

# Student Perspectives of Team-Based Learning in a CS Course: Summary of Qualitative Findings

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## ABSTRACT

Team-Based Learning (TBL) is an active learning pedagogy that involves a substantial amount of preparation work by students. While previous work shows that objective measures of student learning outcomes improved after TBL adoption in CS, little work has been done to evaluate the students' perspectives rigorously. In this work, we present the qualitative findings from a larger mixed-methods study of student perspectives. These results suggest that most students find TBL rewarding, although there are some aspects of the pedagogy that can be frustrating and may require alteration for TBL adoption in CS.

## CCS Concepts

•Social and professional topics → Computer science education; •Applied computing → Collaborative learning;

## Keywords

active learning, education, pedagogy, qualitative analysis, computer organization

## 1. INTRODUCTION

Team-Based Learning (TBL) [10] is an active learning pedagogy designed to use in-class time to apply learned concepts to solving problems collaboratively. In this approach, students are assigned to teams that persist for the duration of the semester, and the course is divided into 5–7 modules that are typically 2–3 weeks in length. Each module begins with the Readiness Assurance Process (RAP), which includes a significant amount of individual preparatory work by students and a test prior to in-class instruction. The remainder of the module is then devoted to applications of the material. Some variations on TBL also include taking exams together as a team.

The structure of the RAP and the size of the modules places a significant burden on the students. For example,

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preparation for a single module may require reading one or two full textbook chapters that contains unfamiliar terminology. Furthermore, the collaborative nature of the work (especially the team exams) requires students adapt to a new set of process expectations. Given that the structure of TBL requires a substantial amount of work on by the students to adapt to a new style of preparation and assessment, we were interested in whether students found the approach effective and worth the difficulty. We were also interested in what aspects of TBL influenced students' perspectives.

Prior work on evaluating the use of TBL (or variations thereof) in CS courses [12, 6, 4, 1] showed positive outcomes in terms of grades and withdrawal rates after its adoption. However, these works focused almost exclusively on objective metrics. The only considerations of students' subjective perceptions were general summaries of end-of-term surveys that made no attempt to validate the instruments or to perform rigorous thematic analysis of open-ended comments.

To understand student perspectives of TBL in CS in greater depth, we conducted an explanatory mixed-methods study during the offering of a Computer Organization course. The present study was structured in a manner similar to a previous one on the use of TBL in a course for psychiatry residents [9]. The quantitative dimension consisted of administering a pre- and post-survey using the Value of Teams Survey (VTS); prior validation of VTS in normative samples yielded internal consistency scores of  $\alpha = 0.79$  and  $\alpha = 0.81$  for its two sub-scales [8]. The qualitative dimension consisted of two semi-structured focus groups. To reduce the potential impact of instructor bias, the focus groups were conducted by a separate faculty member and only anonymized transcripts were analyzed. As a final step to triangulate the findings of these two dimensions, qualitative codes and themes were mapped back to the individual VTS questions, some of which showed statistically significant differences between the pre- and post-survey.

Due to space constraints, this paper provides a summary of only the qualitative portion of the study, as these results provide sufficient support for several relevant recommendations that would be beneficial to members of the SIGCSE community who are exploring collaborative pedagogies for use in CS courses. In particular, this paper uses student focus group comments to highlight the strengths and potential problems of implementing TBL in CS. The full mixed-methods analysis will be presented in future work to provide a more in-depth perspective of student perspectives.

## 2. TBL IMPLEMENTATION

TBL is a specific pedagogical structure and is not simply the use of teams for in-class activities [10], though some instructors make modifications in practice [4]. We attempted to adhere to Michaelsen’s approach as much as possible. This section provides details of our specific implementation.

### 2.1 Team formation

While the standard approach recommends teams of 5–7 members, we formed teams of either 4 or 5 students. To create the teams, students replied to a pre-semester survey using the CATME tool [11]; we supplemented the standard CATME questions with items requesting the students to summarize their prior exposure to C, their grade in the prerequisite course, and other information. Parameters were set to create heterogeneous teams for almost all factors, as well as to ensure no groups contained only a single female member (for purposes beyond the scope of this paper).

### 2.2 Readiness Assurance Process (RAP)

Reading assignments were posted one week before each module began. Along with the reading assignment, a list of discussion questions was posted onto the course discussion forum (Piazza). Students were told to answer these questions individually while reading and they formed the basis of the individual and team Readiness Assessment Tests (iRAT/tRAT); on Piazza, each student was only allowed to answer one question, and many questions were never answered prior to the iRAT/tRAT.

On the first day of the module, students were given 10–12 minutes to complete the iRAT, which was a 10-question multiple choice quiz with questions aimed at the lower three levels (Remembering, Understanding, Applying) of Bloom’s Taxonomy [3]. After turning in their iRAT, the students got into their teams and took the tRAT, in which all questions were identical to the iRAT. The tRAT was completed using IF-AT scratch-off forms. When the team decided on an option, they scratched off a box on the form. If the answer was correct, the box contained a star; if not, the team discussed the question more and tried again. After the tRAT was finished, the instructor provided feedback based on the most commonly missed items on the tRAT.

### 2.3 Module application activities

Module application activities form the core of TBL. While the goal of the RAP is to establish a baseline understanding of terminology and concepts, the purpose of the activities is to engage students in solving progressively more complex activities according to the “4 S’s” (same problem, significant problem, simultaneous response, single answer). For instance, in the module on assembly language and linking, early activities would involve encoding or decoding single instructions; later activities would include translating an assembly language program with symbols into hexadecimal, while constructing a symbol table that would be used to resolve dependencies in the instructions. For more information on this topic, interested readers should consult [10].

### 2.4 Individual programming projects

Students were assigned three moderate-scale projects (each 4–6 weeks) that they completed individually. These projects consisted of an introductory assignment involving reading and manipulating binary data, a disassembler and interpreter, and a small hardware language compiler. TBL guide-

lines suggest that such out-of-class assignments should be completed individually; out-of-class team projects introduce the management difficulties of freeloading and schedule conflicts, both of which damage the in-class team dynamics.

### 2.5 Team and individual exams

This course was structured as six modules, with an individual midterm at the end of module 3 and a cumulative final exam. In addition, students took two team exams at the end of modules 2 and 5. These team exams were cumulative and were designed as a moderate-stakes assessment of students’ inter-module understanding. The format of the team exam was similar to an individual exam, with the teams turning in a single copy as their collective submission.

## 3. METHODS

The study was conducted as an explanatory mixed methods observational study, adopting a pragmatic theoretical framework. The quantitative methods used provide an empirical pre- and post-assessment of student perspectives using a validated survey instrument. The qualitative methods provided a richer set of responses to add depth to the students’ responses. A final analysis of mixing the quantitative and qualitative results was performed for the goal of triangulation of student views on the use of TBL in a CS course. Due to space constraints, only the qualitative findings are reported in this paper.

### 3.1 Setting

The course was conducted during the Spring 2015 offering of a 300-level Computer Organization course at a university in the eastern United States. The institution is classified as a Master’s University (Larger Programs), with a very high undergraduate (more selective, full-time, lower transfer-in) enrollment profile [2]. Prerequisites for the course included two semesters of introductory programming, one semester of Data Structures, and one semester of Discrete Mathematics. Initial enrollment for the course included 30 sophomores, 47 juniors, and 34 seniors, for a total of 111 students. The course was offered in four sections; two sections (28 and 27 students) were taught by a single instructor using TBL and two (27 and 29) were taught by a separate instructor using a more traditional lecture style.

### 3.2 Qualitative Methods and Recruitment

Two semi-structured focus groups were conducted during the 12<sup>th</sup> week of class. Each team was asked to select one representative to take part, though participation was voluntary and anonymous. There were eight participants from one section and six from the other, matching the number of groups in each, with discussion facilitated by a College of Education faculty member. Audio recordings were submitted to a professional transcription service that created anonymized transcripts; the transcripts were analyzed using open and axial coding techniques for thematic interpretation. As the study was conducted by a single investigator, no inter-rater reliability techniques were applied. This study was conducted with approval from our Institutional Review Board (IRB).

## 4. RESULTS

The focus group transcripts were initially analyzed using open coding to rephrase student comments in consistent lan-

guage. Axial coding was used to combine similar responses accordingly to establish themes. Themes were ranked in prevalence based on the percentage of transcript coverage devoted to each theme. The first three (the value of in-class collaboration, team formation, and factors influencing success) each accounted for just over 20% of the discussion<sup>1</sup>. The other two (RAP difficulties and team tests) each accounted for just over 15% coverage. As such, these five themes accounted for approximately 90% of the focus group discussion, thus constituting the main points of discussion for the participants. The themes are summarized with representative verbatim comments from participants.

### **The value of in-class collaboration**

The most frequent comments centered around how much students perceived class time as valuable in TBL. Participants felt the structure gave them the opportunity to discuss the material in greater depth and to ask questions in a low-stakes setting. Participants reported a sense of greater learning, although they also highlighted that the out-of-class preparation was more challenging than typical courses.

- “I have really enjoyed getting the opportunity to understand material and then turn to the person next to me and speak to them about it and help them with it. That dynamic happened so many times in our group that I learned the material better.”
- “[I]t’s easier to ask your peers that are in your immediate group if you don’t understand something. Like if it’s a dumb question, you might be afraid to ask, but if it’s a dumb question you can ask someone in your group and you wouldn’t feel bad about it cuz they could just walk you through during class time even. Personally, I think it helps a lot.”
- “[T]here are two or three classes I’m in this semester, I don’t feel I need to come every single class. This one I do. Why? Because he actually deals with stuff that’s really important every single class.”
- “I would say it was harder to do things out of class, but in class was a lot more valuable time.”

Participants indicated they felt discussions often gravitated toward correct answers, even when no one in the team would have chosen that option initially (prior work [13] shows this effect is real and not just perceived). They felt that the acts of talking their own thoughts and challenging peers’ guesses helped them to discard incorrect ways of thinking. Participants felt this self-assessment made them more confident and led to a sense that they could accomplish more as a team than as separate individuals.

- “Even if everyone didn’t know the answer exactly, like when we talk about it we somehow come up with an answer. Like, you’re just tossing words out there and goes like, ‘Wait, this makes sense actually.’ ”
- “[I]f a professor tells you something, you automatically believe it. If a classmate says it you’re like, ‘Okay, well prove it to me.’ Then they have to prove their answer, and by you dissecting their answer it makes you a lot better at that subject.”

<sup>1</sup>Coverage percentages are approximate and inexact for multiple reasons; for instance, some comments and codes fit under multiple themes and different speakers have varied speaking styles and levels of eloquence.

- “If you’re like 50 percent confident and somebody else is, then you both feel more confident because you both thought it.”
- “I made a joke along the lines of as a group we work really well together, but as an individual entity we all suck.”

Some students would have preferred for the out-of-class projects to be collaborative, as well, reflecting their expectations of how professional software development is done. Others felt that could induce freeloading, and that individual projects were necessary to master small details.

- “I mean as programmers we’re gonna be working on teams and developing software programs. If we’re doing this team based, I think maybe it woulda been more practical to go work that out to the projects as well to make the whole class team based. Cuz part of it’s team based and you have this one component [the projects] that’s not.”
- “I think there are others that might use that as a way to cruise. Where I think the individual nature of the projects pushed you to really understand what it was you were doing, which helped exams and the future project.”

### **Team formation is critical but problematic**

Perhaps the most polarizing topic in the discussion centered on the formation of the teams. All agreed that forming teams appropriately was critical for success in the course, yet there was considerable divergence on how this should be accomplished. The majority felt that the goal should be to establish consistently heterogeneous groups that mixed students of different backgrounds and strengths; the observation was that individuals in the team alternated playing a leading or following role that matched their natural abilities and interests. A very small minority felt there would be more solidarity and effort if all members within each group were of similar abilities, though most felt that would be detrimental to all except the best students.

- “I think maybe if that was improved then the teams could be more balanced... I feel like there could be better ways to balance the groups and that would really enhance the experience.”
- “I think this whole class touches on so many subjects that everyone kinda...each person gravitates toward one part of it, that they really get clicks for them.”
- “[I]f you really don’t know the stuff, you put in the survey that you don’t know this much stuff, and he puts you in the group that people who don’t know, I feel like then you guys will work harder. You guys will work harder to get that grade then. You guys will teach each other, like, ‘Hey, guys, we don’t have anyone that really knows the stuff in the group, so we’re gonna work hard to get it.’ ”
- [*Interviewee A<sup>2</sup>*:] “I think that’d be good for the higher-ups, but if you don’t know any of the material from

<sup>2</sup>In quotes that combine the statements of more than one participant, the statements will be distinguished as Interviewee A, B, C, etc., simply to indicate multiple speakers. These labels do not suggest persistent identities, and speakers identified as Interviewee A in multiple quotes are not necessarily the same participant.

the start and you get paired up with the people who don't know it as well—” [Interviewee B:] “You're at a disadvantage.”

Many participants disliked the use of the CATME survey, as they felt it was too prone to manipulation or misinterpretation; the suggestion was made to use a quiz instead, creating heterogeneous groups based on scores. However, several participants observed that the unpredictable nature of interpersonal conflict would make any process imperfect. Although the participants generally felt the process could be improved, there was a consensus that they did not want to select their own teams instead; the only mentions of this idea clearly indicated that students would perceive it as unfair.

- “[I]t all depends how honest you are on the survey too. Cuz if you say that, ‘Okay, I’m not proficient in this,’ and then you actually are, and then you’re put in the group with a bunch of a people who are really good at it, then you’re already like, ‘Okay, I’m fine. I don’t have to worry about this.’ It’s not fair if you lie.”
- “Instead of a survey I would give a general activity just based off of things that might be harder and easier. Then, just grade that. Obviously don’t grade it for a grade, but just grade it and see like, okay, these people are getting, outta ten points they’re getting around eight; these people are getting twos; these people are getting tens. Then, based off of that, be like, ‘Okay, I’m gonna put somebody with a ten, somebody with a eight, somebody with a four, somebody with a two.’”
- “That’s not to say that I’d like to choose the groups on my own because I feel like that could be unfair to the people who don’t know anybody or the people that just transferred in where they get the leftover groups.”

### **Factors that influence successful outcomes**

Participants identified several factors that contributed to successful outcomes in the team environment. Participants expressed a strong preference for teammates who showed effort rather than ability. Some felt confident enough to encourage the participation of their teammates proactively. Participants also observed that it takes time to establish working dynamics within the teams, which can be a contributing factor for strong collaboration. In addition, participants felt that peer assessment could play an important role in shaping team behavior, but it needed to be formative and repeated during the semester, rather than summative.

- “I’d rather have you try and get the answer wrong than just to sit there and not do anything at all.”
- “That’s the good thing about the team stuff though. At least if you’re more shy and if your team cares about what you have to say, then they’ll force you to speak. Like, I forced one of the people on my team to go ahead and talk. Like, ‘What do you think about this?’ ”
- [Interviewee A:] “We had a tRAT one day where I think there were two of us in one group and two people in the other group and we had to combine the groups to do the tRAT.” [Interviewee B:] “That’s even a different experience cuz that’s a team that you haven’t been working with yet.”
- [Interviewee A:] “I feel like [peer evaluations] should be maybe twice during the semester.” [Interviewee B:] “I know. Cuz at the end of the semester what good is it gonna do [chuckles]?”

Participants also emphasized that this reliance on team member attitudes is risky. Strong students who are shy or apathetic may not contribute to the team’s success as much as they could. More troubling, weaker students may find their efforts dismissed or their struggles ignored, particularly if they do not feel confident enough to ask for help.

- “[I]f you have the smarter people in a group and with people that don’t know anything, they’re supposed to try and teach them, but they’re introverted or don’t care, they’re not gonna teach anything to us.”
- [Interviewee A:] “One things that’s really hard in my group is the two people that don’t really say much when they do say things, we don’t really listen to them. Which sounds awful, but it’s like, ‘You don’t know any of the other stuff, so like...’ ” [Interviewee B:] “That’s understandable.”
- “They would go into that stuff so fast, and I was literally so lost. I had so much anxiety the first couple of weeks because I didn’t know what was going on. They didn’t wanna take the time to explain it to me. We’d just go right through the quizzes and the exams and I couldn’t put any input in and I couldn’t even check the answer right, because I didn’t know what was going on. They just completely moving on without me.”

Several participants commented on the issue of accountability. There was a stronger sense that the collaborative nature of the work increased their sense of accountability; that is, feeling that their teammates depended on their contributions created peer pressure to be more prepared for the work. A small minority of participants felt that the presence of the team reduced their sense of accountability, making them feel they were more likely to skip difficult topics. Others responded that TBL ultimately enforced accountability, as students who prepared less in the beginning of the semester dropped or did poorly throughout.

- “If you feel that they’re gonna rely on you, then you might be more inclined to make sure that you read and make sure you know. Yeah, if it’s just individually and I’d say, ‘Okay, well, I’m gonna skip this one.’ ”
- “[I]f you had some more individual stuff, that puts more pressure on you to, ‘Okay, I need to turn this in; I need to understand this.’ Not like, ‘Oh, he understood it, so...’ ”
- “Well, I mean, yeah, I think it’s kind of a self-correcting system. I mean eventually they might kind of reap the rewards for a while, but you’re gonna face what’s happening in the class.”

### **RAP difficulties and frustration**

Many participants found the RAP to be unnecessarily frustrating. Participants found the reading assignments to be very difficult given the nature of the subject matter, making many participants feel unprepared to take the iRAT and lacking confidence until beginning the in-class activities.

- “He gives you a reading, but it’s not...this is not like a history class where you just read it and get all the materials there. It’s kinda hard. Some of the concepts are very vague in the book, too.”
- “I just think that this class is not the best one for it. It’s just so much material and it’s so dense.”

- “[I]f you go back and reread the book before your test now that you’ve already learned the material it makes a million times more sense. Whereas when we’re trying to just read it, we’re like, ‘This is so much information. I really don’t understand what it’s saying.’ ”
- “We basically had to teach ourselves and then we got graded on that. Then we wouldn’t learn...until we did the activity, which was after the quiz, so not very effective.”

While the majority expressed frustration with the RAP and the iRAT in particular, a small minority viewed the RAP as a valuable self-assessment of their preparation.

- “I feel a certain point of this is to show you how wrong you are in thinking whatever you thought you knew from studying, and then just like crushing in another way and learn something new.”
- “[T]he iRAT would show me what I think I know versus what I don’t know, which is usually 70 percent or whatever. Then the tRAT sort of allows us to collectively come together and reason out why. Then when we get to the module activity guide, then I know what questions I don’t understand and then I can ask my group mates.”

One student also highlighted an important problem with the RAP. After completing the tRAT, feedback is provided based on the group performance. If there are questions that the teams all got correct while some individuals missed, these students are missing out on the opportunity for instructor feedback on those questions.

- “They’re not gonna—not everyone’s gonna explain every single answer that they put, and then they’re like, ‘Okay, we got that right,’ but you still have no idea why that was the right answer.”

### Team exams require new process skills

Participants did not seem to have strong feelings either for or against taking team exams. However, their comments clearly indicated that the exams added a new level of difficulty over individual exams by requiring time management skills. On early exams, several teams ran out of time because of discussions; this led to a lack of confidence in their submissions. Participants did not feel that a divide-and-conquer strategy was the solution, as that would defeat the purpose of collaboration. Instead, several teams indicated they met before the exam to plan their time management strategy. Participants also highlighted that excused absences and withdraws are especially hard to accept on team exams and create an unfair situation.

- “[I]f we start a problem and then I say what I think the answer is and then my group, they disagree, then we have to talk about it. Instead of if I think this is the answer and I just write it down on the individual test, I can go through a lot faster. I find that we’re rushing at the end because we’ve taken so much time talking about. Which is a good thing sometimes, but I think that we run outta time a lot.”
- “You don’t feel really good turning it in. You don’t feel like maybe you were thorough?”
- “If we split up the team exam into different sections so certain people do certain parts, that defeats the point of it.”

- “[W]e had that idea in the back of our mind, like we practiced that the day before and we had a strategy. That was something we vocally talked about the day before our second exam cuz we didn’t do quite as well on our first exam. Talking about pacing ourselves.”
- “It’s harder for groups that have less to choose from, like people who have lost a member or two due to drops or if someone can’t be there cuz of a medical thing. It sucks. They have to [make it up] later, so. They’re kinda screwed, but they also screwed your group too.”

## 5. DISCUSSION

The results from the previous section provide some insight into how students in this offering perceive the use of TBL in CS. Overall, most students seem to perceive TBL as an effective use of class time and feel that the in-class discussions and problem-solving, in particular, are valuable for learning the material. Obviously, such discussions are not unique to TBL, so one may expect to find similar views from students in courses taught using other active learning pedagogies, such as POGIL [5] or Peer Instruction [7]. However, the style of the problems in TBL differs from these other pedagogies, and students expressed positive opinions of what they were able to accomplish in the TBL style.

The biggest source of concern for students in the course centered around the team formation, with most indicating a preference for teams that mix individuals with different backgrounds and abilities; while a few felt homogeneous groups could offer greater solidarity and motivation, most felt that approach would be unfair. Although there were differences of opinions regarding what the ideal team would be, there was a consensus that students preferred instructor-formed teams rather than allowing student self-selection. There was also a general agreement that using a survey tool like CATME opens up the process to manipulation, and the students felt it would be more fair to base team formation on objective measures, such as a pre-quiz. Students also highlighted the importance of good interpersonal dynamics and attitudes in the teams, but felt any team formation procedure would be imperfect in trying to address these issues; students seemed to feel that they ultimately had to accept some responsibility for the team’s functioning. Regardless of the team formation approach, transparency in the process also seemed to be an important consideration to get buy-in.

The concerns about the RAP and the team exams highlight challenges that are specific to TBL rather than other active learning pedagogies. There was a clear sense of frustration with the iRAT, as students felt they were forced to “teach themselves.” They felt the nature of the subject matter was especially challenging to read prior to any direct instruction, particularly as it involved a lot of unfamiliar terminology. Moreover, the comments suggested that a reading guide alone—with no ready feedback—was insufficient to prepare them for the iRAT. Given the “more selective” enrollment profile of the university [2], it is reasonable to suggest that students at other institutions would have similar complaints about the readings without additional support. The implication, then, is that *instructors using TBL in intermediate CS courses need to provide considerable scaffolding to support student preparation*. Examples of such scaffolding could include video lectures, annotated reading guides, instructor notes, and/or an ungraded online practice quiz.

These results also highlight one troubling aspect of the RAP that instructors should be wary of: lingering individual misunderstandings. The standard TBL approach suggests teams are supposed to come to a consensus on their tRAT answers. If an individual is not convinced by their team's answer, the team is supposed to address this during the discussion. Then, during the clarifying instruction phase, the instructor provides feedback on the most commonly missed *team answers*. If the team's answer was correct and they did not provide a sufficient explanation to the individual, that student may be failing to get the benefit of the RAP. Consequently, the instructor should find other ways to solicit and answer lingering questions and points of confusion.

The team exam comments indicate that this component required students to adjust to new expectations and processes. The transcripts contained occasional minor references to other aspects, as well, where students felt uncertain about how to benefit from the pedagogy. Consequently, more direct instruction on how to succeed in a TBL class would be beneficial to most. For instance, to return to the RAP concerns, the instructor could provide an ungraded pre-quiz of basic concepts for practice, along with an explicit set of objectives that should be met by completing the reading. Similarly, on the exam, the instructor could provide guidance on how to manage their time effectively. One can make the counterargument that some of these are standard college academic skills that they should already know; however, as the success of the TBL course as a whole depends on successful preparation and some aspects (*e.g.*, team exams) are very different than their individual counterparts, *it is reasonable to suggest instructors should provide clear guidance on what level of understanding is required for the reading and how to function on a team test*. This is one advantage of POGIL, as process skills are an explicit part of the pedagogy. These results suggest that TBL could likewise benefit from more explicit instruction.

Based on these results and interpretation, instructors considering the use of TBL should consider the following recommendations to address potential student concerns:

1. Be transparent about the process of assigning students to teams. Use objective metrics to the extent possible.
2. Provide explicit instruction for TBL process skills, including how to prepare for team exams and the iRAT.
3. Supplement reading assignments with scaffolding materials to facilitate achieving desired learning objectives for the RAP.
4. Consider replacing or augmenting the iRAT with a pre-class online quiz.
5. Ask for additional points of confusion after addressing commonly missed tRAT questions.
6. Make team exams shorter than individual exams to allow for discussion and to be mindful of the impact of absences.
7. Provide time estimates for team exam problems.

## 6. CONCLUSIONS AND FUTURE WORK

This paper presents a summary of the qualitative findings from a mixed-methods study on student perspectives of TBL in a CS course. We have also highlighted a set of recommendations and potential hazards for CS instructors who choose to adopt TBL. In future work (currently in preparation), we will present the full findings of the mixed-methods analysis

that provide more insight into student perspectives of TBL and the value of teamwork in general.

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