THE 37TH AUSTRALASIAN ASSOCIATION FOR ENGINEERING EDUCATION ANNUAL CONFERENCE
AAEE 2026
13-16 DECEMBER SYDNEY

Challenges and Support Needs: Comparing Undergraduate and Postgraduate Student Perceptions of Team-Based Learning

Yunxian Li[a]; Xi Wu[a]; Guien Miao[b] and Rahul Gopinath[a]
[a]*The University of Sydney,* [b]*University of Technology Sydney*
Corresponding Author Email: yunxianli2002@gmail.com

ABSTRACT

CONTEXT

Team-based Learning (TBL) is widely used in engineering and computing education to develop collaboration, communication and professional skills. Although TBL is used in both undergraduate and postgraduate programs, little is known about how students at each level perceive teamwork challenges and support needs. Understanding these differences can help align TBL design with cohort needs and the collaborative demands of professional practice.

PURPOSE OR GOAL

This study compares undergraduate and postgraduate student perceptions of TBL. It examines perceived teamwork challenges, and the resources, interventions and support strategies students find most helpful. The aim is to inform level-specific TBL design rather than a uniform model.

APPROACH OR METHODOLOGY/METHODS

A mixed-methods Qualtrics survey used conditional branching to separate undergraduate-only, postgraduate-only and combined-experience pathways. Closed responses were analysed descriptively (frequencies, proportions and percentage-point differences), with within-participant comparisons for respondents reporting both levels. Open-text responses were analysed using Braun and Clarke's six-phase thematic analysis.

ACTUAL OR ANTICIPATED OUTCOMES

Both cohorts reported similar challenges but different main concerns. Unequal contribution was the top undergraduate challenge (70.3%) but less common among postgraduates (29.2%), for whom differing standards and expectations predominated (50.0%). Clear communication was the most important success factor at both levels. Students wanted clearer expectations, teamwork guidance, accountability and visible contributions. Clearly defined roles were the most endorsed intervention.

CONCLUSIONS/RECOMMENDATIONS/SUMMARY

Undergraduates were more concerned with fairness and contribution, whereas postgraduates emphasised standards alignment and expectation management. Communication and early support were valued at both levels, but preferred support strategies differed. This study contributes evidence for tailoring TBL support to different student cohorts.

KEYWORDS

Teamwork challenges, student perceptions, team-based learning

 Copyright © Li, Wu, Miao & Gopinath, 2026

Introduction

Team-based learning (TBL) is widely used in engineering and computing education to develop collaboration, communication, project management, and professional skills. By engaging students in sustained teamwork around authentic or industry-inspired projects, TBL aims to provide learning experiences that resemble professional practice and prepare graduates for collaborative workplaces (Michaelsen & Sweet, 2008). As a result, teamwork has become a central feature of many engineering and computing curricula, particularly within project-based and capstone units. Evidence from higher education suggests that TBL can support student motivation; for example, Jeno et al. (2017) reported significant increases in intrinsic motivation, identified regulation, perceived competence and perceived autonomy support when students moved from a lecture phase to a TBL phase in a physiotherapy project. At the same time, a systematic mapping study of collaborative learning in software engineering education found that teamwork research mostly addressed student learning outcomes (56%), with less attention to educator support (25%) and curriculum design (19%) (Garcia et al., 2024).

Despite its educational benefits, teamwork remains one of the most challenging aspects of TBL. Students frequently report difficulties associated with unequal contribution, communication breakdowns, conflicting expectations, coordination problems, and accountability (Dorić et al., 2023; Telling, 2024). Such challenges can negatively affect both learning experiences and project outcomes. To address these issues, researchers and educators have proposed a range of support mechanisms, including role clarification, peer evaluation, teamwork training, structured communication processes, and instructor intervention (Quek et al., 2023). However, the effectiveness and perceived value of these supports may depend on the context in which teamwork occurs.

Existing research has largely examined teamwork experiences within a single academic level, most commonly undergraduate education. Consequently, less is known about whether students at different academic levels perceive teamwork challenges in similar ways or value the same forms of support. This represents an important gap because undergraduate and postgraduate cohorts often differ in their educational backgrounds, professional experience, disciplinary diversity, and expectations of teamwork. Prior research suggests that factors such as team composition, experience diversity, and expectations can influence teamwork dynamics (Dorić et al., 2023; Graßl et al., 2023), raising the possibility that students at different academic levels may experience and interpret collaborative challenges differently.

Understanding these differences is important for higher education practice. If undergraduate and postgraduate students encounter different teamwork challenges or perceive different support needs, then support strategies developed for one cohort may not transfer effectively to another. A clearer understanding of student perceptions can therefore inform more appropriate approaches to supporting teamwork across different stages of higher education and better align TBL experiences with the collaborative demands of professional practice.

This paper reports the student survey component of a broader investigation into team-based learning experiences across undergraduate and postgraduate education. Focusing specifically on student perspectives, the study examines how students perceive teamwork challenges and which interventions and resources they identify as most helpful for successful teamwork. The following research questions guide the study:

- RQ1: How do undergraduate and postgraduate students differ in their self-perception of team-based learning challenges?
- RQ2: Which intervention strategies and resources do undergraduate and postgraduate students identify as supporting team-based learning across academic levels?

 Copyright © Li, Wu, Miao & Gopinath, 2026

Method

Context and Participants

This study reports the student survey component of a broader investigation into TBL experiences across undergraduate and postgraduate education. Ethical oversight is reported in the Ethics statement section.

Participants were recruited through an anonymous survey targeting students with prior experience of TBL activities in engineering and computing-related disciplines at a large Australian university, with particular emphasis on students who had completed the team-based project units. Eligibility was open to students who had participated in undergraduate and/or postgraduate TBL projects. The survey was designed to capture perspectives from students with experience at either academic level as well as those who had experienced both. The survey link was disseminated by education designers within the relevant teaching units and publicised on discussion forums hosted on the learning management platform. The survey was open from 28 October 2025 to 19 November 2025.

A total of 93 responses were submitted. Following data screening, 80 responses were retained and routed into three pathways, including undergraduate-only (n=56), postgraduate-only (n=6), and combined experience (n=18). For analyses conducted at the academic-level context, responses from the combined pathway were incorporated into both undergraduate and postgraduate datasets, resulting in an undergraduate context of n=74 and a postgraduate context of n=24. Most respondents reported prior experience with multiple TBL activities, supporting reflective comparison of teamwork experiences.

Survey Instrument

The survey was built in Qualtrics and combined closed selection items with open-text responses. Closed items were multi-select questions (either capped at a specified number of options or select-all-that-apply) and a ranking item in which respondents ordered five success factors; open-ended text questions invited further reflection, and Likert-scale items were not used. Conditional branching routed participants into one of three pathways according to their academic level and the scope of their TBL experience: undergraduate-only, postgraduate-only and a combined pathway for those reporting both levels. The combined pathway presented parallel undergraduate and postgraduate blocks so that the same respondent could reflect on each level, enabling within-participant comparison while reducing between-participant variation.

Item content was grounded in prior work. Challenge options drew on Dorić et al.'s (2023) taxonomy and selection was capped at three to encourage the prioritisation that Tafilovich et al. (2016) associated with more meaningful responses. Intervention items included established accountability and peer evaluation constructs informed by Quek et al. (2023). Responses were collected anonymously, with no identifying information requested at any point.

Data Analysis

In line with established guidance on pre-processing educational data (Romero et al., 2014), submissions were screened manually by the researcher before analysis. Responses showing systematic missingness, uniform answer patterns or non-substantive open-text entries were excluded. Closed responses were analysed descriptively in Python using frequency counts, proportions and percentage point differences. For the combined pathway, within-participant comparison examined how the same respondents described teamwork at each academic level. Open-text responses were analysed using Braun and Clarke's (2006) six-phase thematic analysis, with codes generated inductively and grouped into sub-themes aligned with the research questions. Screening and coding were conducted by a single researcher, and the frequency with which codes recurred was taken as an indication of their relative weight. No inter-rater reliability check was applied. Given the small postgraduate-only group, comparisons are interpreted descriptively and cautiously rather than as statistical tests of group difference.

 Copyright © Li, Wu, Miao & Gopinath, 2026

Results

Teamwork Challenges (RQ1)

Undergraduate and postgraduate respondents selected from the same set of challenges, but the dominant difficulty differed by level. Unequal contribution was the most frequently reported undergraduate challenge, selected by 70.3% of respondents, followed by different work standards or expectations at 54.1% and communication difficulties at 40.5%. In the postgraduate context the ranking reordered. Different work standards led at 50.0%, communication difficulties followed at 41.7%, and technical skill differences rose to 33.3%. Unequal contribution fell to 29.2%, a reduction of 41 percentage points relative to its undergraduate prevalence (Figure 1).

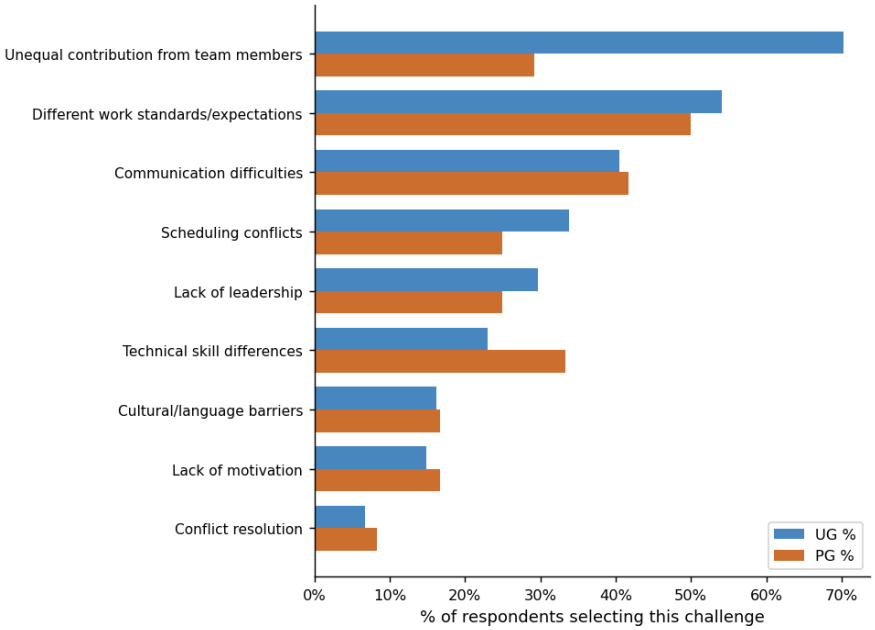


Figure 1: Team-Based Learning challenges, UG vs PG

Response strategies in Figure 2 showed a parallel difference. Directly addressing issues with team members was the leading strategy at both levels, selected by 71.6% of undergraduate and 75.0% of postgraduate respondents. Compensating by doing extra work was the second most common undergraduate strategy at 62.2%, but fell to 45.8% at postgraduate level, where redistributing tasks according to strengths and creating structured communication channels were endorsed at the same rate. Seeking instructor mediation declined from 23.0% to 12.5% across the two contexts.

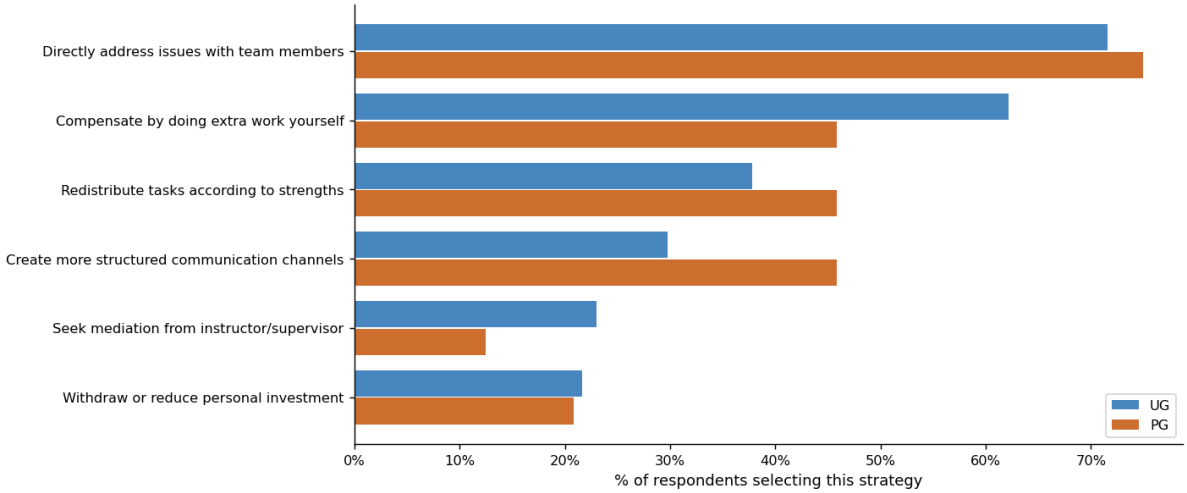


Figure 2: Response strategies to TBL challenges, UG vs PG (% of respondents)

 Copyright © Li, Wu, Miao & Gopinath, 2026

Intervention Strategies, Resources, and Gaps (RQ2)

Clearly defined roles and responsibilities was the most endorsed enhancement strategy at both levels, selected by 74% of undergraduate and 62% of postgraduate respondents, followed by regular scheduled meetings at 55% and 46%. Peer evaluation mechanisms were endorsed by 22% of undergraduate respondents but only 8% of postgraduate respondents. Detailed project briefs were the most valued resource in both contexts, selected by 68% and 67% respectively (Figure 3).

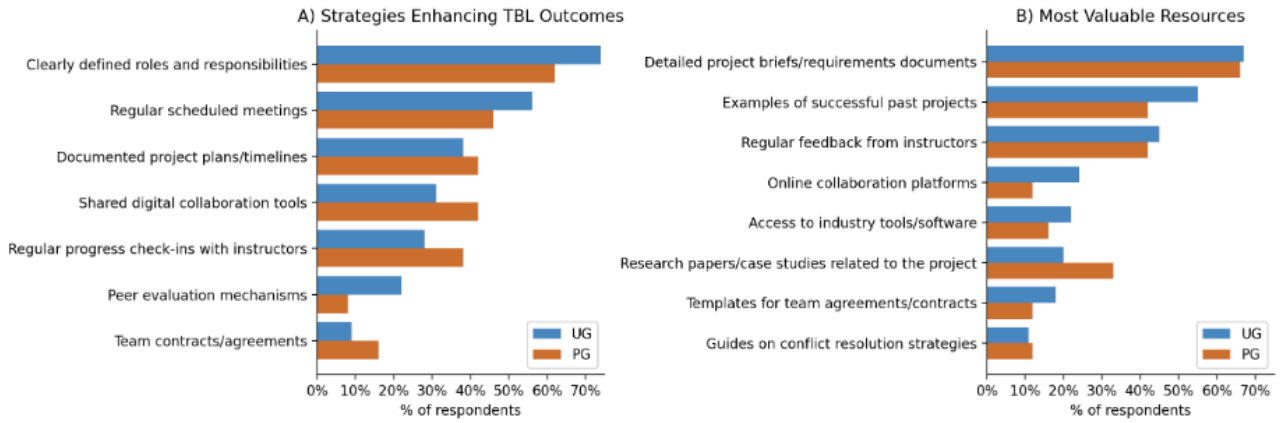


Figure 3: Intervention: Strategies and Resources (% of respondents)

Reported resource gaps differed by academic level. Unclear guidelines on teamwork processes led in the undergraduate context at 50%, whereas a lack of clear evaluation criteria led in the postgraduate context at 58%. The contrast mirrors the challenge profile, with undergraduates more concerned about process clarity and postgraduates more concerned about how their work is judged.

Qualitative Themes

After excluding non-substantive entries such as single-word answers, 45 open-text responses were available for thematic analysis. Inductive coding produced two overarching themes aligned with the two research questions. Table 1 summarises the themes, their sub-themes and the branch from which each was most often drawn.

Coding for RQ1 was concentrated in the undergraduate branch, which contributed 35 of the 44 challenge-related codes, compared with 7 from the combined branch and 2 from the postgraduate branch. Team composition and the selection effect was the most frequently coded sub-theme (16 instances), followed by unequal contribution and free riding (11), the emotional and motivational toll of dysfunctional teams (9), and communication barriers and cultural exclusion (8). The weighting toward the undergraduate branch indicates that these difficulties were described as ongoing rather than retrospective, matching the quantitative challenge profile. The motivational cost behind the contribution figures was visible in several accounts.

> *Most of the time, I just end up doing extra work myself because I cannot trust the others to do anything properly, and I do not want my grade to get destroyed by useless group members. The whole thing is just stressful and demotivating, and I wish group work did not have such a huge effect on my marks. (Undergraduate student)*

For RQ2, the undergraduate branch again contributed the most, with 19 intervention-related codes against 5 from the postgraduate branch and 4 from the combined branch. Instructor scaffolding through structure, templates and clear criteria was the most frequently coded sub-theme (9 instances), followed by the emergence of generative AI as a team-based challenge (8), peer evaluation and individual accountability mechanisms (6) and systemic or institutional gaps (5). The appearance of AI as a distinct sub-theme is notable, since students raised the difficulty of

separating individual understanding from AI-assisted output, which bears directly on the contribution-visibility concerns reported elsewhere. Where students described effective practice, they pointed to structures that made contribution visible before final submission.

> *A good structure for group assignments, making students create group contracts and have clear responsibilities for each student, with lab preparation exercises leading up to the assignment that make each student contribute something to the final assignment. (Undergraduate student)*

Table 1: Summary of the student thematic analysis: overarching themes, sub-themes, and primary source branch (UG = undergraduate branch; PG = postgraduate branch; Both = combined branch).

Overarching theme	Sub-theme	Source
Self-perception of teamwork challenges	Unequal contribution and free riding	UG
	Communication barriers and cultural exclusion	UG
	Emotional and motivational toll of dysfunctional teams	UG
	Team composition and the selection effect	UG
Intervention strategies	Peer evaluation and individual accountability mechanisms	UG
	Instructor scaffolding: structure, templates, and clear criteria	UG, PG
	AI use as an emerging team-based challenge	UG, PG
	Systemic and institutional gaps	UG

Discussion

Self-Perception of Challenges between UG and PG (RQ1)

Undergraduate and postgraduate students did not report wholly different kinds of teamwork problems, yet they appeared to interpret those problems through different frames. The sharp fall in unequal contribution from 70.3% to 29.2%, alongside the rise of different work standards to 50.0% at postgraduate level, suggests that academic progression shifts how students define the central problem of teamwork. Undergraduate respondents framed difficulty through fairness and effort distribution, while postgraduate respondents framed it through quality alignment and technical compatibility. Given the small postgraduate-only sample, this reading is indicative rather than conclusive, though it is reinforced by the combined branch.

The qualitative coding lends weight to this interpretation. Challenge-related codes were concentrated in the undergraduate branch, which supplied 35 of the 44 instances, and the most frequent sub-theme was team composition and the selection effect (16 instances), ahead of unequal contribution and free-riding (11). Undergraduate students tended to locate the source of dysfunction in who their teammates were rather than in the structure of the task. This externalising frame helps explain the high undergraduate rate of compensatory overwork at 62.2%, since a student who attributes failure to fixed team membership has little reason to expect that process changes will help and may default to absorbing the work. The emotional and motivational toll of dysfunctional teams (9 instances) was also evident in the open responses, indicating a cost that challenge-frequency counts alone do not capture, while communication barriers and cultural exclusion (8 instances) pointed to difficulties that fell hardest on students entering teams without established social ties. In terms of self-determination theory, this compensatory overwork can undermine students' sense of autonomy and weaken their relatedness to the team (Ryan & Deci, 2000). The pattern extends De Prada et al.'s (2022) argument that teamwork development does

 Copyright © Li, Wu, Miao & Gopinath, 2026

not reach a fixed endpoint at graduation, suggesting that progression involves a change in how students diagnose team problems and not only in their capacity to manage them.

Interventions and Resources (RQ2)

The most consistent intervention finding was a preference for structural clarity. Clearly defined roles was the most endorsed enhancement strategy at both levels, while unclear process guidelines and unclear evaluation criteria were the most prominent resource gaps. This aligns with Lu et al.'s (2020) finding that role clarity supports more consistent assessment, and it connects to the qualitative accounts, where successful experiences were associated with group contracts and front-loaded structures that made individual contribution visible before submission. The dominant intervention sub-theme, instructor scaffolding through structure, templates, and clear criteria (9 instances), reinforces this, indicating that students attributed effective teamwork partly to the design choices of teaching staff rather than to team effort alone. Such accounts support Francis et al.'s (2025) argument that contracts and peer evaluation work best as part of an integrated accountability system rather than as isolated mechanisms.

A more pointed contrast sits between what students reported as problems and what they endorsed as solutions. The difficulties that accountability structures are designed to address, including the unequal contribution and unclear teamwork processes that dominated the RQ1 accounts, were precisely the ones students raised, yet peer evaluation drew only weak support, at 22% of undergraduate and 8% of postgraduate respondents. The qualitative accounts help reconcile this, since the same students who resisted formal peer evaluation spoke positively about group contracts and clearly assigned responsibilities. One reading is that students welcome accountability when it is built into the structure of the task but resist it when it takes the form of social or assessment risk imposed on peers. The pattern is consistent with Presler-Marshall et al.'s (2022) finding that communication and task completion act as early signals of team functioning, since a student who communicates early is also taking responsibility for the effect of their work on others.

Intervention codes were drawn most heavily from the undergraduate branch, which supplied 19 of the 28 instances, against 5 from the postgraduate and 4 from the combined branch. The sub-theme of peer evaluation and individual accountability mechanisms (6 instances) sat alongside the weak quantitative endorsement of peer evaluation, which suggests that timing and framing matter. A mechanism introduced as routine practice at the start of a unit may be more acceptable than one introduced after dysfunction has already become interpersonal, since once compensatory overwork is established, later intervention risks documenting the problem without changing the team process. Two further sub-themes qualify the design implications. AI use as an emerging team-based challenge (8 instances), raised at both levels, points to a difficulty that current accountability structures were not built to address, as students described problems distinguishing individual understanding from AI-assisted output. This complicates the contribution-visibility mechanisms they otherwise endorsed and implies that assessment may need to weight process evidence and documented reasoning more heavily than final artefacts. Systemic and institutional gaps (5 instances) located some of the difficulty beyond the team, in course structures and resourcing, which is consistent with the level-specific resource gaps in the survey: undergraduate teams may benefit most from early scaffolding around role negotiation and communication norms, while postgraduate teams may need clearer standards and evaluation criteria to address the quality-alignment concerns that dominate their accounts.

Limitations

Several limitations qualify these findings. The postgraduate-only branch was small (n=6), so the postgraduate context (n=24) relies substantially on the combined pathway, which supplied 18 of the 24 respondents (75%). Each postgraduate respondent therefore represents about 4.2 percentage points, and small differences in the postgraduate percentages should not be over-interpreted. The within-participant design of the combined pathway reduces between-participant variation, but comparisons between academic levels are best read as cohort tendencies supported

 Copyright © Li, Wu, Miao & Gopinath, 2026

by the combined branch rather than as statistically generalisable claims. Because qualitative coding was conducted by a single researcher without an inter-rater reliability check, the themes have not been independently verified. The sample was drawn mainly from Australian computing and engineering contexts, with engineering strongly represented, which reflects the available recruitment networks and may limit transfer to disciplines with different assessment cultures. Several items used fixed response options, which supported comparison but may have constrained the range of experiences students could report. The design was also cross-sectional, so it cannot establish whether observed differences arise from progression, cohort composition, or prior experience.

Conclusion

This study compared how undergraduate and postgraduate students perceive team-based learning across the challenges they encounter and the interventions they find supportive. The two groups reported overlapping difficulties, but their emphasis differed, shifting from fairness and unequal contribution at undergraduate level toward standards and quality alignment at postgraduate level. Across both levels, students favoured structural clarity, particularly clearly defined roles, while endorsing peer evaluation only weakly even though they reported the very problems such accountability is meant to address.

The results suggest that effective reform requires more than adding group work to individual units. They point to academic-level-specific design, with early role clarity and contribution visibility for undergraduates and stronger support for standards negotiation among postgraduates, together with accountability practices introduced as routine rather than as a response to conflict. Such design would better support student motivation and engagement throughout their progression.

References

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101.

De Prada, E., Mareque, M., & Pino-Juste, M. (2022). Teamwork skills in higher education: Is university training contributing to their mastery? *Psicologia: Reflexão e Crítica*, *35*, Article 5.

Dorić, L., Luburić, N., Slivka, J., & Kovačević, A. (2023). Understanding the teamwork challenges of software engineering students. In *2023 46th MIPRO ICT and Electronics Convention (MIPRO)* (pp. 1578–1583). IEEE.

Francis, N., Pritchard, C., Prytherch, Z., & Rutherford, S. (2025). Making teamwork work: Enhancing teamwork and assessment in higher education. *FEBS Open Bio*, *15*(1), 35–47.

Garcia, R., Treude, C., & Valentine, A. (2024). Application of collaborative learning paradigms within software engineering education: A systematic mapping study. In *Proceedings of the 55th ACM Technical Symposium on Computer Science Education* (Vol. 1, pp. 366–372). ACM.

Graßl, I., Krusche, S., & Fraser, G. (2023). Diversity and teamwork in student software teams. In *European Conference on Software Engineering Education (ECSEE 2023)* (pp. 110–119). ACM.

Jeno, L. M., Raaheim, A., Kristensen, S. M., Kristensen, K. D., Hole, T. N., Haugland, M. J., & Mæland, S. (2017). The relative effect of team-based learning on motivation and learning: A self-determination theory perspective. *CBE-Life Sciences Education*, *16*(3).

Lu, M., Liu, J., & Li, X. (2020). A comparative analysis of consistency among self, peer, and teacher assessment during a collaborative learning experience. In *Proceedings of the 2020 9th International Conference on Educational and Information Technology* (pp. 77–82). ACM.

Michaelsen, L. K., & Sweet, M. (2008). The essential elements of team-based learning. *New Directions for Teaching and Learning*, *2008*(116), 7–27.

Copyright © Li, Wu, Miao & Gopinath, 2026

Presler-Marshall, K., Heckman, S., & Stolee, K. T. (2022). Identifying struggling teams in software engineering courses through weekly surveys. In *Proceedings of the 53rd ACM Technical Symposium on Computer Science Education* (Vol. 1, pp. 126–132). ACM.

Quek, S. W. D., Teo, J. K. F., Louahemmsabah, N., Tong, Y. B. C., Poh, A. Z. R., Cao, Q., Seow, C. K., Yau, P. C., & Chen, A. Q. (2023). Improving teamwork in software engineering projects in higher education. In *2023 IEEE Frontiers in Education Conference (FIE)*. IEEE.

Romero, C., Romero, J. R., & Ventura, S. (2014). A survey on pre-processing educational data. In A. Peña-Ayala (Ed.), *Educational data mining* (Vol. 524, pp. 29–64). Springer.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68–78.

Tafilovich, A., Petersen, A., & Campbell, J. (2016). Evaluating student teams: Do educators know what students think? In *Proceedings of the 47th ACM Technical Symposium on Computing Science Education* (pp. 181–186). ACM.

Telling, K. (2024). Why do students resist assessment by group-work? Hearing critique in the complaint. *European Educational Research Journal*, *23*(5).

Ethics statement

The ethical aspects of this study were approved by the Human Research Ethics Committee (HREC) of The University of Sydney (ethics identifier: 2025/HE000231). The student survey was administered anonymously through Qualtrics in compliance with university ethical requirements. No identifying information was requested at any point, and responses were stored on secured institutional servers accessible only to the research team.

Acknowledgements

The authors sincerely thank Mr. Ross West who helped us distribute the survey in the learning platform of unit of studies, and the anonymous participants who took the time to complete the survey.

Copyright statement

Copyright © 2026 Yunxian Li, Xi Wu, Guien Miao and Rahul Gopinath: All papers accepted to the Annual Conference of the Australasian Association for Engineering Education (AAEE) are licensed under a Creative Commons Attribution Non-Commercial 4.0 International (CC BY-NC 4.0) License, which allows sharing, copying, distributing, and adapting the work for non-commercial purposes only, provided proper attribution is given to the original authors. To view a copy of the license, visit https://creativecommons.org/licenses/by-nc/4.0/ . Authors are permitted to post the final accepted manuscript or published article on personal, institutional, or non-commercial repositories, provided that the CC BY-NC license and DOI are retained.

37th Annual Conference of the Australasian Association for Engineering Education, UNSW, Sydney, Australia.