

Evaluating team-based learning in a foundation training pathway for trainee pharmacists

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Abstract

Background: A new programme incorporating online study days delivered using team-based learning (TBL) for hospital-based trainee pharmacists (TPs) in the North of England was created. To our knowledge, TBL has not previously been used in educational programmes for TPs designed to supplement their workplace learning. The project aimed to investigate the experiences of TPs learning using online TBL by exploring their perceptions on their engagement, learning, and satisfaction with TBL.

Method: Data were collected using online anonymous surveys at the end of four online TBL study days. A bespoke survey consisted of 5-point or 4-point Likert scale and two free text questions. TBL Student Assessment Instrument (SAI), a validated survey, was used to assess TPs' acceptance of TBL. Survey data was summarized descriptively, and free text comments analysed using thematic analysis.

Results: TPs developed accountability to their team, remained engaged with TBL delivery online and stated a preference for and satisfaction with this method. TPs valued opportunities to apply their knowledge in challenging scenarios and learn from discussions with their peers, the larger group, and facilitators. TBL was also perceived to be an engaging approach to learning and helped to maintain their interest with the teaching material. However, TPs struggled to engage with pre-work outside of the class due to competing work priorities.

Discussion: This study shows that online TBL was well accepted by TPs and can be successfully used to deliver education to large cohorts of learners. The model developed shows potential for scalability to larger numbers of learners.

Keywords: team-based learning; trainee pharmacist; foundation training; pharmacy education

Introduction

Active and collaborative learning strategies such as team-based learning (TBL) have been shown to have positive results on the attendance, engagement, and attainment of full-time students attending in person [1]. Furthermore, distance learners have been shown to be at least as engaged in their studies as full-time campus-based students; however, they are significantly less likely to participate in active and collaborative learning [2].

TBL, an active and collaborative learning strategy, is designed to provide a motivational framework to engage students in their learning [3]. With TBL, students are allocated to permanent, teacher-formed teams of 5–7 members, who will participate in a series of TBL units. In each unit, students carry out individual directed pre-work, followed by an individual (iRAT) and identical team (tRAT) multiple choice question test (to motivate preparation and create accountability), a clarification session, and finally, a series of team application exercises [4]. Application exercises are designed to be challenging and authentic problems, which require the application of knowledge to solve collaboratively, then publicly display and justify their decisions. Facilitated discussion between teams creates further debate and learning opportunities.

Using TBL in a full-time, undergraduate pharmacy programme in the UK resulted in increased student accountability, satisfaction,

and attainment [5, 6], whilst comparable results were also seen in postgraduate pharmacy education [7]. In postgraduate medical residency, TBL significantly improved learner-rated classroom engagement and interactivity [8, 9]. In postgraduate nursing education an increase in the confidence in clinical knowledge and communication skills was observed [10]. Prior to this initiative, TBL had not been used in the UK for the education of trainee pharmacists (TPs), who undergo a salaried 12-month foundation training either following a 4-year MPharm degree, or during a sandwich style 5-year MPharm degree. The foundation training programme is designed by employers and must meet the pharmacy regulatory body standards for the initial education and training of pharmacists [11]. Role expectations and study time provision can vary between different employers.

National Health Service England (NHSE) funded our programme, which was designed in 2021 to provide supplementary training to hospital based TPs, in the North of England. As TPs are adult learners in full-time employment; the programme was designed to align with andragogical adult learning principles [12] and promote engagement in active and collaborative learning. Thus, TBL was chosen as the learning and teaching strategy. Also, successful use of TBL was seen in the undergraduate MPharm programme over the previous 10 years, which led to the development of faculty expertise

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in its use. TBL is also a less resource-intensive approach than problem-based learning [4]. Online delivery allowed TPs across a large geographical area to access training in a more sustainable and cost-effective way.

This study aimed to investigate the experiences of TPs learning using online TBL. We explored learners' perceptions on their engagement (degree to which learners are actively involved and participating in the learning process), their learning (perception of improved understanding of key concepts), and their satisfaction with TBL (when compared with online didactic teaching).

Method

Setting and sample size

The evaluated part of the programme comprised four online TBL study days (SD 1–4), designed and delivered according to the TBL principles (Fig. 1). Zoom and Intedashboard (TBL-specific software) platforms were used to facilitate online delivery. TPs also attended three face-to-face study days (clinical assessment skills, first aid training, and Objective Structured Clinical Examination), which were not part of this evaluation (Supplementary Material 1).

The programme was attended by TPs recruited through a national postgraduate recruitment scheme to complete a hospital-based foundation training (including split-setting placements) in the North of England. In total, 225 TPs were registered to attend TBL SD 1, 3, and 4 and 209 TPs to attend SD2. The attendance for each SD was between 96% to 100%. The sample for this evaluation included all TPs, who attended online TBL SDs and consented to complete the surveys. Ethics approval was granted by the University of Bradford.

Data collection and analysis

This was a quantitative study that used data collected via anonymous surveys (Microsoft Forms), which took approximately 10 minutes to complete, and focussed on the TBL intervention. The bespoke survey was designed by authors to capture feedback on design, content, organization, quality of teaching, and usefulness of pre-work materials as required by the funder. No demographic or identifiable data were collected.

The survey, consisting of seven 5-point Likert scale questions (Supplementary Material 2), was conducted following each TBL SD (four data collection points). The response rates for each SD were SD1 = 87% ($n = 180/208$), SD2 = 42% ($n = 80/190$), SD3 = 56% ($n = 123/218$), SD4 = 73% ($n = 158/217$). Also, TPs were asked to rate their overall experience with TBL (5-point Likert scale) and the usefulness of different aspects of TBL (4-point Likert scale) after SD1, 2 and 3 (three data collection points). Descriptive statistics were used to summarize responses.

The survey also had two open-ended (free text) questions about what TPs found useful and why, and how the use of online TBL could be improved (four data points). Free text comments were independently analysed by two authors (K.M. and S.H.) using thematic analysis [13]. Developed themes were refined through discussion with all the authors. Verbatim, illustrative quotes for each theme are presented in Table 1.

In addition, the TBL Student Assessment Instrument (TBL-SAI) [14] was used to assess TPs' acceptance of TBL. The TBL-SAI tool (33 items) was chosen as it has been extensively used and validated across multiple disciplines to explore the accountability, satisfaction with, and preference for TBL, when compared with experiences of other teaching methods. It was administered to all TPs following the final TBL SD (SD4) (one data collection point) to assess TP accountability to their team, preference for, and satisfaction with TBL.

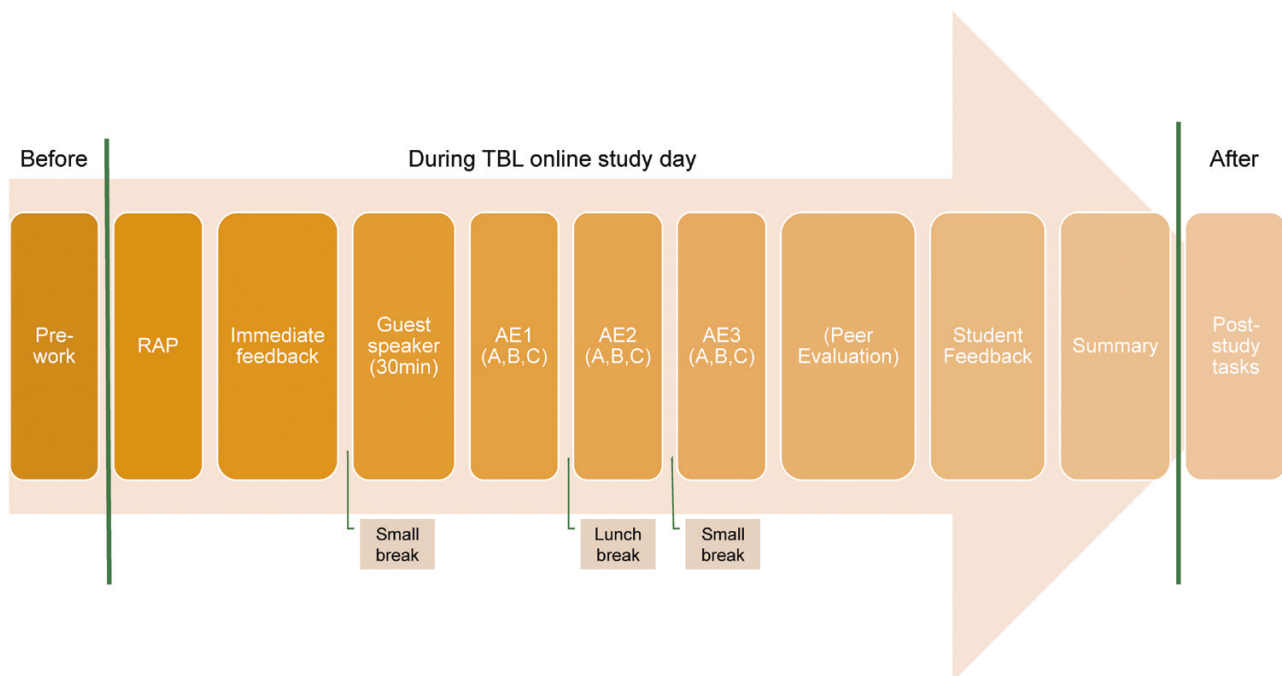


Figure 1. Overview of online TBL study day. Pre-work was released two to four weeks before each study day on a virtual learning environment. Readiness Assurance Process (RAP) includes individual (iRAT) and team (tRAT) tests. Application exercises (AE) consisted of three parts. Peer evaluation was completed on study days two and four.

Table 1. Quotes from free-text comments supporting themes presented in the results.

Theme	Quotes
Learning in a team	I found the discussion with my teammates useful as we all shared different aspects of knowledge and learnt from each other. (SD4, Response 56) The TBL was great to talk to others and share resources I wouldn't have found on my own. The cases were really in depth and encouraged my mind to work and relate to topics I haven't covered in a long time. (SD1, Response 54) Also, delegating aspects of the case to find more information about. (SD1, Response 158) Ensure that everyone in the breakout rooms has spoken. One member of my group didn't contribute at all. This felt awkward and wasn't fair. (SD1, Response 34)
Nurturing learners' engagement	TBL, engaging and everyone gets a chance to speak and share their ideas. (SD2, Response 54). Speak about the activities with the facilitators really helped to improve my knowledge and understanding of the questions being asked and how to go about approaching scenarios like this in future. (SD2, Response 45) I think less time needs to be spent discussing answers to questions as we keep repeating a lot of things and I struggle to keep focussed - it needs to be more concise. (SD2, Response 56)
Optimising the virtual learning environment	It was very useful having summary points added to the chat and links to different resources. (SD4, Response 22) I also appreciate the breaks we are given as it is really difficult to stay at a computer all day. (SD2, Response 45) Stop having so many breaks. (SD2, Response 13) Sometimes the full time may not be needed for each application exercise, however we do not submit until the minute timer is up. (SD4, Response 23) Discussions in individual teams - better as everyone had cameras on. (SD3, Response 46)
Perceived priorities by learners	Not a fan of TBL - think much more content can be covered in another format. (SD2, Response 63) I would like some scenarios that aren't entirely focussed on community pharmacy, even just some GP (General Practitioner,) one as well. Yes, I understand it's for the benefit of the exam and because we are in hospital but a lot of the feedback in the answers is not applicable to working in hospital and isn't useful if you don't intend on working within community. (SD1, Response 149) Needs to be clearer exercises with defined best answer there are too many scenarios where the answer was grey between different options, this is of no use in preparing for an exam where there is a definitive answer to each question. (SD3, Response 86)

Questions were adjusted to allow comparison between online TBL and didactic lectures. Results were descriptively analysed using the TBL-SAI analysis tool [14].

Results

Satisfaction with TBL

The results from the TBL-SAI suggest TPs had a more favourable experience compared to didactic online lectures, with all scores being above neutral (accountability = 29 > 24, preference for TBL = 51 > 48, satisfaction with TBL = 32 > 27, total score = 112 > 99). Results indicate that TPs showed preference for and satisfaction with TBL, and developed accountability to their team over the course of the programme. Overall, most TPs (86%) rated their TBL experience as excellent, very good, or good. Most TPs rated application exercises as useful or very useful (84%), followed by the individual (iRAT) and team (tRAT) tests (81%), and pre-work (79%) (Fig. 2).

Learning in a team

Many TPs highlighted the benefits of learning in a team through discussion, which leads to collaborative learning and understanding. The value of team discussion was constructed through learning from peers' approaches to questions and resources used, appreciating different perspectives and ways of thinking and understanding rationales for decisions made. Some found working with peers helped to consolidate and retain learning gained from the pre-work and teaching, in addition to highlighting knowledge gaps.

Some teams used the breakout rooms to socialize with peers and build relationships, further encouraging peer support. Some TPs described attribution of roles and delegation of tasks, which highlighted that wider learning outcomes related to working effectively as a team were being met.

For some, their experience appeared to be influenced by the maturity of their team formation. Most teams formed well, and TPs enjoyed working together in breakout rooms. Some TPs reported a lack of contribution of team members, which gave a sense of inequity and affected team dynamics. Some TPs felt greater input from academic facilitators would encourage contribution. A few TPs felt that changing teams would facilitate further learning, through exposure to different people and perspectives. However, a continuous interaction is needed for a team formation, a key aspect of TBL [4], thus this suggestion was not implemented.

Nurturing learners' engagement

Many commented that TBL was an engaging approach to learning, which maintained their interest with the teaching material through the day. TPs enjoyed the interactive, inclusive nature of TBL and the opportunity to share their ideas in both their teams and/or main room group discussion. Although most TPs indicated that they were encouraged to participate, a lower proportion of TPs (63-68%) felt that sessions 'captured their attention' (Table 2). Some suggested engagement might be further improved by increasing the variety of activities (e.g. online polls, calculation questions, talks, or lectures).

A few TPs stated that input from academic facilitators had the potential to both stimulate and reduce engagement.

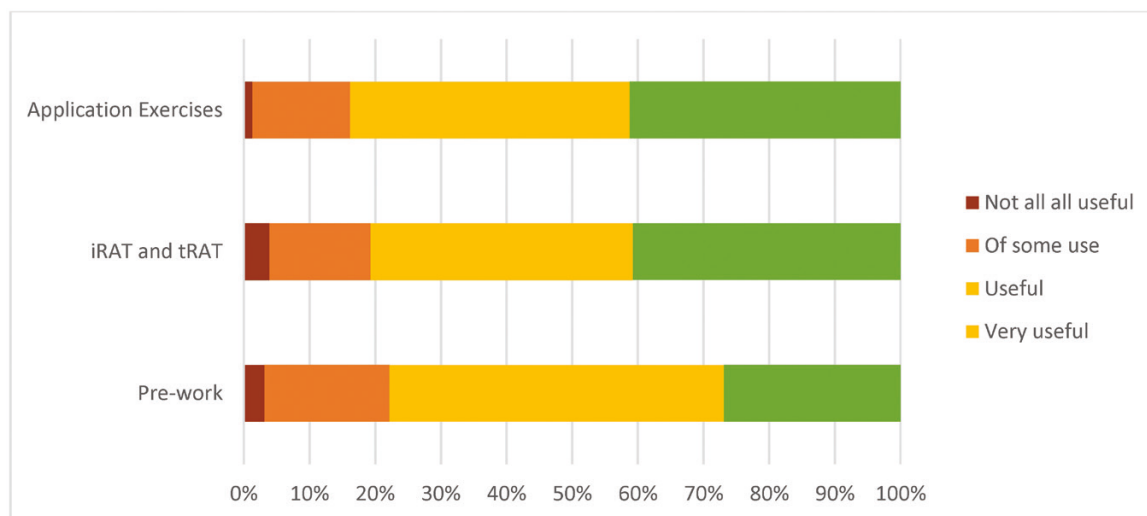


Figure 2. Learners' rating of usefulness of each part of the TBL. Readiness Assurance Process (RAP) included iRAT- individual readiness assurance test and tRAT- team readiness assurance test.

Table 2. Proportion of TPs that strongly agreed or agreed with the following statements after each study day.

Statement/Study Day (SD)	SD1 (n = 180)	SD2 (n = 80)	SD3 (n = 123)	SD4 (n = 147)
The content was relevant to my training	91%	90%	87%	82%
The content was understandable and clear	87%	90%	88%	85%
The material was clearly explained	82%	90%	85%	84%
The session managed to capture my attention	68%	66%	63%	65%
I was encouraged to participate in the session	92%	96%	95%	91%
Facilitators were able to answer my questions	87%	88%	85%	89%
The study day was well organized	68%	76%	86%	86%

Contribution of facilitators with diverse ranges of pharmacy/ healthcare experience in TBL team discussion was perceived to add value by promoting deeper understanding, analytical thinking, and application of learning into practice. Many TPs enjoyed facilitators sharing their varied 'real world' practice experience but were keen to avoid prolonged or repetitive discussions around 'best answer' rationales.

It was noted that some TPs preferred having a definitive 'correct answer' and appeared uncomfortable with the notion of 'best answer', as this resulted in a lack of certainty and clarity. A few TPs stated that they engaged less with this content and deprioritized these activities in the pre-work. Some TPs suggested providing summary points after each application exercise might help with clarity, which was implemented (communication via 'chat' function in Zoom) in subsequent study days. Overall, most TPs reported study day content to be clear and understandable (Table 2).

Optimizing virtual learning environment

Online learning, especially during SD1, came with some technical problems (e.g. TPs accessing the TBL software), which caused distraction and impacted on timings. A few TPs stated frustration with 'wasted time' spent on resolving logistics and subsequent impact on SD structure and timings of breaks. The optimal number and duration of breaks was difficult to determine as views differed between TPs.

However, most TPs stated that the SDs were well organized (Table 2).

Timings allocated to other activities were also highlighted. After completing the application in their team, some TPs found waiting to return to the main room affected engagement, whilst others enjoyed using that time to network with their team.

Availability of required equipment (e.g. broadband, microphone, camera) was raised by some TPs. A few commented on having a poor broadband connection at home, affecting their participation and experience. Some TPs noted that camera use in teams boosted engagement and teamwork, whilst others were apprehensive to use them due to personal reasons, e.g. anxiety. Also, some TPs noted that an opportunity to attend SDs online provided benefits such as the use of chat function to share online resources during discussion.

Perceived priorities by learners

Most TPs reported SD content to be relevant to their training (Table 2). TPs accessing pre-work on the virtual learning environment (VLE) remained consistent (over 90%) throughout the programme. Although, the usefulness of the pre-work was rated as excellent, very good, or good by most of the TPs (Fig. 3), the proportion completing set pre-work reduced with each study day (Table 3). Some responders stated the amount of pre-work was too great,

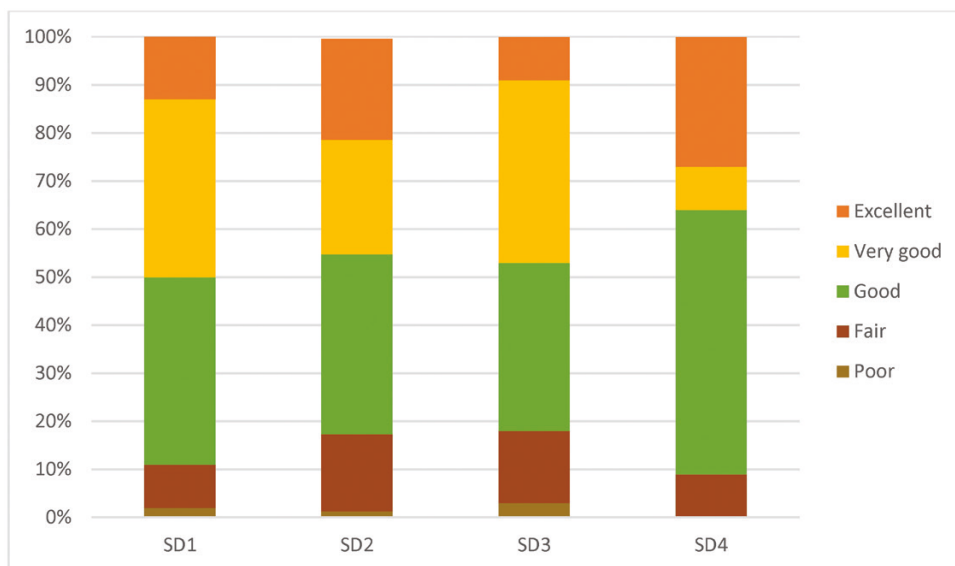


Figure 3. Rated usefulness of pre-work material for TBL study days by TPs.

Table 3. Self-reported access to and completion of the pre-work for each study day.

Study day (SD)	Accessed on VLE	Fully completed	Completed within 3 hours	Not attempted completing it
SD1	98% (177/180)	82% (148/180)	87% (125/144)	3% (5/180)
SD2	98% (78/80)	79% (63/80)	76% (48/63)	3% (2/80)
SD3	94% (116/123)	67% (83/123)	96% (80/83)	7% (8/123)
SD4	91% (134/147)	52% (77/147)	83% (64/77)	10% (15/147)

but most TPs reported requiring up-to 3 hours to complete it. Barriers in completing the pre-work included busy work schedule, forgetting about study day, preparing for progress reviews, limited study time from employer, job interviews, illness, and exam revision. In some cases, TPs stated that they partially completed the pre-work and selected elements they felt were the most valuable.

A few requested whether the content covered during the study days could be increased. It was suggested that a lecture-style (didactic) approach might cover more content in less time and could be used instead of/or alongside TBL. The value of certain content was also questioned with some comments indicating that some learning outcomes were not aligned with TP expectations/ preferences. Aspects of the study days aligned with contract requirements and were focussed on developing skills such as decision-making, critical thinking, and improved knowledge of community and primary care sectors (as they were not spending time in these sectors). However, several TPs were keen to explore hospital-based scenarios and wanted greater focus on the registration exam. Some TPs perceived cases and questions addressing ethics and 'grey areas' to be of less value and stated a preference for more 'registration exam style' questions.

Discussion

This study shows that online TBL was well accepted by TPs and can be successfully used to deliver education to large cohorts of learners. TPs developed accountability to their team, remained engaged with TBL delivery online, valued

opportunities to apply their knowledge in challenging scenarios, learn from discussions with their peers, and perceived TBL to be an engaging approach to learning. However, TPs struggled to engage with pre-work outside of the class due to competing work priorities.

The strength of this study lies in surveying the views of a large number (~220) of TPs across the North of England, making the results useful when evaluating the impact of TBL on their learning. However, the group consisted entirely of hospital based TPs; thus, it cannot represent the views of TPs undertaking their training in community pharmacy or primary care, who may have different attitudes to TBL. Also, information on whether TPs had prior TBL experience was not collected. To maximize response rates, the surveys used were brief and quantitative. Only brief qualitative comments were given by TPs, and these were analysed independently by two researchers. Richer data could be achieved by undertaking in-depth interviews with TPs about their experiences. Data collection was undertaken anonymously, so it was not possible to see how individual's views of TBL changed over the course of the programme.

Satisfaction with TBL

Results from the TBL-SAI showed that TPs found the TBL approach preferable to lecture-based teaching in terms of accountability, preference for TBL, and satisfaction with TBL. These results were in agreement with those found in post-registration pharmacists undertaking a Postgraduate Diploma (29.7, 49.2, and 30.0, respectively), indicating a small, but clear preference for TBL [7]. It was not possible for this study to identify whether learners who had

experienced TBL previously (e.g. at undergraduate level) were more or less likely to prefer it as an approach in later programmes.

Learner engagement

TBL was selected as the learning and teaching approach for this online programme with the aim of maximizing learner engagement with the material, bearing in mind the large numbers of learners. The results demonstrate that TPs enjoyed the online TBL study days and remained engaged with the material. This is consistent with experiences of undergraduate and postgraduate students who enjoyed using TBL and found it more effective for their learning [1, 5–7], and shows that TBL can be a useful approach at all levels. The SCALE-UP study also found that students were more likely to attend TBL modules compared to non-TBL based modules [1].

An area for improvement identified by participants focussed on the limited amount of time they had to spend on pre-work and getting maximum value from the contact time on the day. The TPs were working full-time and did not always have protected time to prepare for study days and, so in the future, it will be important to limit the amount of pre-work to ensure it is achievable and enables learners to engage with the material. This issue was also identified when a TBL module was introduced to postgraduate doctors [9] and the authors noted that whilst undergraduate students receiving a grade may be more motivated to prepare, this can be more challenging in employed post-registration learners. A clear explanation of the link between the pre-work, study day activities, and the registration assessment and/or pharmacist role might help motivate TPs to prepare [1, 15].

Trainees felt that ‘*Optimising the virtual learning environment*’ was an important aspect to enable engagement on the study day. There were however conflicting comments in terms of what constitutes ‘ideal’, e.g. some TPs were grateful that breaks were included, whereas others felt the breaks were unnecessary. Salmon’s five-stage model of teaching and learning online has been updated [16] and is a useful tool to scaffold online learning programmes.

Learner learning

The free text comments over the course of the programme show that TPs particularly valued being able to apply their knowledge in challenging scenarios and learn from the opportunity to discuss the cases with their peers, the larger group, and facilitators. It is in agreement with earlier study findings [10], where ‘relate’ (team support and mutual trust) constituted 41% of undergraduate pharmacy students’ engagement with TBL. TPs also appreciated the opportunity to assess their knowledge and understanding in the RAP, and they used the information and feedback from the study day to identify areas they needed to work on.

Participants did feel that less time was required for discussions than was given and requested more signposting of materials so that they could follow up on aspects they found difficult after the session. The literature recognizes the challenges with managing larger groups of learners in online TBL, with some recommending visiting all breakout rooms [17], whereas others [18] acknowledge the difficulties this presents and recommend visiting the groups across all sessions instead.

TPs were engaged in the discussions and enjoyed collaborating with both their peers in teams and the expert

facilitators in the group. It is important to ensure that discussions (both in teams and the whole class) are carefully managed for time to ensure learners feel they receive optimal learning opportunities from the class. Yang *et al.* [18] suggest setting up a shared document, enabling learners to add their questions throughout the day so that they can be addressed at the end of the application exercise or study day.

Our study shows the scalability potential of online TBL teaching to larger numbers of learners, including the possibility to expand the programme to include TPs from other sectors, or even other healthcare professionals. The developed programme also removed the need for TPs to travel to study days, reducing the cost and environmental impact of delivery. Future research could focus on exploring more in-depth views of students, balancing pre-work with training, and the effect of TBL on developing critical thinking and decision-making skills.

Conclusions

This study shows that learners preferred TBL to lecture-based teaching and online TBL can be used to successfully deliver education to large cohorts of TPs. Learners valued being able to engage with scenarios to apply their theoretical knowledge and the opportunity to learn and discuss with their peers and practising pharmacists. They struggled to engage with pre-work outside of the class, so this should be considered to ensure appropriate amounts of work are set.

Supplementary Material

Supplementary data are available at *International journal of Pharmacy Practice* online.

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Author contributions

K.M., S.H., and G.Q. participated in the development and delivery of the programme. K.M., S.H., S.T., and G.Q. participated in the conception of the study. K.M. and S.H. collected data and completed the initial analysis. All authors participated in the interpretation of data. K.M., S.H., S.T., and G.Q. drafted the article. All authors provided critical input and aided in the revision of the manuscript. All authors have read and approved the final version.

Conflict of interest

The author(s) declare that there are no conflicts of interest.

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The funder was not involved in the study design (collection, analysis, and interpretation of data) and writing of the report.

Data availability

The data underlying this article are available in the article and in its online supplementary material.

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