Stage 4: Getting over the line

The key elements of this stage are the delivery by the student teams of the finished project(s), and the assessment of their performance as a team and individually.

STEP 1	Submit completed team task(s)
STEP 2	Peer assess individual performance
STEP 3	Validate peer assessment
STEP 4	Calculate marks

Stage 4, Step 1: Submit completed team task(s)

There is not much for you to do here unless the deliverable contains pieces of work completed by individuals that are to be assessed individually. In this case, you will need to develop a form that students can use to identify their input, and of course your assessment criteria, made available at the start of semester, should state the breakdown between team and individual marks.

Stage 4, Step 2: Peer assess individual performance

i) Overview

Each deliverable should be accompanied by a Peer Evaluation Form (Appendix D2) or the use of an online system such as GPA to manage this process. There are many who argue against the direct application of a peer assessment factor to a student's marks[11], and they have done so in the scholarly literature, but if the process is done rigorously with checks and balances at all stages (Stage 4, Step 3), then it is a very good tool for ensuring that individuals receive the mark that they warrant (Stage 4, Step 4).

The process described below is the one that I have used for two very large classes (N=1000) with 50-60% team-based assessment over the past decade. Each year, I have somewhere between two and five complaints, and of those complaints, perhaps one requires an independent investigation[12]. For the other students, the rigour that I have applied to agreeing their peer assessment factor (PAF) leaves no room for argument.

> *We used to get teams to fill out a single form agreeing weightings between individual members. All members of the team had to sign the form before it was submitted. However, we received complaints from students reluctant to openly penalise friends and people that they had to continue to work with. The anonymous version has completely eradicated this complaint.*

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[11] Many propose a scaling factor such as Kilic and Cakan (2006) for example, to reduce the impact of the PAF. The formula for this is: Scaled PAF = PAF – Scaling Factor x (PAF -1). They recommend a scaling factor between 0.5 and 0.3 depending on the desired distribution of the students' marks. I have never used a scaling factor and apply the PAF directly to the mark achieved by the team to calculate the individual's mark.

[12] For one in approximately 2000 students (i.e. 0.05%), I will conduct an independent investigation. They will claim that their team did not give full recognition to the work that they did for the assessment piece. This can happen due to personality clashes, conflict, or simply ignorance on the part of the team. So, I ask another academic to conduct brief interviews with all the team members and examine any available evidence (e.g. chat room records, design drawings etc.). In about 50% of the cases, I find that the student has been unfairly treated and amend their PAF accordingly.

ii) Calculating a Peer Assessment Factor (PAF)

All students in the team are asked to split 100 points between the members of their team and themselves[13] depending on various criteria. This can be undertaken for a single criterion (e.g. overall performance) or many (e.g. communication, effort, punctuality to meetings and with submission, technical input etc.). I use the following criteria as these have been developed over several years in collaboration with students.

- Teamwork and Leadership = attendance and participation at meetings, email/ SMS/ discussion board response, ability to work with and share findings with team; ability to lead through collaboration

- Contribution to overall project = including: scoping, research, design, testing, analysis, reporting, editing, final submission production. *Don't forget to reward up-front work such as idea generation and literature research that may not have been used in the long run but that underpinned final work;*

- Timeliness = ability to meet agreed contribution times; and

- Performance = standard and completeness of work.

The process is undertaken anonymously in that team members do not see others' evaluations.

The PAF is calculated by the sum of all scores attributed to a student ($\sum Scores_{\text{Given to student}}$) divided by the number of criteria multiplied by 100 (N_{Criteria} x 100):

$$PAF_{Student} = \frac{\sum Scores_{\text{Given to student}}}{N_{\text{Criteria}} x 100}$$

The sum is divided by 100 as this is the mark achievable should everyone get an average mark (e.g. with five students in a team, an average student would receive 20 points from each student including themselves – this would total 100). The formula assumes all students have completed the assessment. If a student has not completed the assessment then the equation becomes:

$$PAF_{Student} = \frac{\sum Scores_{\text{Given to student}}}{N_{\text{Criteria}} x 100} \; x \; \frac{N_{\text{Students in team}}}{N_{\text{Students completing peer assessment}}}$$

GPA does these calculations and corrections automatically.

iii) What does the PAF mean?

A student who pulls their own weight and undertakes a similar amount of work to everyone else, should get a PAF of 0.99-1.01. Students who lead the team and put in extra work, may get a PAF above 1.0. Table 13 shows the various levels of PAFs and possible interpretations.

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[13] You can ask students to assess the others in their team and not include self-assessment. I am not in favour of this as this does not allow students to develop an appreciation of their own input against others but it does remove the opportunity for students to try and give themselves higher marks than are deserved.

Table 13:   Interpreting PAFs

PAF	Interpretation	Comments
>1.3	Alarm! Team failure.	Some team members are not participating and/ or this student is doing all the work. Either way, learning objectives are probably not being achieved by all the team. You need to find out what is causing this and put something in place to ensure all the team passes the course.
1.15-1.3	Super Leader/ Dominator?	As above, scores this high indicate a team imbalance that should be addressed. You may need to assign tasks to get all members active.
1.03-1.15	Leader	A leader who is putting in some extra effort. Usually no cause for alarm.
0.98 - 1.02	Good teamwork	A score in this range indicates that the student is pulling their weight. Scores under 1.0 usually are caused by rewarding a leader with additional points thus causing others to get less than an average amount of points. And usually they are not cause for alarm.
0.95-0.97	Rescuable social loafer	This student is underperforming, may be a little quiet in meetings, or perhaps has not been giving the team their full attention. Letting them know often is all that is necessary to bring them back to unity.
0.85-0.94	Social Loafer	Any PAF below 0.94 is unacceptable. Talk to the team (and the student), and find out what is going wrong.
<0.85	Alarm! Individual failure!	This student is in grave danger of failing the course. Much work/ trust is required for them to be accepted back into the team.

The PAF may need to be capped as giving potentially large increases in marks can lead to final course marks greater than 100% if there is no other assessment. I use a cap of 10% as the marks for my courses are project-based which means that greater 'bonuses' can cause marks to be elevated beyond that commensurate with the individual student's achievement and learning. This cap is communicated at the beginning of the course and it is documented in the electronic course profile.

iv) Calculating a Self-Assessment over Peer Assessment (SAPA) factor and what does it mean

The SAPA is the score that the student has given themselves (Score$_{Self}$) across all criteria divided by the average of the scores that all the other students have given them ($\sum$Score$_{Others}$/(N$_{Team}$-1)).

$$SAPA = \frac{Score_{Self}}{\sum Score_{Others} / (N_{Team} - 1)}$$

A SAPA of over 1.0 indicates that the student believes they do more in the team than their teammates think; a SAPA less than 1.0 indicates that the student undervalues their contribution.

SAPAs are useful to feedback during mentor meetings and they are also useful for moderation purposes as they can show where a student may have tried to unfairly disadvantage themselves. Similarly, the scores given by a student to another, calculated as per the SAPA:

$$Ratio_{\text{Individual over average}} = \frac{Score_{\text{Assigned individual by student A}}}{\sum Score_{\text{All other team members}} / (N_{Team} - 1)}$$

are very useful when it comes to moderation (see next step) and identifying possible conflicts within the team.

GPA calculates both the SAPA and the Ratio.

Stage 4, Step 3: Validate the PAF

i) Formative feedback

As with any pedagogic innovation, especially one attached to summative assessment tasks, students should be given the opportunity to practice the task so they understand how to do it, and how it impacts on their grade before it counts. Therefore, we have included the completion and feedback of the Peer Assessment Factor in mentor meetings (see Stage 3, Step 2). It gives the students a chance to improve on their team input and develop their skills.

ii) Moderating marks

I am often asked about the possibility of manipulating the PAF system in the first lecture that I introduce the process; I explain how easy it is to spot this and that such marks are not used in the final calcuation. My course profiles also reflect that I will moderate all peer assessment and that I will provide a level of moderation in terms of how any marks are used. This serves to increase confidence in the PAF process and may also provide a warning to the minority who are considering such an action.

There are always a couple of students who intentionally use the PAF system to skew results in their favour, or to penalise other team members with whom they have disagreed. This is picked up by looking at their SAPA and the Ratio as detailed in the previous step.

GPA not only calculates these ratios but it will flag those SAPAs and Ratios that are outside a certain range from the average making it very easy to see where this may have been done.

It is recommended that a limit be agreed within the teaching team about how far from the average (1.0) the SAPA and ratios should be allowed to deviate before scores are removed from the PAF calculations. Commonly these limits might be set at 10% or 15% (i.e. for a 10% limit, all SAPAs and ratios greater than 1.10 and less than 0.90 would be highlighted in GPA).

The student comments can be used as further justification of a student using the system to skew PAFs. If you identify scores that do not reflect the rest of the team's marks, and that are not supported by comments or by teaching team observations, the scores should be removed from the PAF calculation.

Table 14, which is a representation of the results screen of GPA, shows an assessment where all scores assigned by the students are within a 20% limit. There is no need to correct any of the scores if the skew limit is 20%, but a skew limit of 15% would mean that scores shown highlighted with dark shading (purple) would need to be removed from the calculation by the ratios shown highlighted with light shading (orange).

Table 14: Sample GPA output showing SAPAs and Ratios

	PAF	SAPA	Score assigned by student					Ratio				
			1	2	3	4	5	1	2	3	4	5
Student 1	0.93	1.10	20	17	20	16	20	1.10	0.89	1.10	0.83	1.10
Student 2	1.25	1.00	25	25	25	25	25	1.00	1.00	1.00	1.00	1.00
Student 3	0.78	0.95	15	16	15	17	15	0.95	1.03	0.95	1.11	0.95
Student 4	1.10	1.18	20	25	20	25	20	0.89	1.18	0.89	1.18	0.89
Student 5	0.94	1.08	20	17	20	17	20	1.08	0.88	1.08	0.88	1.08

GPA will automatically correct PAFs and SAPAs, but for completeness, the formula to correct a PAF is:

$$\text{Corrected PAF}_{Student} = \frac{\sum (Scores_{\text{Given to student}} - \text{Skewed score})}{N_{Criteria} \, x100} \, x \, \frac{N_{\text{Students in team}}}{N_{\text{Students used to calculate peer assessment factor}}}$$

So for Student 1 in Table 2, their new PAF would be:

$$\text{Corrected PAF}_{Student} = \frac{20+17+20+20}{1x100} \, x \, \frac{5}{4} = 0.96$$

This change from 0.93 to 0.96 is significant and shows how important the moderation process is. It does take time but as per my opening words, the PETS process is not a quick fix.

iii) Agreeing with the teaching team

Our university policy provides for students' work to be evaluated by an academic rather than a peer. The first step towards fulfilling this requirement is to correct for bias as above. The next step is to agree PAFs with your teaching team. Often mentors and tutors can provide supporting knowledge for unusual PAFs. It is also necessary in the case of unusual PAFs to read the justifications that the students gave for their division of points. This deliberation ensures that contested PAFs can be justified.

> *I get my tutors to fill out a form before they leave to study for their own exams. The form simply asks if each student was a) a leader, or b) a loafer. If the latter I ask for a quick comment. This extra piece of information is very helpful when looking at low PAFs that cause students to fail. If the tutor disagrees with the PAF, I will call them in for a discussion and thus ensure that the students final PAF is representative of their efforts.*

Stage 4, Step 4: Calculate marks

The student's final mark is calculated as shown and will depend on the elements chosen in Stage 1, Step 1. Each part should carry weightings as determined by learning objectives and the weighting of assessments in the course (e.g. 40% team project, 20% team skills, and 40% other assessment).

$$\sum_{1}^{n} (Team\ project\ mark \times PAF + Individual\ Mark)$$

$$+ TAM \left(= Team\ dimension\ score \times \frac{Individual\ mentor\ meeting\ score}{Maximum\ mentor\ meeting\ score} \right)$$

$$+ Any\ other\ assessment$$

where:

- *n* is the number of team projects;
- the *team project mark* is that given for the final deliverable(s);
- the *PAF* (Peer Assessment Factor) is calculated as per Stage 4, Step 2;
- the *individual mark* is that given any section specified to be undertaken by the student or pair of students (see Stage 1, Step 2); and
- the *TAM* (Team Assessment Mark) is calculated as shown. If used, this mark can be formed from mentor meeting scores or the overall team dimension score (see Tables 10 and 11);
- the *team dimension score* is that given to the team by the mentor based on their communication, conflict resolution and overall success; and
- the *individual mentor meeting score* is that achieved by the individual during mentor meetings. It may be transformed into a factor which is applied to the team dimension score by using the maximum possible mentor meeting score to calculate the TAM as shown. The maximum possible mentor meeting score is 15 x the number of meetings if the format specified in Table 10 is used.