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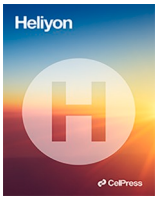

Research article

A teamwork framework for preventing breaches of academic integrity and improving students' collaborative skills in the AI era

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ABSTRACT

Generative artificial intelligence (AI) tools have become a major challenge in the education sector in terms of the way that students use and manage them. This study examines the development, implementation, and evaluation of a teamwork framework by using academic integrity standards and formative feedback to minimise the use of generative AI tools in the Business Project Management (BPM) unit and promote students' learning skills through teamwork and self/peer evaluation. This teamwork assessment was designed to transform students into independent learners by improving their cultural awareness, self-confidence, teamwork, communication, leadership, as well as personal and interpersonal skills. The study's objectives are to determine whether a teamwork framework can help to maintain academic integrity and transform BPM students into independent learners and leaders in the era of generative AI, and to determine whether lecturers' formative feedback enhances students' skills in teamwork assessment. This research comprises an empirical study of 408 local and international BPM students from different cultural backgrounds. A mixed-methods approach was used to collect data and achieve a broader perspective of the research topic. BPM students reported their satisfaction with this type of assessment since it helped them acquire skills such as intercultural effectiveness and teamwork. Following the implementation of the teamwork framework, the number of instances of academic misconduct and requests for extensions have decreased dramatically, while the assessment's average marks increased by 10 %. A set of recommendations is offered that will ensure the successful implementation of the proposed framework for teamwork assessment and self/peer evaluation. This study was limited to the Business Project Management unit, but in 2024, the same study will be conducted involving other postgraduate units at Curtin University with a future rollout in other universities to compare how students perceive teamwork assessment.

1. Introduction

This study examines the implementation of teamwork and self/peer evaluation assessment in the Business Project Management unit (BPM), based on the teamwork framework. "The BPM curriculum provides a framework for project management, its context, and processes. BPM students study a range of topic areas including management of scope, time, cost, quality, communications, and risk, all of which relate to business projects; team development; cost estimation techniques and tools; risk management; project resourcing,

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team member responsibility, accountability, and autonomy; project management standards; accreditation and professional certification. Students also learn about and utilise contemporary project management software packages" [1].

The reason for integrating teamwork assessment and self/peer evaluation in the BPM unit is that businesses locally and globally, specifically practitioners involved in Information Systems (IS), have been rigorously advocating the need for IS graduates to have a range of skills required for the workplace, including teamwork, critical thinking, writing, communication, and oral and written presentation [2–6]. Furthermore, in 2022, generative AI tools (e.g., ChatGPT, DALL-E, and Bard) were created to assist people to produce novel content such as text, speech, video, music, and images. This technology has posed great challenges to academics who need to ascertain whether students' assessment tasks have been completed by the students themselves or produced by AI tools.

To address these concerns, this study comprises the development, implementation, and assessment of the teamwork framework in the BPM unit in order to develop students' skills by asking them to complete a teamwork assessment including self/peer evaluation based on a real-life case study. This assessment activity is designed to enable students to improve skills such as cooperation, communication, cultural awareness, creative and critical thinking, technological literacy, and information literacy. Furthermore, in higher education (which includes distance learning), this style of assessment improves students' academic performance, raises their confidence in a variety of circumstances, and qualifies them for the job they seek.

By integrating academic integrity into the teamwork assessment task, individual students are motivated to complete their work with their team according to the detailed assessment guidelines and lecturers' formative feedback, thus minimising the use of generative AI tools [7,8]. A virtual 30-min meeting is conducted with each team to discuss the work breakdown structure (WBS) and organisational breakdown structure (OBS) tasks and provide formative feedback to improve their work. These tasks are critical to the teamwork assessment process because unless students understand the tasks, they will be unable to meet the objectives of the teamwork assessment. During the meeting, the BPM lecturer asks each team member whether his or her contribution is original, and to acknowledge the factors that motivated them to complete the assessment task. The self/peer assessments are intended to help each student examine and grasp how well they and their peers performed in the team activity, and to assist them in developing their collaborative skills. Each student creates one peer-reflective form for each team member, as well as one personal (self-reflective) form in which they reflect on their contribution to the assessment. They also send to the lecturer a copy of their notes on the items they produced or acquired in the course of completing the assessment task.

Integrating teamwork assessment into BPM encouraged and motivated students to learn new skills through teamwork, critical thinking, collaboration, communication, and cultural awareness. Our students are from Australia, Asia (including India), the Middle East, America (North and South), Russia, Mauritius, and other parts of Africa. This mixed culture motivated students to collaborate with one another and use the formative feedback provided by the lecturers to complete their teamwork assessment task successfully.

The objectives of this study are: 1) to determine whether a teamwork framework maintains academic integrity in assessments and transforms students into independent learners and leaders in the era of generative AI; 2) to determine whether lecturers' formative feedback enhances students' skills in teamwork assessment. The findings of this study will make major theoretical and practical contributions to the literature on teamwork and help academics address present-day challenges, including the irresponsible use of AI tools by students. The study also benefits academics and practitioners in all sectors of higher education by offering useful suggestions for integrating teamwork assessment and self/peer evaluation in any study mode, including online learning. The study's scope is limited in the sense that it conveys an Australian viewpoint on the integration of teamwork assessment in one unit.

2. Related literature review

This section provides a comprehensive description of the teamwork assessment, how the teamwork assessment was implemented in the BPM postgraduate unit, the selection of teams, and the development, implementation, and evaluation of the teamwork framework at an Australian university. Furthermore, this section discusses academic integrity, generative AI, teamwork assessment, and self/peer evaluation.

3. What and why teamwork Assessment

It takes collaboration, communication, cooperation, connection, desire, and incentive for students to work as a team to accomplish the assessment goals, and this is the purpose of the teamwork assessment [9]. Students are required to collaborate with their peers to finish the entire project over a period of 12 weeks from orientation to submission, and they must be aware of their own roles and responsibilities, as well as the expectations they have of their peers.

Teamwork, communication (writing, interpersonal interaction, cultural awareness, and presentation), critical and creative thinking (problem-solving and decision-making), information literacy, and information technology literacy are just a few of the specific skills that a teamwork assessment task in a postgraduate course aims to develop. Both domestic and foreign businesses are seeking graduates with these skills as potential employees [10–15].

To help students succeed in university life, their future careers, and life in general, academics at universities have included the teamwork assessment in their units' curricula. For instance, scholars such as Schulz et al. [16] and Tenhunen et al. [17] reported that team activities, such as pair programming, have positive impacts on students' academic success. Teamwork is currently included in university courses for IS students, but very little information is available about the specific obstacles that prevent its successful integration. One of the objectives of this study was to develop and implement a teamwork framework in BPM to tackle these obstacles and promote academic integrity and students' teamwork skills. To the best of our knowledge, there is no teamwork framework in the literature that has a focus on academic integrity in the AI age.

A teamwork assessment task and self/peer evaluation were designed and integrated into the BPM unit to align with university objectives and the requirements of businesses. This initiative has motivated and challenged students to investigate and develop new solutions for a real-world business project plan that they deliver in a PowerPoint presentation in an academic style and in accordance with the project plan's assessment requirements. The PowerPoint presentation must include the following information: project key dates, project objectives, project assumptions, cost expenses and NPV (net present value), WBS and OBS, critical path, sustainability mapping, communication plan, register risks and RACI (Responsible, Accountable, Consulted and Informed) matrix, closing plan, and references.

In university units, notably those on computing and information systems, teamwork assessment and self/peer evaluation have grown in popularity [18–21]. The inclusion of teamwork assessment and self/peer evaluation in BPM has enhanced students' skills in terms of leadership, decision-making, time management, communication, and cultural awareness. Additionally, this assessment task has promoted problem-based learning and collaborative skills such as negotiation, communication, and project management by generating numerous fresh ideas and perspectives and increasing discussion and debate. This assessment has also made learning more engaging, fruitful, and exciting for both students and lecturers [14,19,22]. According to the literature [12,13,15,23,24], students who successfully complete assessments in a teamwork environment are better able to collaborate with others in the future both in the classroom and workplace. One of the main objectives of this assessment is to encourage students to interact in culturally diverse teams that can positively influence creative collaboration, intercultural effectiveness, management behaviour, and job performance [25–27]. This assessment can also foster understanding and acceptance of cross-cultural values and develop students' skills for the purpose of lifelong learning.

Currently, academics are facing a huge challenge in ensuring that students maintain academic integrity in the era of generative AI. Well-designed assessments, such as those involving teamwork and self/peer evaluation, are essential in managing the risks of using such tools as they involve the application of students' knowledge and skills. In the next section, the authors discuss the issue of academic integrity and generative AI, especially in terms of assessments. Later, the teamwork framework will be explained in detail.

4. Academic integrity and generative AI

In higher education, the upholding of academic integrity standards is essential for all stakeholders to ensure learning opportunities, intellectual growth, and professional success. Academic integrity includes ethical principles and the core values of "honesty, trust, fairness, responsibility, respect and courage" that need to be embraced by the entire academic community" [28]. Not only does academic integrity promote transparency and sincerity; it also correlates well with personality traits and creative thinking [29]. As Fajaryati et al. [30] maintain, creativity, collaboration, and problem-solving skills are considered essential in the 21st century workplace, and thus should be integrated into the instructional process as a primary objective. Fostering creative pedagogy through professional development programs [31] and building a culture of integrity amongst students, both in terms of their awareness and practice [32], can improve the quality of education and maintain public trust in the higher education sector [33].

Despite growing interest in maintaining academic integrity and the significant contributions to the field, research suggests that, increasingly, tertiary students are engaging in behaviours that lead to academic dishonesty [34,35]. However, there seems to be a limited understanding of what constitutes unethical conduct across cultures [36,37], and it is unclear which practical and effective approaches should be followed to avoid academic integrity breaches such as plagiarism, collusion, and cheating [38,39]. There have also been substantial increases in the use of technology tools that are available to students, especially in the forms of generative AI and contract cheating services. Although AI has an important place in the workplace and formative activities in education, it has increased the risk of plagiarism and cheating [40–42]. Consequently, students could become overly reliant on platforms such as ChatGPT and Bard to complete their assignments, without acquiring a comprehensive understanding of the content or meeting learning outcomes. There are also concerns that existing plagiarism-detection tools, namely Turnitin, may not be effective in identifying text that has been generated by AI [43].

In order to ensure assessment security and safeguard against academic misconduct in a digital world, the literature highlights the need to improve the design of assessments [38,44]. For example, Cotton et al. [40] proposed using structured and coherent assignments with a clear rubric and detailed instructions so that students' understanding of the material and the quality of their work can be effectively evaluated. They also emphasised the importance of monitoring the drafts of student assignments before the final submission to detect any potential signs of AI-generated content or instances of plagiarism. The value of an early educative intervention by engaging and equipping students with essential academic skills has also been recommended to ensure academic integrity [45,46].

By implementing an effective teamwork framework, the students in this study were engaged in interactive activities and had a clear understanding of the assessment's requirements. They met with the lecturers to discuss their progress and received formative feedback on their work. They were also required to use original ideas and demonstrate problem-solving, critical thinking, and communication skills, an approach that safeguarded the integrity of the assessment and its subsequent evaluation.

5. Teamwork Assessment and self/peer evaluation in the BPM unit in Australia

Teamwork assessment and self/peer evaluation are increasingly becoming essential components of the BPM unit as a means of motivating students to acquire, refine, and use communication skills (such as writing and oral presentation) and to foster cross-cultural collaboration through significant interactions with their peers and by exchanging knowledge and ideas in relation to the unit in general and the assignment in particular. The teamwork assessment and self/peer evaluation concepts are presented to students during Orientation Week. Students acquire important knowledge such as how to avoid plagiarism, how to use appropriate referencing styles,

and how to put together effective PowerPoint presentations.

In the first seminar, an icebreaker activity is used whereby students introduce themselves to the BPM lecturer and other students. This enables the seamless development of students' confidence and communication skills. The icebreaker questions are: *Why did you select this unit? What do you expect to gain from this unit?* and *What is your name, degree, current job (if any), experience with computers?* (BPM Unit Materials). This method is a useful means of enabling students to get to know their peers (i.e. their education, knowledge, and job experience) and make a better-informed choice when selecting group members for the teamwork assessment task. Another way to choose the members is to set up a discussion forum on Blackboard, where students can introduce themselves first. From there, they can form a group of four students, which is thought to be the ideal number for sharing the teamwork assessment. This process occurs between weeks 1–6, when students finalise the recruitment of their team members from the seminar cohort face-to-face or online.

To improve their collaborative skills, as part of the self/peer evaluation, all students are encouraged to reflect on and understand how well they and their partners completed the teamwork assessment. Each student completes one peer/reflective form for each team member and one personal (self-reflective) form about what they accomplished in this assessment, along with a copy of the notes on the resources that were created or located for the purpose of completing the teamwork assessment. The questions on the form were organised under these headings: *1) Individual roles and responsibilities; 2) Generating and creating ideas/strategies; 3) Research; 4) Collegiality; 5) Organisational skills; 6) Final outcome/product.* Along with the aforementioned headings, each student was asked to respond to three questions*: 1) What did I learn from this group activity (in terms of the process of working in teams – not content/information)? 2)What would I need to change to further develop in terms of how I worked with my partner in order to make future team activities more successful? 3) List 3 strengths you have in teamwork and 2 weaknesses that you need to continue to improve in the future"* (BPM Unit Material).

Before submitting the assessment, the final step of the teamwork project approach involves emailing a teamwork agreement to students to comply with Curtin University's standards for academic integrity. This agreement assists the BPM lecturer to identify which student is responsible for each section and in what capacity (collected research, edited, or completed a section). Each member of the group is asked to complete and digitally sign this agreement prior to submission. One form must be signed by the whole team, and one group member must email it to the lecturer at a certain time using the appropriate naming convention.

Once the lecturer receives the teamwork assessment, she reviews and assesses each group's work, determines how well the team cooperated by asking one team member to upload the teamwork (PowerPoint slides) assessment to Turnitin to ensure adherence to academic integrity requirements. The self/peer evaluation documents along with the assessment draft are submitted to each student's account on Blackboard. The self/peer evaluation gives students the opportunity to talk to the lecturer about any concerns they have with peer interactions, task distribution, or any other subject. With the use of this data, the lecturer can differentiate between each student's grades according to the contribution they have made to the assignment.

6. Developing and implementing a teamwork framework in the BPM unit in Australia

The teamwork framework was developed based on the lecturers' extensive teaching experience, knowledge, skills, and collaboration in terms of teaching and learning in the BPM unit, in particular its implementation. The lecturers developed the teamwork framework by trialling several techniques and approaches over the last three years. In this section, the development and implementation of the teamwork framework for the BPM unit is discussed.

The procedures for conducting this teamwork and self/peer evaluation assessment are explained during the preliminary seminar. Also, a lecturer from the Academic Capability Development (ACD) department is invited to emphasise the importance of the project plan teamwork assessment and its procedures. Her presentation includes the following topics: the value of working in a team; setting up a team project, including individual roles and team schedules; PowerPoint format and components; time management; notetaking; and how to write the self/peer evaluation in an effective way. A useful handout showing different examples of the above procedures is uploaded to Blackboard for student access. It should be noted that the collaboration between the BPM lecturer and the lecturer from the ACD department commenced in Semester 1, 2021.

During the teamwork phase, students are tracked, and if there is a conflict between them over the assessment or if they seem not to be getting along, the BPM lecturer contacts the affected students to assist them in completing and submitting the assessment on time. Furthermore, after the assessment has been submitted, the self/peer evaluation forms will be examined and compared to determine whether the peer teamwork contract was workable. If there is a significant disparity between the evaluations, students will be identified as to clarify the issue, and the grade obtained by each student for the assessment will be modified as appropriate. Finally, the lecturer provides formative feedback to address any problems immediately and to improve the presentation, structure, and layout of the assessment task. Several studies [12–14,47–52] have indicated that formative feedback is essential in teaching, as the lecturer provides advice to students in order for them to improve their learning, achieve high quality academic outcomes, sustain results, learn from their mistakes, and acquire new knowledge. Furthermore, this type of feedback gives students an indication of what they are doing well and where they may need to focus to better succeed. In the BPM unit, both lecturers provide formative feedback to guide students along the correct path and provide instructions to help them perform well in the teamwork assessment task.

The incorporation of the teamwork assessment in BPM assisted students to: 1) detect problems and evaluate the most important issues; 2) identify, implement, and evaluate methods for problem-solving; 3) provide innovative answers; 4) accept group members' views and integrate ideas to generate a cohesive case to tackle the problem in the assessment; 5) manage time efficiently, which includes meeting the expectations established by other students; 6) manage the project by organising and coordinating the group effort; and lastly, 7) reach an agreement with other students effectively, which requires encouraging students to move from a position they favour to a position that is acceptable to all parties.

Furthermore, the students acquired the following skills through teamwork and self/peer evaluation: 1) communication, as well as information literacy, technological literacy, cultural awareness, and teamwork skills; 2) the ability to determine how teamwork assists in distributing duties (ensuring individual accountability), engagement and participation, establishing more educated choices, and delivering original and varied thoughts.

Fig. 1 shows our teamwork framework that consists of seven steps.

Starting on the orientation day, students are told about the teamwork assessment. This is followed by the BPM lecturer giving a detailed explanation of the assessment requirements in week one. From weeks one to six, students are required to form a team and email the lecturer the team details so that they can be assigned a number to use in their documents for submission and marking purposes. In week eight, a lecturer from the ACD department delivers a detailed presentation on the teamwork assessment, including guidelines on how to complete the self/peer-evaluation forms. From weeks nine to eleven, to comply with the academic integrity requirements of Curtin University in the teamwork assessment, the BPM lecturer arranges a virtual meeting (30 min) with each team to discuss the WBS and OBS tasks. As mentioned earlier, these tasks are critical to the teamwork assessment because unless students understand what is required, they will not be able to achieve the aims of the assessment. Therefore, the BPM lecturer asks each team to email their WBS and OBS to be checked, and then provides formative feedback. Each team member is required to attend the meeting. Academic integrity standards will be applied based on this meeting and the lecturer's observation, and each student accepts responsibility for their contribution to the assessment. This meeting assists the lecturer to ensure that each student's contribution is original and confirms the sources used to complete the assessment task.

The final mark will be released based on a signed teamwork agreement, completion of the self/peer-evaluation forms, PowerPoint slides, and the meeting in week nine. The marker uses the assessment rubrics, namely: *"works independently within a group context; works collaboratively; utilisation of team processes; achievement of agreed outcomes; critical thinking issues; evidence-based analysis; critical thinking alternatives; context and purpose; genre and disciplinary conventions; sources and evidence; content development; and control of syntax and mechanics"* (BPM Unit Materials). The self/peer evaluation is marked based on the content of the forms, as well as the individual's effort, contribution, and their leadership skills. However, all students in the group have the opportunity to receive full marks in this component of the assessment if they can prove that they have made a superior contribution to the group function, draft notes, and resources.

Since the implementation of the teamwork framework, the number of requests for extensions, and reports regarding academic misconduct have decreased dramatically, as the lecturers' feedback prevented them from repeating the same mistakes, while improving their learning behaviour and thinking skills, especially concerning report writing, research, and using Endnote software. Furthermore, students have been able to complete their work in teams based on the detailed assessment guidelines and constructive feedback, and this has minimised the use of generative AI tools in completing their tasks.

Finally, the implementation of a teamwork framework in any unit in the future will assist lecturers in minimising academic misconduct and inappropriate usage of AI tools, as lecturers will meet with each team to confirm students' contributions to the assessment via the team meetings in week nine.

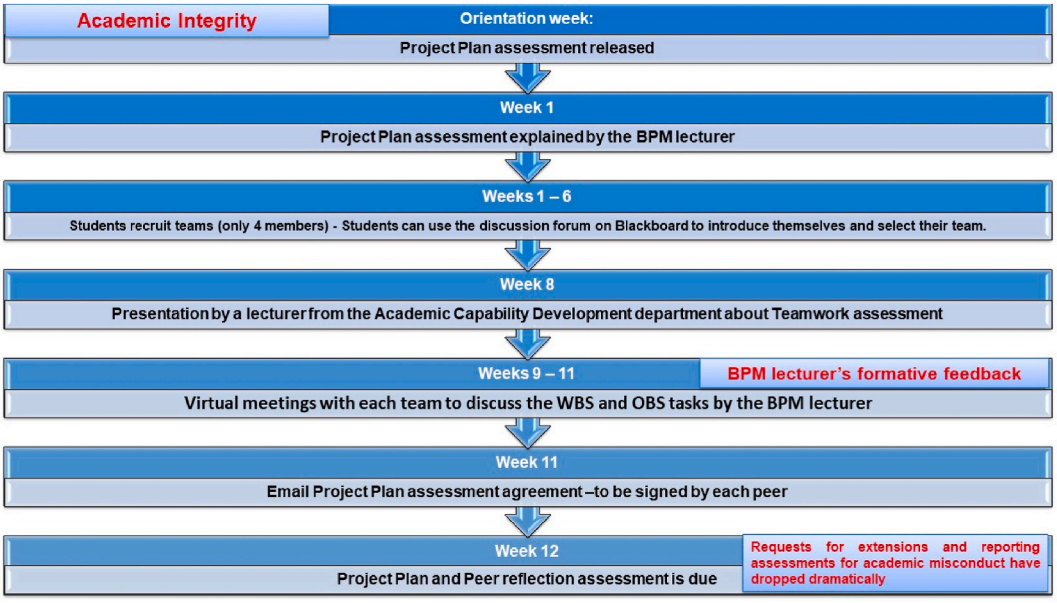


Fig. 1. Teamwork framework – prepared by the authors.

7. Methodology and research questions

This study addressed the following research questions: 1) How can a teamwork framework maintain academic integrity in assessments and transform students into independent learners and leaders in the era of generative AI? 2) How can lecturers' formative feedback enhance students' skills in teamwork assessment? To answer these questions, the mixed-methods approach (quantitative and qualitative methods) is used in this study to minimise discrepancies in the findings and provide a substantial amount of data to identify the positive and negative aspects of the adoption of the teamwork assessment task and self/peer evaluation in the BPM unit.

According to a number of studies [53–56], using the mixed-methods approach allows researchers to fully comprehend the data they have gathered by assessing both textual and statistical information. Additionally, in single research, this approach makes it possible to better understand issues and pinpoint the study's strengths and shortcomings. Both formal and informal comments offered by anonymous students have served as the source of the data for this study. For the qualitative data, the authors used manual coding by reading students' comments and manually developing and assigning codes and themes to the data [57,58].

The informal feedback is gathered in the fourth week of the semester and is examined by the BPM lecturer to perform the necessary adjustments before the end of the semester. Questions in the informal feedback include: *"What are the positive aspects of this unit? What do you like about the lecturer? Do you have any suggestions or recommendations for how the learning experience can be improved? (Please provide specific suggestions.) What do you need the lecturer to continue doing, to stop doing, and to start doing?"* (BPM Unit Materials). This information is collected via the Qualtrics platform by emailing a link to the informal feedback survey to the students and adding it as an announcement on Blackboard. The quantitative data were analysed using Excel software.

Regarding the formal feedback, the university's 'eVALUate' anonymous feedback mechanism typically operates at the end of the semester to gather and report student feedback on a voluntary basis. This feedback is primarily concerned with the unit itself and the degree of student satisfaction with their learning experiences and their lecturers' teaching styles. Responses to the following statements are included in the formal feedback: the learning outcomes in this unit are clearly identified; the learning experience and resources in this unit assist me in achieving the learning outcomes; and the assessment tasks in this unit assess my achievement of the learning outcomes. Additionally, both the quality of the teaching and the feedback that lecturers receive on their work contribute to their success in meeting the learning objectives. The 'eVALUate' anonymous feedback applies a mixed methods strategy that combines, quantitative and qualitative approaches, enabling the lecturer to obtain students' opinions about the unit. Both quantitative and qualitative data were analysed via the university platform, and the analysis results informed the conclusions reached in this study.

8. Study participants and results

In this study, the participants were 408 students who were enrolled in the BPM unit from Semester 1 of 2021 until Semester 1 of 2023. BPM is a core unit in the Faculty of Business and Law and is offered as an elective by the Faculties of Health Sciences and Science and Engineering. Of the 408 students, 146 completed the informal feedback survey and 129 responded to the voluntary 'eVALUate' anonymous feedback about the unit and the teaching of the BPM unit. As for the data analysis, both formal and informal data were analysed by the BPM lecturer using Excel and the Qualtrics platform facilities for the informal feedback, and examining the report that was generated by 'eVALUate' for the formal feedback.

In the BPM cohort, 25 % of the students were Australian, and the remaining 75 % were international students from China, Indonesia, India, Iran, Japan, Malaysia, Mongolia, Pakistan, Singapore, Sri Lanka, Taiwan, Thailand, and Vietnam. This cultural mix played an important role in seminars, in terms of the teamwork assessment, activities, discussion, and debates, as students shared their diverse knowledge, skills, and work experience, enabling them to complete the teamwork assessment task in a professional way.

The teamwork framework that we developed aligned with Cutin University's 2030 strategic plan in the following areas.

- **People:** This project allows students to engage, motivate, and learn new knowledge about the unit, an approach that will improve their completion rates and graduate employment opportunities. It also fosters critical thinking skills and promotes diversity, inclusion, and cultural awareness.
- **Planet:** This project creates and implements new global strategies to solve project problems and develop opportunities to engage with other campuses for further learning and research.
- **Partnership:** Completing the teamwork assessment helps to develop solutions that make real-world differences in solving global challenges, and this enhances opportunities for students across all campuses.

As the proposed research complied with the Curtin University Human Research Ethics Committee requirements, authorisation to conduct the current study was granted, Approval Number: HRE2019-0389.

To help students develop their professional and personal skills, the BPM unit included a teamwork assessment task and self/peer evaluation. Additionally, this assessment task fosters constructive relationships with peers and sharing of perspectives on the task and the unit as a whole. Since this assessment task is rigorously supervised, organised, and scrutinised by the lecturers, it has become a favourite of BPM students. On the orientation day, the teamwork assessment and self/peer evaluation forms, instructions, presentation standard criteria, and rubric were made available, so that students could consider the actions they needed to take within the proposed timeline.

Based on the formal feedback, "eVALUate", students indicated that completing the teamwork assessment task for the BPM unit enabled them to acquire new knowledge about project management, and to develop teamwork, decision-making, technology, writing, and research skills. It also helped them to deliver presentations more professionally. Students stated that:

"The most beneficial aspect is that I learned how to apply appropriate methods for a specific situation, creative thinking, problem solving, and generating alternative solutions during decision-making. It helped me produce written documentation and deliver presentations more professionally. Also, I honed my skills on how to work cooperatively and successfully as a team member, leading me to identify, research, and implement new knowledge from different sources relevant to the field of study. Moreover, I now have the confidence to collaborate on a group project as a team leader or member with responsibilities and accountabilities. I also know how to research and use proper peer-reviewed journal articles as references in the project, keeping in mind the academic and professional integrity principles required for the discipline. (Student 1)

Business project management is an elective subject for me, but I am glad I chose it. It enhanced my knowledge of project management and helped me link it to a business point of view. The assignment was intellectually structured, and the tutor was very enthusiastic and attentive. (Student 2)"

Furthermore, feedback offered by students in terms of improved work opportunities and teamwork agreement and timeline is presented in Figs. 2 and 3.

The overall results indicated our high ranking in the School, Faculty, and University since the items from Learning experience, Assessments, and Feedback ranged from 89 % to 100 % (see Table 1). One significant impact of the BPM unit is that some students secured a high-ranking position with Rio Tinto, Deloitte, Microsoft, and Ernst & Young Global, and they report that in their work environment they continue using their knowledge acquired from studying BPM topics. These students were invited by the lecturers as guest speakers to share their practical experience with current students. Furthermore, the most unexpected outcome was the overwhelmingly high and consistent positive feedback received via eVALUate. As indicated, students were very pleased with the lecturers' unique, effective, and outstanding teaching and presentation styles. These results gave the lecturers self-assurance, encouragement, and confidence to continue with the current assessment practice, giving the students formative and summative feedback aimed at developing and enhancing their communication skills. Table 1 shows the student evaluation statistics.

Regarding the project plan assessment average (see Table 2), there was an increase from 27/40 (67.5 %) in Semester 1 2020 to 31/40 (77.5 %) in Semester 2 2021 and remained at a similar average through to Semester 1 2023, thanks to the engagement of the ACD lecturer in BPM from S1 2021. These notable increases were the result of a combined effort of the BPM lecturer's ongoing formative feedback, the assessment's clear guidelines, and the ACD lecturer's presentation. Table 2 shows the project plan teamwork average.

Students were very generous in sharing these comments regarding the teamwork assessment tasks and the unit in general:

"The teamwork assessment was the most informative to learn about MS Project, which covers almost all the most important topics. Moreover, it educated in a practical way. Thanks. (Student 3)

The use of MS Projects in the teamwork assignment. It's a useful tool that helps attain more skills in the technical aspects of the unit. The approach to which the unit was done was highly effective, interactive, and involved in any way possible. The assignments were quite comprehensive and worthwhile, as a lot more skills were gained over and above the assessment aims. (Student 4)

The assessments, including the teamwork assessment, are aimed at industry standards, so they will be helpful in a future career or workplace. Each week helps me gain new knowledge. I also appreciated the in-depth assessment outline. Other units aren't so descriptive. (Student 5)

The assessment guidelines provided were very detailed. The lecturer (s) has put in a lot of effort to make the unit interesting and easy. The lecturer (s) has made us familiarise ourselves with two major MS- projects and an end note, which will also be useful in the future. The whole unit was very informative, and I gained substantial knowledge from the unit. I enjoyed doing this unit. (Student 6)"

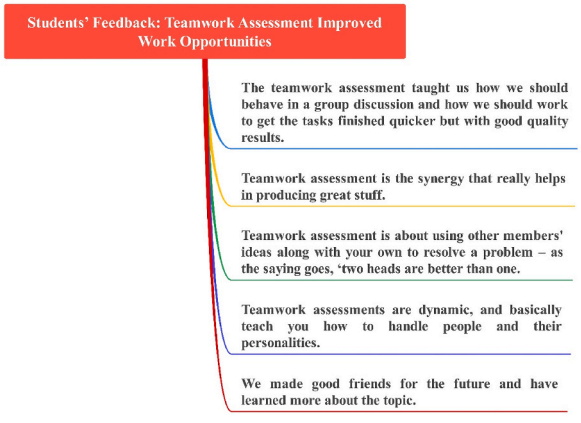


Fig. 2. Students' Feedback: Teamwork Assessment Improved Work Opportunities – prepared by the authors.

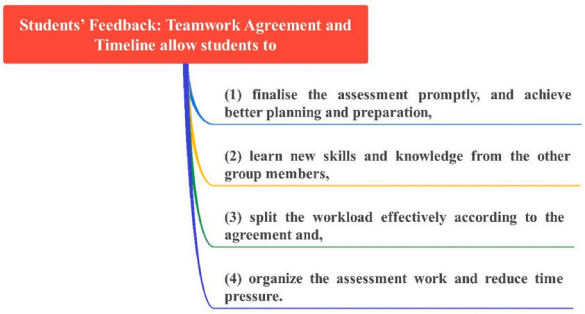


Fig. 3. Students' feedback: Teamwork Agreement and Timeline– prepared by the authors.

Table 1
BPM eVALUate results - prepared by the authors.

Year/Semester	Students enrolled	Response rate and Responses (R)	Item 2 Learning experience		Item 4 Assessments		Item 5 Feedback	
			Unit	**University Average**	**Unit**	**University Average**	**Unit**	**University Average**
Semester 1 2021	**62**	**31 % (19 R)**	**100**	**85**	**95**	**86**	**90**	**81**
Semester 2 2021	**70**	**29 % (20 R)**	**89**	**86**	**89**	**86**	**95**	**81**
Semester 1 2022	**55**	**36 % (20 R)**	**95**	**85**	**90**	**86**	**90**	**80**
Semester 2 2022[a]	**55**	**36 % (20 R)**	**94**		**97**		**100**	
Semester 1 2023	**166**	**31 % (50 R)**	**98**		**92**		**98**	

[a] On the new platform, the university average is not available since semester 2, 2022.

Table 2
BPM Project Plan teamwork average - prepared by the authors.

Year	BPM Project Plan Teamwork (40 %) Average
Semester 1 2020	27/40
Semester 2 2020	28/40
Semester 1 2021	**30/40**
Semester 2 2021	**31/40**
Semester 1 2022	**30/40**
Semester 2 2022	**31/40**
Semester 1 2023	**30/40**

The students' generous feedback about the contributions of the ACD lecturer is presented in Fig. 4.

In terms of informal feedback, of the 408 students enrolled, 146 provided feedback about the BPM unit by responding to the informal questionnaire. Some of the direct quotes are presented in Table 3.

Students also provided the following formal feedback about the BPM lecturer indicating that without her commitment, encouragement, and formative feedback, the implementation of the assessment task could have been less successful:

> "The lecturer was the only teacher who really cared about her students' learning outcomes. That's how teachers should work. (Student 7)
>
> I enjoyed the lectures and was very touched by how the lecturer acknowledged all her students at the end of lecture 12. (Student 8)
>
> The lecturer delivered the course in the most professional manner and made the learning more fun and convenient. It made the whole learning process more enriching. (Student 9)
>
> Our professor was an incredible educator and hard worker and was always on call to assist with any learning or assessment questions. She was very accessible and helpful. (Student 10)

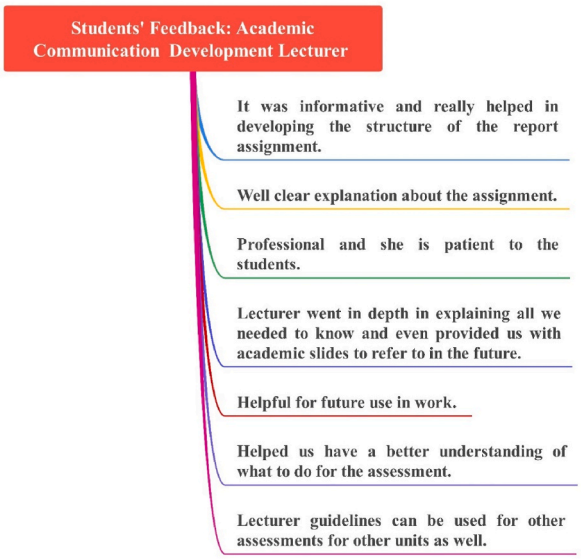


Fig. 4. Students' Feedback: Academic Communication Development Lecturer – prepared by the authors.

> They were very supportive of all students, and despite us emailing her numerous times, they still addressed every concern we had. The feedback provided throughout for our assignments was detailed and made sure we knew what could be improved, so it motivated us to do better for this unit. (Student 11)
>
> Our lectures are very consistent in engaging students to participate in class discussions and active in offering query sessions for students who have queries with this unit. (Student 12)
>
> The process feedback assessments were very helpful for me. It was applicable not only to this unit but also to other units. It could be applied to other units and jobs. What was also most helpful was the teacher's very prompt and courteous response to my small questions by email. This could lead to me being able to understand the content smoothly because my questions were answered immediately. (Student 13)
>
> The feedback provided for the assignments is always very thorough, and I would know where I went wrong. This also helped me perform better for future assignments. The lecturer was very enthusiastic throughout the semester and provided the students with a lot of support. (Student 14)
>
> The professor was very helpful in providing feedback on every weekly case study and individual and group assignments. This helped me understand more about the subject requirements and expectations. (Student 15)."

Fig. 5 presents further generous comments about the BPM lecturer.

In terms of the students' feedback on the self/peer evaluation forms, the majority believed that they enhanced their professional and personal abilities. Students used self/peer evaluation forms to identify both their strengths and limitations. In regard to strengths, one student stated:

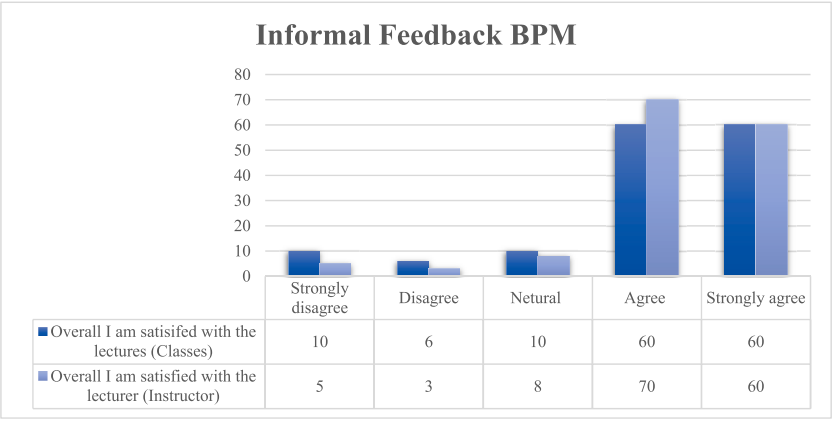
> "Good researcher and leader, cooperative, hardworking, making decisions, patience, commitment, open-minded, participated in discussion, passion, good professional and personal skills, reliable, teamwork, effective attitude, motivator, friendly and contributed equally, encouragement, problem-solving, listening skills, recognising what needs to be done and delivering and performing, agreement, culture, and responsibility. The identified weaknesses included inadequate time management, detrimental planning, technology, poor communication, editing, proofreading, and English, as well as being lethargic, hesitant, unsure of one's options, and restless. (Student 16)"

After checking thoroughly and determining each student's academic strengths and weaknesses, the BPM lecturer offers suggestions, instructions, and methods to reduce the number of weaknesses by requesting students to participate in additional workshops offered by the university's ACD department and library. These workshops help students study, write academically, and improve their communication abilities.

Furthermore, both lecturers measure the impact of BPM by tracking students who enrol in other units to determine whether they are applying the skills acquired through the BPM unit when undertaking specific activities and assessment tasks individually or within a team via the Wiki platform.

The study results obtained through the mixed methods approach addressed the study's research question. Students demonstrated that their newly acquired skills obtained through the teamwork assessment, in particular their critical and creative thinking, cultural awareness, communication, problem solving, and technology literacy will assist them in their future academic work, occupations, and

Table 3
Informal feedback provided by the BPM students.



What are the positive aspects of this unit?	✓ There are many benefits to learning this unit. As project management improves productivity and helps with problem resolution, how to reduce cost and manage time and workload. Made you an effective team player and helped to improve customer satisfaction. ✓ This unit is giving me more interesting information about management in general and projects in particular. ✓ The information in this unit. It can help develop writing skills and work as a team.
What do you like about the lecturer?	✓ She is one of the best in the faculty. The thing that I admire the most is that she puts in extra effort and time to help every student and goes beyond her limits to make learning so comfortable for everyone. ✓ She delivers everything quite well, and I love taking this lecture. The most important thing is that I don't get bored during the lecture. ✓ The teacher is very constructive and encourages students to speak. ✓ The lecturer is well versed in the unit. She explains every term so well and always keeps the lecture interactive. The tutorials make us read in depth about the unit. She has explained how to write Assessment 1 and provided details about referencing and how to write a research project, which is admirable. She replies to all the queries quickly through her emails, thus making it easy for students like me who come from different streams to understand the unit.
Do you have any suggestions or recommendations for how the learning experience can be improved? (Please provide specific suggestions.)	✓ Maybe more case study discussion in class. ✓ Honestly speaking, she is doing great and doesn't feel in any way that it can be improved. ✓ As per me, learning experiences are best in this unit, even in these tough times. Superbly managed!!
What do you need the lecturer to continue doing, to stop doing, and to start doing?	***Continue*** ✓ Summarizing and explaining key points as well as what we need to notice for actual industry project management. ✓ Continue the interactive sessions and keep guiding us about assessments. ✓ Keep reminding students what they should do and providing help for offshore students. ***Stop*** ✓ Nothing; she is great. ✓ So far, I am happy with her. ✓ Really nothing. ***Start*** ✓ It's perfect, I think. ✓ Taking a break each hour. ✓ Maybe more icebreakers for those offshore students shy to participate.

life in general.

9. Discussion, new theoretical framework and recommendations

The study's findings confirmed that using the teamwork framework for teamwork and self/peer evaluation allowed students to learn and develop personal and professional skills that are needed for their current studies and the workforce in the future. Furthermore, students' time management skills (enabling students to meet deadlines) developed through the completion of the teamwork assessment task. Therefore, based on the current study's outcomes, the teamwork framework should be adopted in other

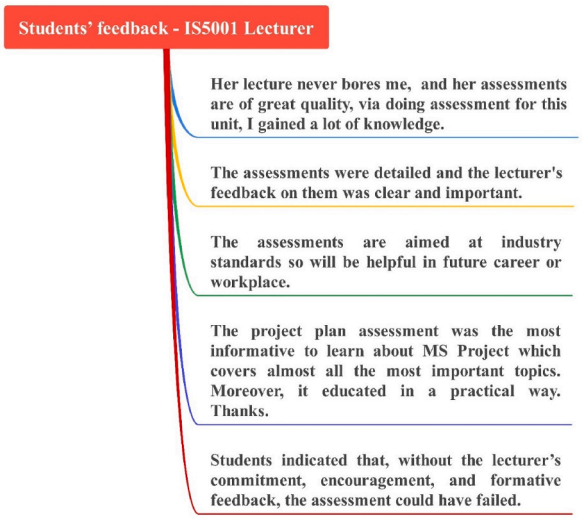


Fig. 5. Students' Feedback: BPM Lecturer – prepared by the authors.

units in our university and globally to enhance students' skills and minimise the use of AI tools, allowing students to become independent learners who uphold academic integrity.

The study adequately addresses the research questions. The first research question is answered by the findings which show that by incorporating the teamwork framework in BPM, students developed as independent learners and leaders, especially in the age of generative AI. In the comments, the students expressed a high level of satisfaction with the unit, with the majority confirming that the teamwork assessment tasks improved their skills (see Tables 1 and 2). The authors are now recognised as teacher leaders in the school's teamwork assessment programme, and they collaborate with their colleagues to support and integrate this assessment in the curriculum as it is designed to help students develop their learning abilities and prepare them for postgraduate success.

Additionally, the second research question is addressed by the lecturers in that they provided detailed formative feedback to the teams to ensure that the teamwork assessment task was completed on time and with good quality in terms of presentation, structure, and layout. By providing formative feedback, students could improve their learning, achieve high academic achievement, learn from their mistakes, and acquire new knowledge. Nevertheless, the most important aspect of the implementation of the teamwork framework was that in week nine, the lecturers could identify students' original knowledge and contribution based on their role in the team and determine whether the work was completed by the students themselves or if it was generated by AI tools. As a result of the lecturers' formative feedback, the students were able to improve their work before final submission, and this reduced the instances of academic misconduct, the number of requests for extensions and prevented students from repeating mistakes in the same or other units.

At present, generative AI tools are becoming available in all sectors, including the education sector, where some students have started using them for assessment tasks. This has posed a major challenge for lecturers, even though assessments are submitted via Turnitin. In this study, however, the teamwork framework has allowed the lecturers to identify the students' original contribution and to acknowledge the sources that helped them complete the assessment tasks, as each student attends and presents their findings based

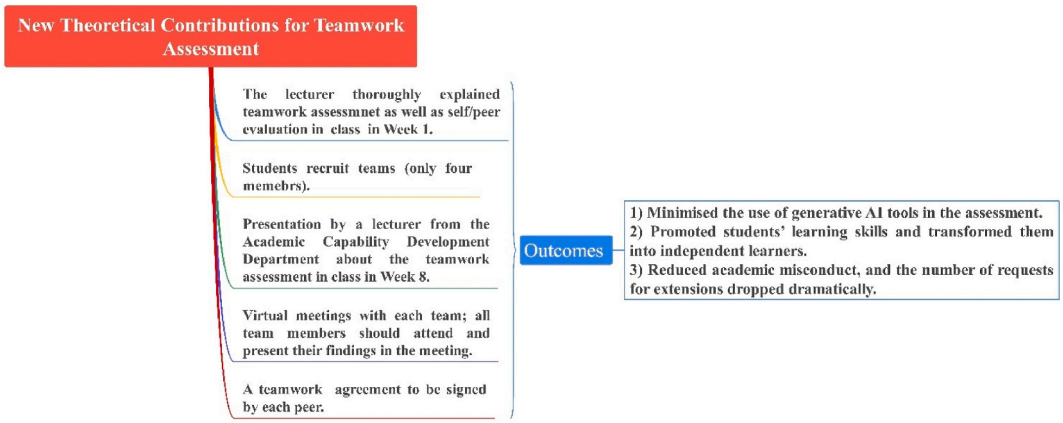


Fig. 6. Theoretical Contribution - prepared by the authors.

on their role in the teamwork assessment. Ascertaining students' contributions is critical these days to determine whether they have completed the work themselves, or it was produced by AI tools. Based on the students' presentations in the meetings, the lecturers confirm the original work of each student for this assessment, and the meetings have proved to be essential for obtaining the final mark for each student.

According to the literature [11,12,20,22], it is crucial to include teamwork assessment in the curricula of higher education in order to prepare students for the collaborative nature of today's job market. As the literature review indicated [5,15,18,24], the teamwork assessment is conducted by means of self/peer evaluation and rubrics. What makes this study impactful is that it has added significant theoretical and practical contributions to the literature. In terms of theoretical significance, the development of a teamwork framework with a focus on academic integrity will contribute to the literature related to teaching and learning in the AI era. Fig. 6 shows the study's new theoretical contributions.

In terms of its practical significance, this study will help academics and teaching and learning departments to understand how to implement and integrate teamwork assessment and self/peer evaluation to transform students into independent learners and leaders. Furthermore, students will enhance their professional and personal skills, which are needed for their current studies and future careers. As teams are comprised of students from different countries, each student can learn and share his/her cultural perspectives on a local and global scale. Therefore, this study makes a practical contribution by providing an effective teamwork model in which the importance of diversity and cultural awareness is emphasised. Implementing the teamwork model will also allow students to complete their work in teams based on the detailed assessment guidelines and lecturers' formative feedback to minimise the use of generative AI tools [7,59].

In this study, a mixed-methods methodology was adopted to achieve a better understanding of the broader perspective of the research. The integration of qualitative and quantitative data allows researchers to obtain sufficient evidence to better address a problem and understand a phenomenon. In addition, the data obtained in this study can enhance assessments by compensating for the drawbacks of a particular approach and leveraging the advantages of another. Several studies [53–55,60,61] determined that applying a mixed-methods approach in research had numerous benefits. One major advantage that was reported is the capacity to incorporate quantitative and qualitative data and conduct analyses inside a single study, allowing researchers to obtain more comprehensive and accurate knowledge of the research topic. Furthermore, this approach facilitates a deeper investigation of research concerns and conveys an improved understanding of the subject. The exploratory methodology used in this study can assist academics to further their research in the area of teamwork and its associated assessments.

Finally, to integrate teamwork and self/peer evaluation in higher education (face-to-face or online), this study has generated a set of recommendations (see Fig. 7).

10. Limitations and future research

It must be acknowledged that finally, this study's investigation was limited to the Business Project Management postgraduate unit at an Australian university. The study was limited to one assessment task within the unit: teamwork assessment. Therefore, further research will be carried out in the future to examine the implementation of teamwork assessments in other units within the same faculty and in other faculties at the same university, and to collect further data to strengthen the research conclusions.

11. Conclusion

This study comprised the development, implementation, and evaluation of the teamwork framework adopted in Business Project Management with academic integrity standards embedded to minimise the use of generative AI tools in the assessment. This approach promoted students' learning skills, transformed them into independent learners, and reduced instances of academic misconduct and the number of requests for extensions. Moreover, students were given the opportunity to develop leadership, brainstorming, research, writing, problem-solving, and decision-making skills, all of which are crucial to their studies, future employment, and higher education today. Other learnt skills include interpersonal interaction, negotiation, conflict resolution, listening, and cultural awareness.

Based on the findings, a set of recommendations was presented for integrating teamwork and self/peer evaluation in an effective way. This study offers a good example of the teamwork assessment approach applied in higher education, since the skills acquired by students are essential for their studies and careers locally and globally. To safeguard the integrity of the assessment task, the students in this study were required to meet with the lecturers to discuss their progress and receive formative feedback on their work in regard to original ideas and critical thinking in particular. This assessment is both exciting and challenging for students and lecturers, so they should work closely with each other to complete it successfully.

Although the scope of the study is limited to BPM, in 2024 the same assessment approach will be employed in other postgraduate units in various faculties at Curtin University, with a future rollout in other universities to compare how students perceive teamwork assessment and self/peer evaluation. The findings of this research will add theoretical and practical significance to the literature on teamwork and offers evidence-based suggestions for integrating teamwork assessment and self/peer evaluation in any study mode. They also assist academics to address the challenges posed by students who use AI tools in assessments. It is hoped that this study's exploratory approach, outcomes, and recommendations will encourage further research on teamwork in different universities throughout Australia and overseas.

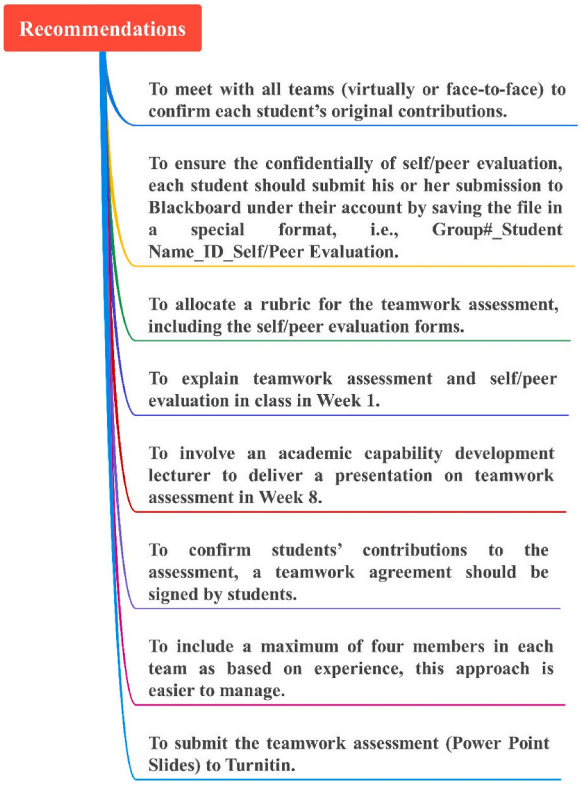


Fig. 7. Recommendations for the Integration of Teamwork/Self-Peer Evaluation in Higher Education – prepared by the authors.

Ethical statement

This study has been approved ethically by Curtin University, Approval Number: HRE2019-0389.

Data availability statement

Data will be made available on request.

CRediT authorship contribution statement

Tomayess Issa: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Mahnaz Hall:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:Dr. Tomayess Issa is a Section Editor at Heliyon. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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