed, 84% of students felt that they benefitted from discussing solutions with their team members.

### *Resources*

Despite the short timeframe for accessing the resources, and modest number of students engaging with them, it was encouraging that over half of the participants indicated that the resources improved their level of participation in the discussions (61%), and signified an improvement in the overall quality of discussion (56%) and in their confidence communicating (56%). It is anticipated that these improvements would become more significant over a longer period of time.

The observations also supported this notion: following the provision of the directive resources, several students changed their approach to the session and made an active effort to improve the level of their discussions. The changes observed from just one session were promising and it was rewarding to witness some small accomplishments of students, such as finding the confidence to speak more freely within their team.

Following the provision of the resources, students reported their contributions to the discussions to be more closely matched to their team members, suggesting that the resources may have had a positive impact in encouraging students to be more involved within the discussions. The observations also support this notion, as several individuals were perceived to be making an active effort to improve their contributions within the discussions.

### *Group Dynamics*

A recurring factor highlighted within this project is the importance of establishing good group dynamics. The observations revealed that teams which had members who supported and encouraged each other had obvious learning benefits compared to the groups who did not interact as effectively. Group dynamics was also identified as a major theme within the semi-structured interview.

The importance of developing team rapport was emphasised by the negative impact merging teams within cycle 2 had on group dynamics; several individuals were notably quieter due to unfamiliarity with the team. Indeed, it is recommended that teams remain consistent to enable collaborative relationships to be developed (TBLC, 2019).

However, several individuals were observed to be making efforts to explain their responses in more detail than they had done previously, and were not taking it for granted when everyone agreed on which option to select. Some of the 'quieter' individuals were also observed asking for clarification of the answers.

Both cycles signified that the teams who discussed and debated their answers scored more highly on the tRAT; the higher scoring teams contained members acting as key facilitators in encouraging debates and discussions. This suggests that the allocation of team roles would be an effective way to improve on the current process.

### *Recommendations*

The key critique highlighted within the semi-structured interview related to the challenges of group work when team participation is not equally balanced. A suggestion to overcome this was to allocate a proportion of the module marks to the activities. Many studies within the literature use TBL as part of the assessment to promote engagement, but this has been shown to reduce students' overall enjoyment of the activity (Thompson *et al*. 2007).

Further cycles are needed to explore the full extent of these developments and also to investigate how the resources can be taken forward. It is suggested that involving students in the development of expectations is an effective method for promoting motivation (Balan, Clark and Restall, 2015). Understanding the benefits to their learning in terms of subject knowledge

and development of transferable skills can also increase awareness of their obligations regarding preparation and active engagement.

For future cohorts, the resources will be shared during an introductory session to increase exposure to the information and will remain available to students throughout the course. It is hoped that this will encourage students to develop active and effective participation within sessions.

### *Limitations and Further Research*

Although there is strong evidence that interactive sessions improve learning (Biggs, 2003), this may not be the case for all individuals. Further consideration is needed to provide support for the diverse needs of the students, particularly for individuals who may have social anxiety or difficulties in communication.

A key limitation of this study is its short timeframe; good study habits take time to develop, so longer-term studies are now needed to investigate any continuing benefits arising from the resources, specifically, their role in promoting positive behaviours and building better collaborative cultures.

Although this research revealed several interesting points, it should be acknowledged that unforeseen circumstances resulted in a reduction of participants for cycle 2. Groups had to be merged to maintain effective group sizes and the change in team members may have impacted on the level of discussion due to reduced familiarity within the teams. This may have reduced students' confidence values within the questionnaires. However, students were kept with previous team members as much as possible to try to reduce any potential negative impact. Wider recruitment is now needed to confirm and further explore the outcomes of the study, and to reduce the limitations identified.

## Conclusion

Despite the short timeframe for this study, positive changes in students' contributions to team discussions were evident. The initial part of the study informed the content of the resources provided, which outlined expectations of participation and highlighted shared concerns of being wrong.

Students considered that the directive resources helped to improve their confidence in communicating within their team and improved the overall quality of discussions. This notion was supported in the observations of team interactions during the tRAT element of the session, as several individuals had made notable improvements.

This study highlighted a greater need to train students for effective communication within collaborative learning, and to support the development of students' confidence in these areas.

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## About the Author

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