# 3.2

# Peer Assessment

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**Peer assessment (PA) is a well-established and widely used practice in higher and engineering education, aligned with the sector's shift towards active, skills-based learning. It supports students in developing and demonstrating a broad range of transferable competencies, including those highlighted in the second theme of this handbook, namely communication and interpersonal skills; in particular teamwork, interpersonal communication and feedback, as well as general communication. Engaging in PA requires students to review, judge, and evaluate the work of their peers, thereby fostering higher-order cognitive skills and deeper conceptual understanding. This chapter introduces three modalities of peer assessment. First, traditional peer assessment focuses on evaluating the quality of product or output. Second, 360-degree peer assessment extends this by evaluating both the product and the quality of the feedback provided. Third, the individual peer assessment of contributions (IPAC) methodology focuses on assessing individual contributions, teamwork behaviours, and professional competences within group work. The chapter outlines the benefits, challenges and best practices associated with each modality of peer assessment and offers guidance for effective implementation. It is intended to support new and established practitioners seeking to implement effective peer assessment and enhance students' engagement, accountability, and competence development.**

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# 1 Introduction

Different forms of educational activities in which students review and judge each other's work and/or provide feedback to each other may be referred to as peer assessment (PA) (Adachi et al., 2018; Fleckney et al., 2025; Topping, 1998).

In engineering education, PA, as an active education approach, can enrich the learning outcomes associated with a technical subject-specific module element to also include transferable competencies (e.g., communication skills, giving and receiving feedback). Even with respect to the technical learning outcomes, PA aims to engage students at a higher level of cognitive complexity to include evaluation and analysis as students critically evaluate their peers' work (Krathwohl, 2002). PA, with its usual elements involving feedback and scores (Fleckney et al., 2025), can promote reflective responsible practice (Topping, 1998), foster critical thinking, and facilitate a better understanding of the assessment criteria (Iglesias Pérez et al., 2022). In addition, the ability to critically evaluate others' work and to take on the role traditionally held by instructors can build the students' confidence for independent learning, an increasingly important attribute in a rapidly evolving job market with changing skills requirements. As such, the PA approach is also increasingly used in industry as part of the performance measurement of their workforce (Bracken et al., 2016), e.g., at HSBC, PepsiCo, and Exxon. Therefore, PA addresses several competencies that are featured in this Handbook.

In this chapter we introduce you to three common modalities of PA: traditional PA, which focuses on the evaluation of a product with respect to its quality; 360-degree PA, which expands the traditional PA to also include the evaluation of the feedback provided by students to their peers to also incentivise giving quality feedback; and the individual peer assessment of contributions (IPAC) methodology, which centres on PA of the individual contribution to group work, targeting teamwork behaviours and individual accountability within collaborative tasks. Together, these modalities represent complementary perspectives on PA, addressing product, feedback literacy, and participation. For each type, we discuss the benefits and challenges, and how they can support the development and assessment of technical knowledge and professional competences such as communication and giving and receiving feedback. We provide two examples and conclude the chapter with some practical advice. The chapter also briefly considers the future of PA in the context of emerging artificial intelligence (AI) tools and their implications for design and implementation.

# 2 The traditional peer assessment method (PA of a product)

Traditionally, PA is deployed in the context of marking and/or providing feedback on a student product, something tangible. This product can be anything ranging from an answer to a question, to a presentation or a report. For these products there are two main attributes which practitioners may ask students to evaluate:

- *The technical context and content of the product within the subject of study.* Students might be asked to look at the veracity of the information and outcome

presented within the field of study, as well as the correctness of the methods and processes involved.
- *The attributes of effective communication.* This includes communicating at an appropriate level for the target audience, the coherence of arguments, a clear structure, and the effective presentation of elements such as figures to convey the intended message.

When evaluating the subject-specific technical aspects of the product, students may lack sufficient knowledge to provide a reliable and consistent judgement. By contrast, they are well placed to assess the quality of communication as they perceive it. It is therefore reasonable to expect students to evaluate and communicate meaning at their own level, unless the product builds on extensive prior work by the student, requiring more advanced understanding. Therefore, in most cases, peer understanding of the communication of the product provides a useful indicator of its effectiveness.

PA requires the use of marksheets, rubrics, exchange of scores, and feedback. There are specific tools designed to facilitate the implementation of PA, including allocation of work to peers and/or moderation by the practitioner, e.g., Turnitin, PeerMark, and Moodle Workshop activity.

### *2.1 General motivation and benefits of PA*

PA literature indicates that, in the higher education setting, its use may lead to better or equal academic performance when compared to instructor assessment alone (Double et al., 2020, Li et al., 2020). There are multiple benefits that would motivate the use of PA in education.

**Higher cognitive engagement and learning of technical knowledge**

PA promotes metacognitive reflection and evaluative judgement, particularly when feedback and justification are required (Ortega-Ruipérez et al., 2024), which applies to both technical and communication domains. In providing feedback and justification, students need to analyse, evaluate, and sometimes even create solutions, promoting higher levels of cognitive engagement as per Bloom's taxonomy (Krathwohl, 2002). In other words, in reviewing their peers' work, students must interpret technical decisions and appraise their validity in order to be able to propose improvements, all of which include the characteristics of complex cognitive engagement that effective engineering education seeks to cultivate.

**Development of transferable competencies: communication competencies**

PA supports the development of communication competencies because students must evaluate the clarity, structure, and communication effectiveness of their peers' outputs, including written reports, presentations, and other deliverables. This also requires students to produce constructive, precise, and professionally appropriate feedback, fostering communication approaches akin to those expected in engineering practice. Adrill's (2025) research on dialogic peer feedback shows that students value

peer assessment as a means of improving their communication awareness, reflective thinking, and feedback literacy.

**Development of transferable competencies: growing confidence with critical analysis**

Engaging in PA builds students' confidence in critical analysis, as they learn to make judgements based on evidence and criteria. In addition to further enriching learning outcomes with critical thinking and independent judgement, PA can positively impact learner motivation and engagement by expanding perspectives (Adrill, 2025), while reviewer training within PA can further improve learner motivation (Yigiter, 2026). This positions PA as an authentic preparatory practice for evaluative responsibilities encountered in engineering workplaces and research environments.

**Facilitation of prompt feedback in large classes using PA**

Timely, frequent, and task-focused feedback is fundamental to effective learning (Gibbs et al., 2004). However, large class sizes make it difficult for educators to deliver such feedback unaided. PA addresses this challenge by distributing the feedback workload across students, allowing rapid turnaround that satisfies the requirement that feedback must reach learners while still actionable. Technology-supported PA platforms, including Moodle's peer review tools, FeedbackFruits, or Turnitin can be used to manage the logistics of PA to ensure feedback can be delivered in a timely manner.

### *2.2 Challenges and mitigations*

PA does not come without its challenges, chiefly: (1) concerns around the fairness and validity of the peer marks and feedback; (2) students' lack of engagement with the PA process because of lack of motivation or understanding; and (3) logistical challenges in assigning, collecting, and moderating PA in larger cohorts.

**Fairness and validity of PA and student engagement**

All students, assessors and assessees, may have concerns regarding the fairness of PA, questioning and challenging their own ability and the ability of their peers in providing an accurate assessment of their work based on their limited experience and technical knowledge about the topic of the assignment. Traditional PA may also suffer from poor engagement with the assessment by the peer assessors if they are not held accountable for the accuracy and validity of their evaluation, further compromising the integrity of the assessment. These issues can affect the quality of feedback and the reliability of summative marks. In fact, there are studies that suggest that formative implementation of peer feedback is more effective (Fleckney et al., 2025), perhaps because it removes the higher stakes of the summative element. However, this may avoid rather than address the underlying issue, while reducing opportunities for students to develop evaluative judgement against standards.

A typical approach to address the students' concerns over fairness in PA is by including multiple peer assessors in each assessment, which agrees with best practices in assessment in general. Although this provides some resilience in peer marking with

respect to fairness, a degree of tutor moderation or assessment of the feedback may still be needed.

Furthermore, evaluating students' reviews of their peers' work and holding them accountable can partially address the engagement issue. This in turn can improve the validity and consistency of PA. This advanced PA method is presented in section 3 of this chapter.

**Practical implementation issues**

Bespoke PA platforms may facilitate the assignment, collection, and moderation of PA that otherwise places a significant workload for instructors. AI may provide a unique opportunity for assessing feedback and moderating tasks efficiently, but further research is needed into its responsible implementation.

Practitioners should be aware of other practical challenges that can arise when implementing PA in real teaching contexts. For example, PA activities often rely on all students submitting their work on time so that reviews can be allocated and completed within the planned schedule. Late submissions can disrupt the allocation of reviewers and may result in some students receiving fewer reviews than intended.

One way to manage these situations is to design PA activities with some flexibility, for example by assigning multiple reviewers to each submission or by allowing tutors to step in as reviewers when necessary. Clear communication about deadlines and expectations is also important to minimise disruption.

**Building feedback literacy**

Providing a clear briefing to set the context and motivation for PA may facilitate a more uniform uptake. To further improve the outcome, PA may be deployed in iterations for a given activity and/or comprehensively across a module, as students will need sufficient and structured exposure to the process to develop the associated feedback literacy (Fleckney et al., 2025). Furthermore, by appropriately managing the assessment procedure through the provision of the required standards, introducing scaffolding, and the inclusion of a moderation step, the quality of the outcome in PA (peer feedback and summative score) may be improved (Adachi et al., 2018). For more information on teaching feedback literacy, see Chapter 2.12.

### *2.3 Design factors*

PA is quite flexible and adaptable to different contexts and practitioners' general preferences or motivations, e.g. how the peer assessment is used to grade students. There are various design factors identified by Alqassab et al. (2023) that include the assessment type (i.e., formative and summative), output of PA (e.g., written feedback and mark), group or individual assessment, privacy considerations, mode of delivery (e.g., online or in person), pairing strategies between assessors and assessees, number of iterations, and the scope of involvement of the students. The evidence for some of these design choices in terms of their impact on academic performance is mixed and may depend on the context, but a major design decision is undoubtedly

the choice between formative and summative deployment of PA. Some of the design factors that practitioners need to decide are discussed below in more detail.

**Output: qualitative versus quantitative**

PA may involve scoring (quantitative) and/or written comments (qualitative). Qualitative feedback can provide detailed guidance to help students to improve their work, while a quantitative score can help instruct the evaluation process and make it easier to incorporate PA into grading systems.

In general, engineers prefer to work with numbers and may gravitate towards quantitative scoring — this is of benefit to the educator, as it gives a clear scale of how the student is performing. However, qualitative feedback is usually much richer and useful for students to learn from, both when giving and receiving feedback.

**Assessment type: formative vs summative**

Formative PA focuses on supporting learning. Students provide feedback that can be used to improve their peers' work before a final submission. This encourages reflection and helps students to develop evaluative judgement. Summative PA contributes directly to grading, e.g., when peer marks are used to grade the product of the students. As such, summative PA can raise concerns about fairness, quality, or reliability of the marks if the process is not carefully designed.

Summative PA may be the desired option among engineering educators (Alqassab et al., 2023), reflecting the hypothesis that various assessment tasks set in engineering disciplines may be easily objectively evaluated (Li et al., 2016). Such assessment tasks may include those in which a known set of theoretical formulations are used in a predefined way to find a final quantitative answer. However, other more open-ended tasks, such as engineering design with several possible approaches and infinitely many solutions, may require more experienced assessors with a wider and deeper understanding of the discipline than students.

You may wish to consider starting with formative PA for more complex tasks, before introducing a summative element as students develop greater confidence and feedback literacy. In many cases, a combination of both approaches can work well, using PA during the development of work to support learning, and incorporating peer judgement into the final evaluation to promote accountability.

**Transparency: anonymous or open PA**

As a practitioner, one of the key design decisions you will face is whether peer assessment is anonymous or openly attributed. Anonymous PA encourages more honest feedback and reduces anxieties around social pressure amongst students. Open feedback can promote accountability and encourage more thoughtful and constructive comments. The most appropriate approach will depend on your cohort size, the nature of the task, and students' prior experience with PA. For example, anonymous feedback may work better in larger cohorts or early in a programme, while open feedback may be more appropriate more experienced groups where trust has been established.

**Structure: reciprocal, intragroup, or intergroup**

In reciprocal assessment, students review each other's work in pairs or small groups. In intragroup assessments, students evaluate the contributions of members within their own teams. In intergroup assessment, students review work produced by other groups. Each structure has its benefits and may be more suitable for particular activities; e.g., reciprocal assessment can work well in small classes or seminar-style activities where students exchange feedback on each other's work and discuss it directly. Intragroup assessment is commonly used in teamwork settings where students evaluate the contributions of members of their own group, often to support a fairer distribution of marks. Intergroup assessment can expose students to different approaches to the same task and encourage comparison and critical reflection across groups.

**Stage: draft work vs. final submission**

PA may be used during the development of work, e.g. reviewing draft reports or preliminary design, or applied to final submissions. Reviewing of drafts often emphasises formative feedback and supports iterative improvement, while assessing final submissions may be more closely linked to summative evaluation. This is further discussed in example 1, featuring PA of draft work in a final-year capstone project.

**By integration: peer-only vs. self-and-peer**

PA naturally involves an element of informal self-assessment, as students compare their own work with that of their peer, which can help develop independent and reflective learners. Indeed, the comparable impact of peer assessment and self-assessment on academic performance has been shown in the literature (Double et al., 2020, Yan et al., 2022). To potentially reinforce its impact, self-assessment can be formally integrated in any peer assessment model. More information about self-assessment can be found in Chapter 3.2 in this Handbook.

While traditional PA offers significant benefits, the challenges around engagement, mark reliability and feedback quality have led to the development of more advanced methodologies. The 360PA and IPAC approaches, described in sections 3 and 4, directly address many of these limitations.

# 3 The 360PA assessment method (PA of a product and feedback)

## *3.1 Motivation*

Despite the general benefits of the traditional PA for students, its practical implementation presents various challenges, as discussed above. In general terms, traditional PA has two stages: in stage 1 the students submit their work, and in stage 2 the students assess the work of one or more of their peers. The specific implementation will vary depending on practitioner's choices, but in most of the cases the students' final mark comes exclusively from the quality of the work (the product) that they submitted in stage 1, as recorded in the review by Yan et al. (2022). Despite the strong benefits of engaging with the PA part of the process (stage 2), many students perceive this stage as constituting significant extra work with limited tangible

benefit, leading to low levels of buy-in and engagement with this stage. This compromises the validity of grades and quality of the feedback. However, making students accountable and including the assessment of the quality of peer feedback is shown to improve the engagement of the students and the quality of the feedback and peer score (Camarata & Slieman, 2020; Patchan et al., 2018). This is formally done for example in the 360-degree PA (360PA) methodology developed at University College Londen (UCL), Faculty of Engineering, in collaboration with the UCL Institute of Education (Garcia-Souto et al., 2017). Since its introduction, the method has been implemented across a range of engineering activities and has continued to operate successfully improving student engagement and quality of feedback.

### *3.2 What is 360PA?*

The 360PA method extends the traditional PA and follows the process outlined in Fig. 3.2.1. It encourages students to engage with the peer review process and to produce meaningful evaluations, awarding marks based on the quality and accuracy of the feedback that they provide. Therefore, it constitutes a PA of both the submitted product and the feedback generated by the students.

In the 360PA method students first submit a piece of work, i.e., a product (stage 1). Next, they assess a selection of their peers' submissions (stage 2), typically using a structured rubric that defines the criteria against which feedback should be provided, helping ensure consistency and quality across reviewers. Afterwards, they review and evaluate the feedback they received based on tutor-provided criteria (stage 3). Tutors intervene if students highlight inaccuracies or issues when evaluating feedback received, ensuring that moderation is targeted and efficient.

Students' final marks reflect both the quality of the product they first submitted, and the feedback they provided, with the balance between these two elements representing a key decision for the practitioner. Some educators prefer to place greater emphasis on the product (submitted in stage 1) while still acknowledging the effort in stage 2, for example using a 70-30% split. Alternatively, the PA activity can also be designed to focus exclusively on the critical evaluation of a peer's work and the construction of professional, relevant feedback, with all marks allocated to stage 2, as illustrated in example 1 in Section 5 of this chapter.

### *3.3 Benefits of the 360PA methodology*

The 360PA method builds on the recognised benefits of the traditional PA approach outlined in section 2.1, while addressing many of its limitations. The benefits described below are drawn from our experience of implementing this methodology at UCL (Garcia-Souto et al., 2017) and are consistent with broader principles of effective PA design, particularly the importance of structured processes and iterative feedback cycles (Adachi et al., 2018; Fleckney et al., 2025).

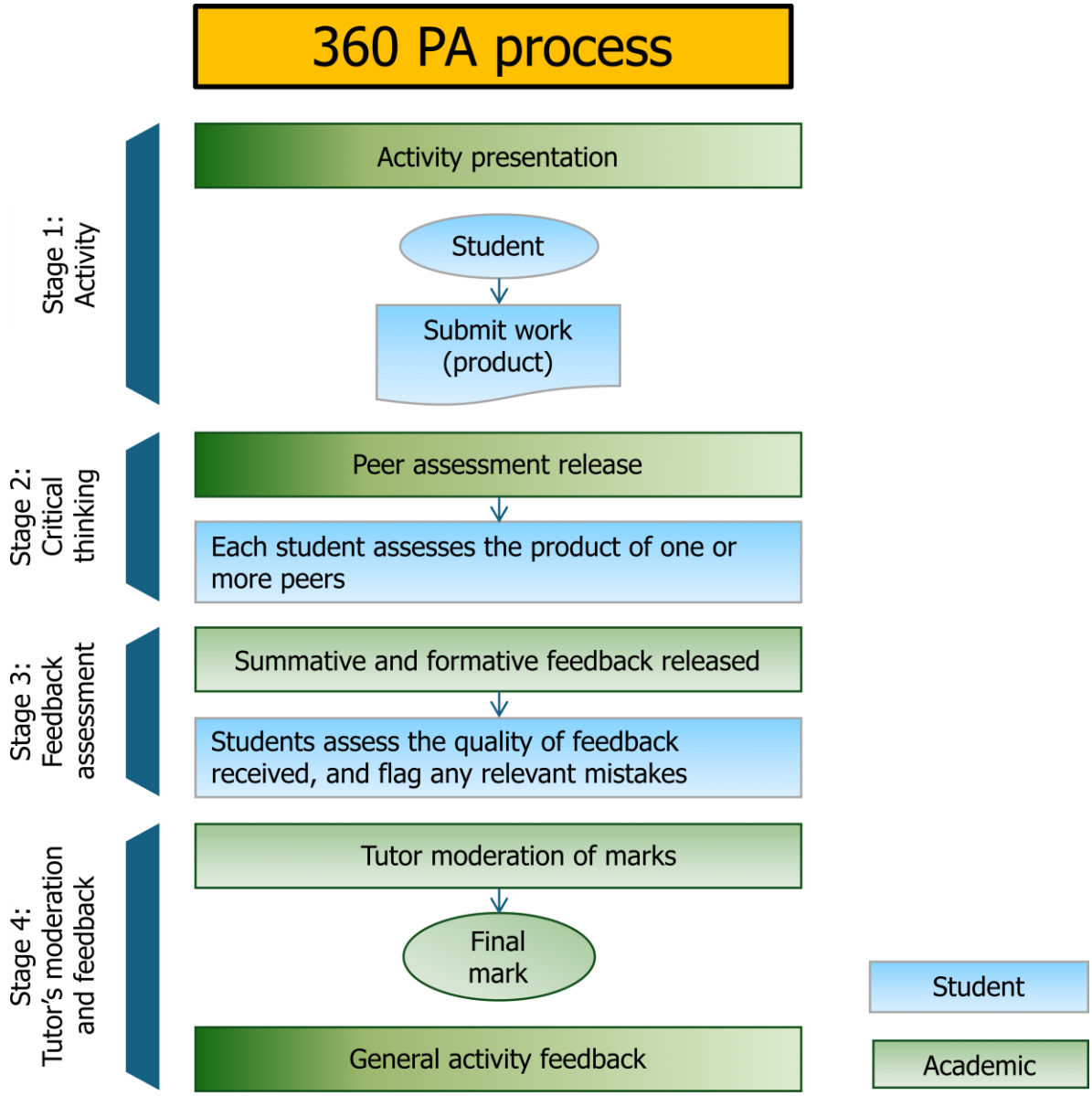


*Figure 3.2.1: 360 degrees PA methodology (360PA) developed at UCL, © 2018 Pilar Garcia-Souto, used with permission, no further use allowed.*

**Increased engagement with the peer review process**

The 360PA methodology embeds incentives such as marks for active participation, motivating students to complete the PA stage, and addressing a major difficulty observed in traditional PA, where many students fail to complete their reviews, thus disrupting the PA process.

**Increase of the quality of the feedback**

Similarly, students are motivated to provide high-quality feedback in their peer reviews, as this directly impacts the grade they receive. This improvement has been

reported by staff as well as by students, who now perceive the feedback they receive as more useful, with fewer instances of disagreement. Providing students with clear standards and criteria to guide the review process supports greater consistency and enhances the quality of feedback (Adachi et al., 2018).

**Greater engagement with received feedback**

Feedback only benefits learning when students actively read and reflect on it, which is not always the case. The 360PA model requires students to evaluate the feedback they receive, thereby, ensuring engagement and encouraging careful consideration of how it applies to their own work.

**A standard process for raising concerns**

The method embeds an expectation and formal mechanism for reporting incorrect or inappropriate feedback, which triggers tutor moderation. This reduces student anxiety and enhances trust in the marks and feedback received, addressing a key limitation of traditional PA. Notably, significantly fewer issues are reported under the 360PA model.

**Further self-regulation**

As students assess the quality and accuracy of the feedback they receive (numerical scores and written comments), they are required to reflect on how this feedback relates to their work and how to act on suggested improvements. This also helps them to develop a clearer understanding of what constitutes effective feedback.

## 4 The IPAC assessment method

### *4.1 Motivation*

One specific application of PA broadly used in higher education, and in engineering in particular, is the PA within teamwork. In this case, PA is implemented to mark and/or provide feedback regarding member contributions in learning scenarios where students work in teams towards a set objective. This Individual PA of Contribution to group work (IPAC) method (Garcia-Souto, 2019) reflects a broad pedagogical shift towards active learning, student agency, and teamwork.

### *4.2 What is the IPAC methodology?*

The conceptual implementation of IPAC is simple (Fig. 3.2.2). Students work together in a team and complete a tangible outcome defined and assessed by the tutor, e.g. a presentation, a report, an engineering design, etc., leading to a shared 'team mark'. The students then assess themselves and their peers, considering the level of contribution and professional competencies with students obtaining an IPAC value after tutor moderation. Both scores are then combined such that each student receives an individual final mark based on the overall tutor-assessed team achievement and their individual participation as perceived and assessed by their peers. Garcia-Souto et al. (2019) and Yang et al. (2022) describe several modalities through which the IPAC methodology can be implemented, while Thite et al. (2024) reviews and proposes relevant rubrics.

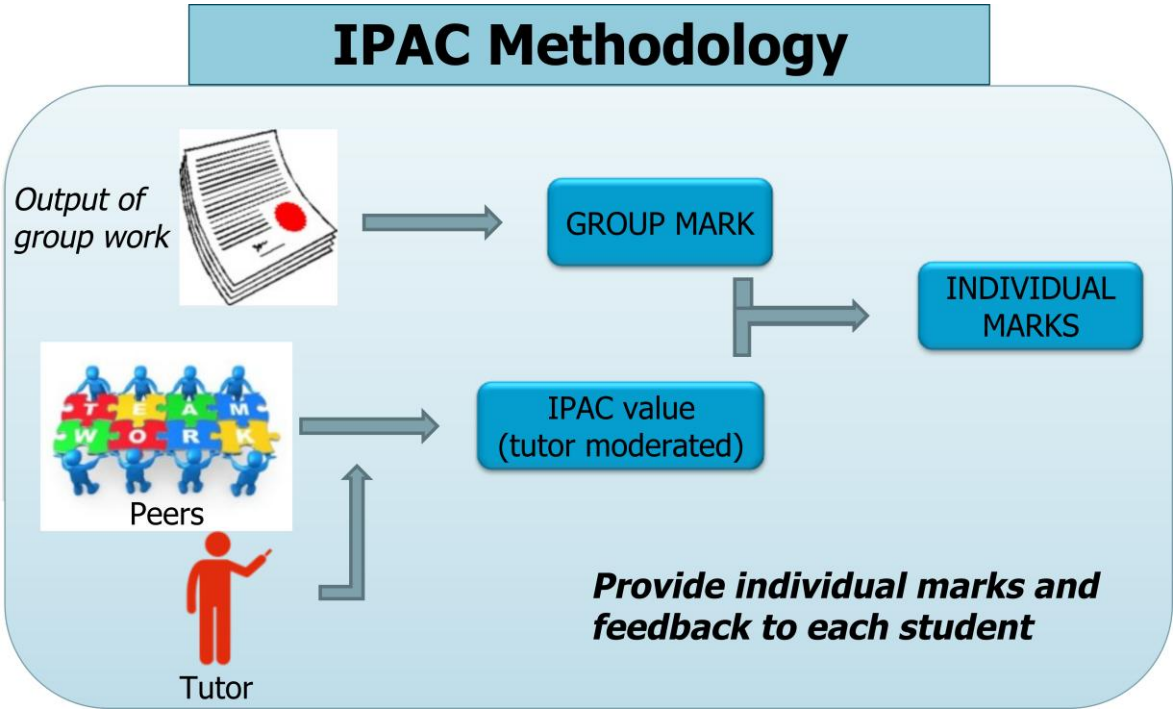


*Figure 3.2.2: IPAC methodology © 2018 Pilar Garcia-Souto, used with permission, no further reuse allowed.*

### *4.3 Benefits of the IPAC methodology*

There are numerous benefits associated with the IPAC methodology that align with those of the traditional PA. In addition, it addresses and mitigates many of the significant challenges commonly encountered in the management and assessment of teamwork, as shown by the practice at UCL Engineering (Garcia-Souto et al., 2024a) and other institutions (Garcia-Souto et al., 2024b). Some of these benefits are:

- Fairer evaluation of individuals, accounting for their contribution to the team using a formal and standard approach;
- Greater engagement and improved professional behaviour following accountability to peers;
- Valuable check point for staff and students, particularly useful mid-project, even for formative purposes;
- Development of feedback literacy and transferable competences such as teamwork and self-regulation.

The flexibility of the IPAC methodology is another distinct advantage, allowing educators to tailor its implementation to suit the specific learning objectives of an activity and the developmental stage of their students. For example, it can be used in earlier years with short projects to assess level of contribution and improve engagement; or in later years with more substantial projects to assess professional competencies once students have developed more feedback literacy (see example 2 in Section 5 of this chapter). The IPAC methodology is generally welcomed by students

(Grammenos et al., 2019) and significantly reduces the number of students' complaints about free riding students and about their own marks. Nevertheless, some queries about low IPAC scores usually arise, leading to more educational staff-student discussions. Furthermore, the students' IPAC scores obtained in prior activities can be used to inform the grouping strategy in subsequent activities (Garcia-Souto, 2025). The IPAC methodology should be supported by training for students in good teamwork competencies and professional behaviour. Furthermore, staff should provide moderation when required.

### *4.4 Tools for the IPAC methodology*

Implementation of the IPAC methodology without an appropriate system is logistically challenging and very time-consuming. There are several tools to implement this methodology e.g., the IPAC system developed at UCL (IPAC, n.d.), WebPA developed at Loughborough University (WebPA, n.d.) and CATME (Purdue University, n.d.) in the US.

## 5 Competencies associated with implementation and practical examples

Implementing PA, whether for individual products or team-based processes, can support the development of students' transferable competencies and skills such as feedback literacy, teamwork (see also Chapter 2.6), interpersonal communication, collaborative engagement, professional communication, self-reflection, and self-regulation (Chapter 2.13).

By engaging with feedback as a dialogue, where both receiving and giving occur in iterative cycles (see example 1), students develop critical judgement and self-reflection (Adrill, 2025). In developing feedback literacy (See also Chapters 2.11 and 2.12), you as an educator play a key role in guiding students and scaffolding the process through effective learning design (Carless & Boud, 2018).

When engaging in PA, students must move beyond technical critiques and address the social dimension of learning, where communication and interpersonal relations (Chapter 2.10) are essential. Through reviewing and providing feedback, they develop awareness of expectations, quality and standards, alongside perspective taking (Cruz et al., 2013). Presentation skills (see also Chapter 2.7), including verbal communication, audience interaction, and time management, can also be improved through peer assessment (Alba-Flores et al., 2019). Your role as an educator remains crucial in designing opportunities for students to practise reviewing, writing, listening, and speaking while enabling perspective taking.

As noted in this handbook, learning in engineering is also often a group endeavour. In teamwork-based activities, the inclusion of PA of each individual's contribution, such as the IPAC methodology offers (see example 2), provides a structured framework for professional communication and the development of competences related to team processes. Students may need to address uneven contributions or breakdowns in collaboration, fostering accountability and team spirit, and supporting a community of

practice, as shown in example 2 and Oakley et al. (2004). This supports students in navigating team dynamics in a safe manner by recognizing diverse contributions and maintaining a shared commitment to team goals.

Finally, PA generally encourages self-reflection through iterative assessment and feedback loops. In preparing to give feedback, students identify gaps in a peer's work, compare this with their own and adjust their learning accordingly (Ortega-Ruipérez & Correa-Gorospe, 2024; Yan et al., 2022).

*Example 1. Use of 360PA in the final year to improve feedback literacy and individual research products*

*The 360PA method has been implemented for over a decade in the Research Skills module taken by all undergraduate students in the Department of Medical Physics and Biomedical Engineering at UCL. This module prepares students to plan, execute, and communicate their individual capstone research project.*

*The primary aim of embedding 360PA is to support the production of high-quality communication outputs for final assessment, including (1) an oral presentation; (2) a research poster; and (3) a selected section of the written report. For each component, students submit a draft that undergoes the 360PA process. Summative marks for the 360PA activity are awarded solely on the feedback they provide as assessed by peers based on tutor-provided criteria that include quality and usefulness of the feedback. Students then use this feedback to refine their work and prepare the final submission that is assessed by staff as part of their research project.*

*The implementation of the 360PA method has demonstrated several significant benefits in the context of the research skills module:*

- Earlier engagement and improved preparation. *"Pushes" students to produce drafts in advance, reducing last-minute work and enabling reflection and refinement;*
- Consistent, meaningful, and timely feedback for all. *All students receive similar and prompt feedback following the scheduled peer assessment activity, reducing variability arising from differences in supervisory input;*
- More focused supervisory workload. *Centralising communication-related feedback frees supervisors to concentrate on higher-level technical guidance;*
- Peer benchmarking. *Reviewing peers' work helps students better understand expected standards and situate their own performance.*

*Example 2. Using IPAC to support accountability, teamwork, and leadership development in a multidisciplinary MEng design project*

*The final year multidisciplinary MEng design project at Swansea University is a substantial 40-credit project involving Mechanical, Electrical, and Materials Engineering students working together in teams from October to May to identify, develop, prototype, and evaluate an engineering solution to a real-world problem.*

*Students work collaboratively across the project while also leading specific work packages or technical areas.*

*The IPAC assessment methodology is used twice during the project and contributes 25% of the overall module mark. The first IPAC activity is formative and takes place following a major project milestone, allowing students to reflect on teamwork, communication, engagement, and leadership within the group. The second IPAC activity is summative and takes place at the end of the project. The summative IPAC score is used to differentiate individual student marks within the group project, allowing the final module mark to better reflect individual contribution and professional engagement within the team. The same IPAC questionnaire is used on both occasions, featuring questions related to the stated aims.*

*Through the IPAC process, students reflect upon and score both their own contribution and that of their peers, while also receiving and providing constructive feedback. In many cases, the feedback is positive and reassuring, helping to build confidence, particularly among quieter or less confident students. In other cases, the feedback identifies areas where improvement is required, and students are encouraged — with support from educators where necessary — to interpret and respond to the feedback.*

*The repeated use of IPAC throughout the project promotes accountability, engagement, and reflective professional practice within the team.*

## 6 Recommendations for implementation

We have shown that PA, in its various modalities, offers significant benefits to engineering education. It is particularly useful when used to foster progressive learning across a programme, such that students develop feedback literacy (giving and receiving feedback), teamwork skills, and other competencies like communication and self-regulation. In this section we give you guidance and advice to implement PA in either of the two major modalities, i.e., (1) assessing a product and the quality of the feedback produced by students (a mixture of the traditional and 360 degrees PA modalities); and (2) assessing the contribution of peers within a team project. Tutor moderation should always remain part of the process to ensure students' acceptance.

### *6.1 Recommendations for implementation of PA of product and feedback quality*

In traditional PA, when students assess a product, we recommend you use the 360PA method, presented and discussed in section 3. This approach encourages students to engage meaningfully with the PA part of the process, creating higher quality feedback for their peers, which in turn is recognised through higher marks. You should also consider what exactly your students should assess, since the benefits of assessing specific points and the students' capability to assess these will differ. We recommend the assessment focuses on the elements outlined below, with an intended progressive development of relevant competences:

*The structure and effectiveness of communication.* Students can assess this from an 'expert' perspective since they typically represent the target audience for these pieces and can judge if they are presented in a way they can understand. Students will feel capable to give an opinion on this, mitigating a challenge in traditional PA.

*Transferrable technical understanding.* This should refer to principles and reasoning skills that are applicable across a wide range of contexts, rather than knowledge that is highly specific to a particular project or field. Examples include formulating a clear research question, ensuring that results and conclusions address that question, presenting graphs and tables that successfully aid the reader, and critically evaluating whether the narrative of discussion is coherent and supported by the evidence, without requiring students to judge field-specific accuracy of the data itself. By focusing on these aspects, you enable students to progressively build critical, analytical, and evaluative competences that are valuable in any scientific or engineering context. You also help to prevent a major challenge in traditional PA, namely that students are often sceptical of their own ability and that of their peers to critique work in a specialised field, since their knowledge is limited.

### *6.2 Recommendations for implementation of PA within teamwork*

You can implement the IPAC methodology explained in section 4 in various ways, based on the specific activity, its learning objectives, and the developmental stage of your students. However, certain foundational recommendations can enhance the effectiveness and consistency of the IPAC assessment process, as listed and discussed by Garcia-Souto et al. (2019). Some of these guidelines are:

- *Must.* Inform students from the outset that the IPAC methodology will be used, along with clear expectations regarding professional behaviour, and that tutor moderations will apply.
- *Valuable.* Ask students to provide feedback that justifies the scores given — this provides valuable insights for staff on team dynamics.
- *Valuable.* Make the IPAC assessment more valuable to students by giving each individual their anonymized feedback (summative and formative assessment).
- *Valuable.* Run an IPAC assessment midway through a project for formative purposes, particularly in longer projects where early feedback can support team development.

We observe that student accountability achieved via the use of IPAC is an effective way of promoting student engagement and professionalism within team projects of any kind. It also provides practitioners with a clear view of team dynamics and a formal record that can support timely intervention when necessary. The development of skills via the IPAC methodology is more impactful in longer projects where students have more time to interact with the other team members. It is also enhanced over the years as students gain experience and encounter more extensive and sophisticated peer feedback in longer projects at later stages of their degree.

### 6.3 Generative artificial intelligence considerations

GenAI has introduced significant opportunities and challenges in higher education, and its transformative nature is likely to drive further changes as it continues to develop. A full discussion of these implications, including those for PA, is beyond the scope of this chapter. However, several key considerations are worth noting.

There is evidence that, for some students, feedback co-generated with generative AI (GenAI) may be perceived as more effective than peer feedback alone (Noel et al., 2025). In addition, long-standing challenges in PA, such as consistency and fairness in marking, may be addressed more efficiently through AI-assisted assessor training and moderation processes (Topping et al., 2025).

At the same time, GenAI tools have made it more difficult to maintain the integrity of several established assessment formats, creating a need for adaptation of these formats (Francis et al., 2025). PA is no exception, and practitioners must reflect on how it is used in this evolving context. One approach is to ask students to critically evaluate GenAI outputs, particularly where these outputs fall short in accuracy or quality. For example, a comparative case study found that GenAI often awarded higher grades than human assessors and sometimes produced contradictory or irrelevant feedback (Usher, 2025). Encouraging students to critically evaluate such inconsistencies can be a valuable component of PA. However, as prompting practices improve and models evolve, this approach requires regular review.

A longer-term response may be to strengthen the focus on competency-based education and iterative forms of assessments (Francis et al., 2025). Iterative engagement, alongside the development of feedback literacy (provision and receipt), embeds local context within the assessment. This creates a requirement for reflection and revision that cannot be met through over-reliance on GenAI alone.

## 7 Summary

We leave you with the following take-home messages. You can use PA to support student learning and self-confidence especially thorough progressive implementation in the programme, developing feedback literacy (giving and receiving feedback), communication competencies, self-assessment practices, and teamwork competences. We suggest that if you implement PA of a product (a piece of work), you should also include the PA of the quality of feedback, i.e., similar to the 360PA, since this will encourage students' participation and increase quality of the feedback. In teamwork activities, we suggest you use the IPAC methodology that makes students accountable to peers and addresses some of the challenges when running and assessing teamwork. When using PA, you need to introduce student training, incorporate tutor moderation, and use a system for implementation. PA remains valuable even in the GenAI era, since it supports students' development. GenAI presents opportunities but also challenges, particularly for assessment integrity, that need to be considered.

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## AI statement

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