Stage 1: Setting it up

The purpose of this stage is to ensure that resources are ready before semester begins.

STEP 1	Define your learning objectives and map against graduate attributes
STEP 2	Design assessable team project(s) which deliver these objectives
STEP 3	Recruit and brief teaching team
STEP 4	Allocate students to teams
STEP 5	Prepare resources

Stage 1, Step 1: Define your learning objectives

Learning objectives are simply defined as what you want the student to know, to achieve, to be capable of, and/ or to be able to do when they have completed the course. Many higher education providers require learning objectives to be mapped against graduate attributes to ensure students not only have knowledge and understanding of the discipline or field of study, but also know how to use knowledge in the field.

Learning activities must therefore be designed to allow students to develop skills contextually within their discipline.

The example shown in Figure 1 is for a first-year compulsory engineering design course for which 60% of assessment comes from a team project. Although only one of the eight learning objectives specifically addresses teamwork, this is mapped across several graduate attributes.

Figure 1: Example Learning Objectives and Graduate Attribute Mapping

Learning Objectives (Abridged)
1. Engineering Design: demonstrate ability to approach a complex and realistic engineering design task through: a. clarification of the scope of the task; b. development of project requirements including data collection and analysis of previous relevant work, …
2. Information Management: locate, evaluate, use and cite information …
3. Communication: demonstrate …
4. Project Management: demonstrate …
5. Team Work: work effectively in an engineering team, identify the characteristics of effective team work and critically evaluate personal and peer contributions to team processes;
…

Graduate Attribute mapping (Abridged)	Learning Objectives
B2. The ability to interact effectively with others in order to work towards a common outcome.	4, 5, 7, 8
C3. The ability to generate ideas and adapt innovatively to changing environments.	1, 5, 7
E5. A knowledge of other cultures and times and an appreciation of cultural diversity.	1, 5, 6, 8

Stage 1, Step 2: Design assessable team project(s)

i) The project

A good team project is designed to increase knowledge and understanding of the discipline or field of study, encourage collaborative learning, and enhance team work skills. In addition, it should engage students in activities and learning that they actively enjoy.

The major facets that should be considered when designing a team project are outlined in Table 2.

Table 2: Design of Team Projects[3]

Facet	Reason
Sufficient depth and complexity to engage all students	Students must not have to fight for work – it is better if there is slightly more than the team can handle.
A variety of assessments (e.g. written document coupled with a poster or oral presentation)	This allows distributed leadership in part and thus each student must engage with the learning objectives of the course.
Sub-tasks that can be completed by an individual or pair, and that may attract an individual mark, but that require synthesis for inclusion in the final deliverable(s)	As above, this allows all students to lead a section, and requires engagement with learning material by the whole team.
A final activity or deliverable that requires sub-tasks and individual sections to be integrated, analysed, and discussed by the team	This facilitates collaborative learning and allows team work skills to be developed. Without this synthesis, the students are a group and not a team.
Milestones/ Schedule for mentor meetings	Milestones aid time management and can be used to monitor team progress and, if paired with mentor meetings and peer assessment, diagnose any dysfunction.
Hurdle assessment administered to the individual student (e.g. pass/ fail quizzes)	Hurdle assessment works well against social loafing in that it requires all students to engage with learning objectives.
Connection with the relevant industry and authenticity	Students are more engaged with authentic tasks that they can see have real world application.
An element of competitiveness	This aspect can add a degree of fun and increase engagement. It may be as simple as a final poster session with a prize for the best.

ii) Team size

I find it easier to set the size of the team when I have scoped out the project and what I want the students to do. However, generally I have found that:

- students feel that teams of seven or eight (or greater) are too large to manage in terms of task sharing, communication, and effective decision making;
- there appears to be no difference in the output and functionality of teams of one fewer than the average number specified (e.g. if the project is designed for six students, a team of five students will usually

[3] If you would like to see team projects that I have designed for engineering students, feel free to contact me l.kavanagh@uq.edu.au and I will be happy to explain further and/ or share resources.

perform just as well) as with a reduction in team membership comes a commensurate reduction in the amount of effort required to manage the team; and

- smaller teams of around three seem to work better in later years whereas teams of six work very well for first year courses.

Table 3 outlines other factors that should be considered when setting the team size. For completeness, I have included common methods of team formation in Appendix A.

Table 3: Factors Influencing Team Size (Adapted from FDTL, 2003)

Factor	Comment
Size of cohort	If the cohort is large, it can be tempting to increase the team size and thus reduce marking. However, as previously stated, we have found teams of seven or at most eight to be the practical limit for effective teams.
Complexity of task	The team must manage itself, its members, and the task. If the task is very complex then this may not leave time or energy for managing the team. However, mentoring (Stage 3, Step 2) and judicious design of the project (Stage 1, Step 2) can help the teams with this and thus lift this restriction.
Roles in teams	There may be roles that need to be performed. This can be particularly important in multi-disciplinary projects where it may be desirable to bring together a combination of skills/ experience. Team selection should still ensure a leader is present in each team (Stage 1, Step 4 or Stage 2, Step 3).
Team skills of members	One of the requirements for a successful team is that its members can work well together. An inexperienced team, working on a complex task, probably needs to be smaller rather than larger. However, mentoring (Stage 3, Step 2) is designed to minimise this restriction.
Ease of meeting	For the team to function it must be able to meet. It is usually harder to arrange a meeting for a large team than a small one. It is good to purposefully build some team time into the semester's schedule to partially ameliorate this restriction. Virtual meetings are possible but I've yet to see them used well.

Stage 1, Step 3: Recruit and brief your teaching team

i) General

Your teaching team must be on the same page as you when it comes to proactively ensuring that student teams are successful. I recommend that you work with people who have a similar pedagogical philosophy to you, and that you plan to catch up with them regularly throughout the semester to discuss problems and to get second opinions where necessary.

ii) Mentor models

In my experience, one of the most important aspects is to establish the type of mentoring that is to be offered to the students. Typically, mentors will offer guidance in matters of the team, technical aspects, and time management but the depth to which this guidance is offered needs to be agreed prior to semester beginning.

> *I have experienced differences of up to 10% in the final marks of student teams with different mentors, when the depth of mentoring to be offered has not been fully understood by my teaching team. Students with mentors who review their team's work before it is handed in and suggest methods of solution will often score higher than those with mentors who do not review work prior to submission and who adopt a model of encouraging the students come to the final decision based on discussion of options.*

The following models are offered and selection should be made on the maturity and specific requirements of the student cohort, and the assessment task.

- **Mentor as Parent:** The mentor leads the team's discussions, ensures tasks are being completed to the required standard, directs the team to information that the team may have overlooked, and reviews all work before it is submitted for grading.
- **Mentor as Devil's Advocate:** The mentor is integral to team discussions and acts to bring the team's focus to aspects that require resolution. They will not necessarily offer direct answers but rather encourage the team to arrive at a correct solution themselves. Aspects that the team has not considered will also be raised by the mentor.
- **Mentor as Expert Witness:** The team directs all meetings; only subjects raised by the team are discussed. The mentor answers questions directly and does not raise uncertainty.
- **Mentor as Polymorph:** The mentor takes on any of the above roles as required by the team.

The model of 'Mentor as Team Member' does not coalesce with good pedagogy and hence is not recommended here. In this model, the mentor becomes part of the team and aids students with their tasks, thus student learning objectives are less likely to be achieved by the students. This model may be more suited to postgraduate teams.

Use Table 4 with your teaching team to agree the type of mentoring to be offered and thus offer equity to students no matter the mentor.

Table 4: Mentoring (for Agreement)

Aspect	Level 1: Parent	Level 2: Devil's advocate	Level 3: Expert witness
Meetings			
Structure	Set by mentor	Mentor agrees with team	Set by team
Chair	Mentor	Team member	Team member
Technical details			
Missing information	Mentor supplies	Mentor leads discussions such that team discovers omission (or not)	No input by mentor unless directly asked
Incorrect information	Mentor identifies, corrects and explains	Mentor queries assumptions and outcomes	No input by mentor unless asked directly
Review of work	Mentor reviews work before submission	Mentor reviews only as requested by students	No review
Decisions	Mentor indicates best way to solution	Mentor discusses various options; team decides	Mentor can provide opinion if asked for
Management			
Team	In all cases, the mentor must ensure that the team remains functional. It is best to always teams the decision about whether to deal with any dysfunction at the mentor meeting or later by themselves (see Stage 2, Step 2)		
Time	Mentor to ensure that team is on time and will complete work	Mentor raises critical path issues but leaves team to decide time management	No input by mentor unless asked directly

Stage 1, Step 4: Allocate students to teams

Everyone has their own way to allocate teams, from completely random, to student choice, to teams based on students' availability for meetings. However, several problems may arise if teams are not purposefully formed. Some of the more obvious ones are:

- teams may be formed that have no leader – this becomes apparent when the first deliverable is due and has not been completed or is of poor quality. In such teams, no one takes the responsibility for getting the job done on time and in budget. If you query the students in leaderless teams about their failure, not a single student will meet your eye – most will look down at their feet;
- teams with too many ESL (English as a Second Language) students will be formed. This is problematic on two fronts:
  - domestic teams will support, teach, and encourage a single ESL student in their midst, as long as they are seen as making an effort, but any more than this and the issue of the language and cultural difference becomes too great especially when a report or oral presentation is due; and
  - students with a common language will often revert to this to communicate and this is not helpful for their future studies, nor does it guarantee that they have a good grasp of what is asked of them;
- teams without a good balance of males and females will be formed and whilst no bad thing may come of this, we have found that each gender has its own positive attributes, experiences, and requirements to bring to a team; and
- similarly, teams may not have a good balance of a particular skill, ability, or knowledge.

Therefore, the PETS process argues strongly for purposeful selection of teams as per Table 5.

Table 5: Considerations for Purposeful Team Selection

Aspect	Source	Comment
At least one leader	Looped from past courses (e.g. a high peer assessment factor), a leadership preference or result from a Team Roles Inventory.	Do not confuse achievement with leadership: high achievers are not necessarily good team workers and hence may not be good leaders.
A diversity of students in terms of cultural background and English as an additional language.	Institutional database	Where possible an even spread of students with English as an additional language is preferred.
A minimum of social loafers	Looped: a low peer assessment factor) or through conversation with previous lecturers.	I have found no reliable way to identify these students in their first semester at university. Low achievers have the potential to become valued members of teams if teamed with good leaders and therefore cannot be assumed to be social loafers
A gender balance	Institutional database	In courses such as engineering with a high percentage of male students, I ensure teams do not have a single female.

Aspect	Source	Comment
A balance of required knowledge and skills	Institutional database: courses studied and performance in these courses	This could be anything from ability to solve a partial differential equation, to disciplinary knowledge, to the ability to run a particular software program.
At least one friend	Solicited from at the beginning of semester	Placing students in pairs within teams can ease transition and ensure that there is at least one friendly face in an assigned team.[4]

There will be other aspects that you might need to include, but the above cover most contingencies.

If you have a large class or are changing teams throughout semester, you may like to use Team Anneal[5] to help you set up teams. It allows you to input your cohort and specify weighted team constraints.

> *Putting known social loafers together in a team can have excellent results. These students, freed from 'Type A' personalities, and given the opportunity to manage themselves, often develop leadership and teamwork skills. In assigning such teams, I allow for greater support and assign them a senior and experienced mentor to ensure that they are successful.*

A final word on naming teams. I strongly advocate against using numbers or an alphabetical sequence to distinguish teams as a team called Team 1 or Team A, may feel superior to a team called Team 6, or Team F. There are several different things that you can do instead:

- use colours;
- use a list of things that mean something within the course (e.g. a course about engineering materials has teams named Aluminium, Ceramic, Polymer etc.);
- use the name of the mentor (plus one of the above if the mentor has more than one team); or
- get the students to create their own team names the first time that they meet.

Stage 1, Step 5: Prepare resources

i) Documentation

Students will need a description of the project, and rubrics for any assessment to give them an idea of the standards that they should aim for. You might like to also consider the development of checklists for mentor meetings that will help students manage their time. These checklists could have:

- a list of tasks (generated by you or the students) with a space for '% complete' and comments;
- specific questions about team work and team progress; or
- sections that require individuals to respond.

ii) A virtual team space

Nearly all higher education institutions have web sites or some form of learning management system (LMS) for each course. The use of a course website can aid student team work in several ways:

- by providing teams with their own discussion board. An individual section is created for each team which hosts a discussion board, quick email access, and storage for working files;

[4] This practice is not without its disadvantages. Two groups of friends placed together in a team can quite easily become two cliques that do not communicate, cooperate, or collaborate.

[5] Contact eLIPSE https://www.elipse.uq.edu.au/ if you would like to use Team Anneal.

- by allowing teams to upload work requiring completion or editing for immediate access by other team members;
- by providing an easy way of communication between members; and
- by encouraging inter-group discussion through the ability to communicate electronically with other teams and through a general discussion board

and so, we strongly recommend that you facilitate an online team space.

iii) Teamwork training links

TEAMS101x, an EDx/ UQx MOOC, is freely available for use with your students. You may consider using it as an optional resource, something that you would like students to complete in whole or part, or something that you would like to embed as part of your course assessment. TEAMS101x is discussed in more detail in Stage 2, Step 4.

iv) Peer assessment

If you decide to use peer assessment in your course, the process including moderation should be set out in the course profile and communicated to students at the commencement of semester. This way, everyone is clear on the rules.

At a minimum you will need to advise students:

- when peer assessment will be used throughout semester;
- how peer assessment factors will be calculated;
- what the process for formative feedback and mentorship to help them improve their peer assessment factors will be;
- how peer assessment will be applied to team marks to create an individual summative mark;
- if there will be a cap on peer assessment factors;
- that scores will be confidential and that personal comments and scores will not be distributed;
- how you will ensure that the system isn't manipulated; and
- that the exercise is compulsory[6].

UQ supports Group Peer Assessment (GPA)[7] based on WebPA from The University of Loughborough. GPA has been designed so that it can be directly linked within Blackboard. Peer assessment is discussed in more detail in Stage 4, Step 2.

[6] In my electronic course profile, I have peer assessment (both formative and summative) as a Pass/ Fail activity. I do chase up incompletes before publishing grades however, as many students forget to do this assessment in the rush to end semester and begin studying for exams and it is unfair to fail them if this is all that is outstanding.

[7] If you would like to use GPA for summative or formative peer assessment, and team diagnosis, contact the UQ eLearning team on help@elearning.uq.edu.au or go to: https://elearning.uq.edu.au/guides/group-peer-assessment#1 .