

Making research-based education more successful: Improving critical thinking and engagement through well-directed peer assessment.

M.d. Pilar Garcia Souto (1), Hughes Gwyneth (2), Alan Cottenden (1), Adam Gibson (1)
UCL Medical Physics and Biomedical Engineering
Institute of Education

Universities increasingly recognize the need to train students using research-based education, using their discipline knowledge within group practical activities and to develop their critical thinking and teamwork skills to prepare them for their careers after graduation. With that in mind, students carry out substantial research-based projects many of which are in groups. These research-based projects may take the form of short labs, longer projects within a module during term time, or intensive one or two-week long full-time projects. In these cases, students may work together in disciplinary or multidisciplinary teams. In addition, some MEng students have a *group project* in the 3rd or 4th year of their degree that traditionally accounts for an equivalent of 2 taught modules.

Despite the well-accepted educational benefits of getting students to work in research-based activities and in teams, some issues can detract from the student experience, i.e. (i) critical thinking skills are needed but difficult to obtain; and (ii) dissatisfaction with the assessment of group work. This paper presents work aimed at overcoming these two issues.

Acquiring critical thinking is challenging and requires practice. Academic staff should implement long-term approaches to facilitate it. Introducing students to the critical analysis of someone else's work early on in their degree programme is an excellent way of developing critical skills. We have incorporated this via peer assessment activities (e.g. of a report, a set of calculations, etc.) that initiates students in reviewing and constructively criticizing peers' work. This stretches them because assessing a piece of work can be harder than completing the work itself, requiring a deeper understanding of the material and of alternative approaches. However, there are problems with traditional peer assessment which include (i) student disengagement leading to provide poor feedback to their peers, and (ii) students lacking confidence in their peers' marking skills, and therefore the mark obtained. We have developed and successfully run for the past 3 years a new method of peer assessment (360 degree peer assessment) that addresses these main two issues, providing a better experience for students, and a successful tool for academics to foster and support the students' critical thinking development.

In the simplest way of assessing group work, the project deliverable (e.g. a report, a prototype, a video) is assessed and all members of the team would receive the same mark regardless of their individual effort. This leads to various problems: (i) dysfunctional behaviour and uneven participation, with some students not contributing their share; and (ii) frustration of high-performing students who do not see their work as being recompensed. Often, the mark will include an individual component, but it is either based on a separate piece of work (not practical to mark neither encouraging students into the group spirit), or they are set by the tutor based on some criteria considering the attitude of the individual in the group with just partial information. Alternatively, various practitioners have started to include an element of individual peer assessed contribution (IPAC) to team work. With this approach, each student in the group receives a mark based both on the overall "group mark" but also on the individual's personal contribution towards the final product. This contribution is assessed directly by their peers, who are more aware of each team member's contribution, and encourages self-reflection. However, the IPAC factor needs to be carefully assessed and applied.

Following some initial work on the field, Pilar Garcia-Souto set up the *IPAC Consortium* whose ultimate goal is to *“Identify a method for peer assessment of individual contribution in group work, develop or obtain an appropriate tool to implement it, and disseminate these across UCL and beyond; showing how to make the practice successful and efficient.”* This consortium is currently formed by 40 members of staff from over 20 departments across UCL, and includes teaching staff in a range of fields (biomedical engineering, mechanical engineering, electrical engineering, physics, management, archaeology, architecture, culture, etc.), educational researchers (e.g. the Centre for Advanced Teaching and Learning, and the Institute of Education), and support staff (e.g. from the Digital Education and e-learning environment department). In this paper we will talk of our achievements so far and make recommendations for practitioners.

In summary, this paper explores how a well-thought peer assessment method can aid students to develop critical thinking skills and allow academics to address group work assessment concerns, such that Research-based Education is more successful. Our approach is scalable and should appeal to anyone interested on incorporating or updating research-based education activities, regardless if you are designing a small activity within a module or a full programme of studies.

Dr Pilar Garcia Souto

Pilar is a Senior Teaching Fellow at the UCL Medical Physics and Biomedical Engineering Department, and a Higher Education Academy Fellow since 2013. She combines scientific and educational research and teaching activities. Her main teaching-related interests are improving teaching quality and student experience across the board. Pilar has developed an improved peer assessment method (360PA), and leads a Consortium (IPAC- Individual Peer Assessed Contribution) with staff members across 20 departments, seeking to improve functionality and fairness within group work activities.