

## Moodle Workshop activities support peer review in Year 1 Science: present and future

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Compulsory Science Faculty (SCIF) courses in various programs of study serve to provide students with a sense of belonging within their own cohort and with their professional future, as well as developing a range of skills relevant to that future. These aims are supported through completion of assessment tasks, which in turn are supported through the use of the Moodle learning management system. Specifically, the Workshop tool facilitates the practice of peer review, one of the processes in the course not only relevant to professional practice in the sciences but supporting active learning among students through noticing aspects of a range of tasks in which they can improve. This paper describes the use of the Workshop tool in its original form as well as modifications developed at the University of New South Wales (UNSW) to support the use of peer review and assessment processes associated with a range of assessment tasks.

Keywords: Moodle, peer review, active learning, workshop, marking

### **Peer review in education and the profession**

The importance of peer review in professional life is beyond question. It pervades all areas of endeavour, within, as most relevant to the current study, the sciences, including research (presentation, publication, grant proposals), and teaching (peer observation). Its many and profound benefits in education in, for example, the biosciences, have been highlighted (Orsmond 2004). The use of peer review and assessment in an increasing range of settings is rapidly gaining acceptance at UNSW (<http://teaching.unsw.edu.au/peer-assessment>). Further, the use of technology to support learning and teaching, including peer review and assessment, in Engineering at UNSW has been described (Russell and Posada 2011). This paper describes use of the Workshop (peer review) activity in Moodle, as it exists or with modifications, to support and enhance learning activities and assessment tasks in selected Year 1 Science courses.

### **The context – Year 1 Science courses**

The Faculty of Science at The University of New South Wales offers a range of courses with a SCIF (Science Faculty) prefix. In Year 1, these courses are designed to support transition to university study by providing a sense of belonging but also cognitive challenge and development or enhancement of skills relevant to the professional scientist. Specifically, these courses, literally and/or thematically “professional perspective and practice” courses, are designed to:

- engender a sense of belonging or acculturation, among students, to strengthen identity within the cohort, but also with scientists and the professional community to which students aspire;
- develop or enhance soft skills, graduate attributes or capabilities (professional practice), and;
- develop perspectives on science, including the history and philosophy of science, the discipline or area of interest, the community serving an area or discipline, and professional life within that community (professional perspective).

These courses comprise two major components. The first is either a lecture series covering history and philosophy of science, or a discipline module variously incorporating research activities processes or lectures contextualised within specific scientific areas or disciplines (e.g. chemistry, medical sciences and so forth, from

which students choose one). While the SCIF courses differ in the first component, the common second component comprises tutorials focusing primarily but not exclusively on the first two aspects of design above.

Given its pervasiveness in professional life in the sciences and academia and its increasingly recognized role as an active learning process, peer review represents a critical activity appropriate to the themes of professional perspective and professional practice in SCIF courses. All these SCIF courses employ Moodle as the learning management system/environment, currently in pilot mode at UNSW. The following sections describe assessment tasks typically used in the courses, the integration of peer review with those tasks and how the use of Moodle and specifically the Workshop activity, in its present form, or with our recent modifications, facilitates the peer review process.

## Essays

Students complete two essays; in both cases, three peers review those essays. The first is a short (600 word) biography, based on an interview of a classmate. This task is designed to promote belonging (within the cohort), to build on classroom activities around written communication, to assess student ability in written communication and provides the first opportunity for peer review. The feedback from this essay is provided back to the author while, in parallel, the essay is marked by the tutor/teacher. The emphasis on peer review with this essay is then around the *process* of peer review rather than utilizing peer review for the *product*. This aligns with providing students with early engagement with the peer review process and classroom activities and discussion around peer review in the sciences. It is also seen as formative for the peer review process itself, as it relates to further use of peer review in the course.

The second essay is a longer (1800-2000 word) personal prospective biography. Students are asked to consider where they will be, professionally, in 15-20 years' time, acting as though they, as a current student in the SCIF course, are interviewing themselves in the future. Thus, this task aligns with the first essay, from present to future. More generically, the tasks align with a course emphasis on written communication and, as the genre is the same, feedback on the first essay scaffolds the second. The peer review process for this essay emulates more fully the research publication process; students submit a draft version of their essay, like an original manuscript, which is then reviewed by three peers. The reviews are made available to the author of each essay, allowing them to review and revise their essay as they feel appropriate, prior to final submission for marking. Thus, this task makes use of peer review not only once again as a *process*, but to facilitate enhancement of the *product*.

Both of these learning and assessment processes are supported using the standard workshop activity under, at the time of writing, Moodle 2.2.1. Three students are assigned, randomly, to review (or assess) the essay of each classmate. Prior to that review, each student is required to review three essays drawn from previous students, using the same criteria as used to review the current essay; these exemplars are of varying quality and have been assigned comments and marks against each of the marking criteria. The use of Moodle automates the assignment of reviewers as well as supporting the scaffolding of the peer review process, as students are able to compare their review of each exemplar with that of the teacher, as expert, for each criterion, and overall, both qualitatively and quantitatively. This enhances the student-centeredness of the activity while greatly enhancing efficiency for the teacher. In the case of the second essay, the formative feedback from the first essay and the opportunity to review the second essay prior to marking results in a better final essay (as observed by tutors), enhancing quality of the final essay and thus efficiency in marking (fewer corrections to be made). This aligns with the observation, in a study of educational practices in the sciences, that “*no learning gain was connected to the writing* [of a scientific report], *whereas the computer-supported peer assessment appeared to be entirely responsible for the measured “average” learning gain...*” (Bos 2009).

A limitation of the current workshop activity is the lack of functionality around rating of peer reviewers prior to engaging in the peer review of essays. There is a simple rating process that can be applied post-review, though this is invisible to the students. We wanted to provide students with an indication of how they compared to the expert review (and indeed with each other) through assignment of a score for the capacity to review, and to use that score, optionally, as a weighting against the mark for their own essay and/or that of their peers. We have developed and are currently trialing a modification to the Workshop activity that reflects or indeed emulates the rating of expertise of reviewers associated with a range of professional or educational sites and applications such as, respectively, ScholarOne Manuscripts (<http://scholarone.com/products/manuscript/>) or Calibrated Peer Review (CPR; <http://cpr.molsci.ucla.edu/Home.aspx>).

## Group assignment

Aligned with another theme of the course, group or teamwork, students undertake a group assignment after completion of experiential learning activities that deal with group dynamics and roles. This involves a group of 3-4 students preparing for and conducting an interview with a professional scientist, typically a member of the academic staff. Students are provided with a starting set of questions, though they are able to shape the interview both before and during its conduct. The interview is conducted using video such that the students produce a video or multimedia product featuring video that tells, in 5-10 minutes, the story of the subject's career in science. This task serves a range of educational purposes, aligned with the aims of the course. The interview provides insight into a professional future (aligning in turn with the prospective biography essay task), provides a task in which members of a group can assume specific roles (aligned with classroom instruction and activities around groups or teams), adds a technological and cognitive challenge, at least for some, in the production and editing of video as a new media project (thereby aligning with inquiry or problem-based learning and the need to learn new techniques, as in scientific research) and provides a readily accessible format (and an alternative to the written form) for other students to gain insights into professional futures, as they undertake peer review.

In the past, students have had to assess this assignment 'offline'. The video or a link to it, or to a multimedia product, such as a web site, has been uploaded into Moodle. One or more groups of students have been assigned randomly and manually to assess the product from each student group. Students have been required to assess the product individually but then to collaborate in providing an overall group review of each product, against the requirements of the assignment (*process and product*) as well as other broad criteria relating to the product. Students also have to provide an individual account of their experience of, role in and contribution to the group assignment (a focus on *process*).

The current Moodle workshop activity is designed for the assessment by one or more individuals of assignments produced by individual students. To utilise the existing workshop activity for review of the group assignment, each student in a given group would have to upload the same assignment (which would seem somewhat pointless even if using a link to a file rather than each student uploading the full video). Similarly, the reviewers from the one or more assigned reviewing groups would have to be manually allocated which, in a large class, would take a significant amount of time. We have now modified the workshop activity to include a "Team mode" so that each group can upload just one copy of their assignment and one or more groups can be assigned to review the assignment, though review still involves individuals within each of the assigned groups. While this has the benefit of providing multiple reviews to a group, even if only one review group is assigned, we still wish to develop the tool for full group-to-group review.

## Seminar/debate

Oral communication, as a technical seminar presentation and/or debate, is embedded as an assessment task in all Level 1 SCIF courses. As with other elements of the course, this task aligns with professional practice, and follows classroom activities around instruction in and discussion of effective technical oral communication (and, particularly in the case of debates, may draw on activities and discussion of ethics and codes of practice).

We focus on the seminar task here. Students must deliver a short (typically 5-minute) seminar on any topic of their choosing, the only proviso that it must relate to science. Free choice is given so as to allow for the best possible delivery by each student; the primary focus is on communication rather than technical content, and performance may be constrained if choice is restricted or the topic assigned. Three peers and the teacher assess each seminar. The assignment of peer reviewers is a highly involved process, as the seminars are delivered within tutorial groups, over multiple weeks. Further, specific allocation is required as, first, it is not desirable to have students reviewing just prior to their own delivery, so they have the opportunity to relax and prepare mentally before their seminar and, second, students are required to reflect on their seminar immediately after their performance, impossible if they are assigned to review.

Unlike the other assessment tasks where random allocation is perfectly acceptable, this obviously makes random allocation impossible. While the initial assignment of reviewers within a given tutorial group and week of presentation is randomized, the final allocation is refined according to the needs just described.

Assessment employs an instrument (mark sheet) that allows for rating of different aspects of the seminar across three broad categories, the speaker, visual aids, and structure and content. There is space for provision of comments and an overall mark and grade. Students become familiar with the instrument when the teacher

delivers a 'how to give a seminar' seminar. In the past, the course coordinator has gathered the mark sheets after the seminars, collating and photocopying them as records of assessment and, finally, returning them to the students; for a large class, this is a very time-consuming and tedious process.

We have modified the Moodle workshop activity to allow for upload of a comma-delimited (.csv) file produced from a spreadsheet of assigned reviewers. This means that the specific reviewers assigned to each seminar (or any task, for that matter) no longer have to be allocated manually within Moodle; after the initial necessary allocation of reviewers in a spreadsheet (an unavoidable task), the upload to Moodle is automated, saving a great deal of time.

The student, as presenter, submits to the workshop activity their visual aids (typically a Powerpoint file), a script, or simply a 'dummy file' as their assignment. The accumulative grading mode is used as that provides the representation closest to the use of the mark sheet. The reviewers, both teachers and students, are then able to transcribe their reviews to the workshop activity, entering as words the rating chosen for each criterion with any specific comments and a numerical rating out of 10. This process concludes with upload of any final or overall comments, an indicative grade and a mark out of 20. This mode is a little clumsy; for the most part the Rubric mode would align best with the format of the mark sheet, but there is no provision for inclusion of comments. Thus, the workshop activity requires further modification to permit selection or inclusion of multiple modes of assessment (rubric and/or accumulative grading and/or comments). This is under discussion. Regardless, the upload of feedback to Moodle by all participants shares the workload and aligns better with the practice and benefits of peer review. It also improves the quality of feedback as presenters are provided with mature typescript rather than handwriting that may be note form and thus difficult to read and/or interpret.

## Conclusion

Through the use of the Workshop activity, as-is or with our modifications, we have been able to facilitate online peer review, providing students in Year 1 Science courses with opportunities, through various assessment tasks and different models of peer review, to engage in peer review not only for its own sake (as a professional practice), but as a mechanism to enhance learning through active or reflective practice. Collectively, these activities align with all three themes of ascilite 2012: peer review promotes learning for the future, both generically, in promoting self-efficacy, and professionally, in early engagement in the practice; further, integration of peer review in high-end programs in the sciences is particularly important as these programs are considered incubators of scientific leaders in the future, and; as we embrace increasingly the use of technology in teaching and learning, including the imminent enterprise implementation of Moodle at UNSW, the ongoing development and refinement of educational technologies to support pedagogies demonstrates leadership in a climate of change.

The innovations in Moodle represent collaboration between academic staff in Science and Engineering and the Faculty of Engineering Learning and Teaching Team who, through the nature of open source software, were able to modify and add to the Moodle Workshop activity to suit the needs of UNSW users. The following key modifications facilitated the assessment activities described above:

- Team Mode, allowing teams/groups to submit assignments for review by members of other teams/groups within the course (there are plans for further modification, allowing team to team review);
- CSV Allocation Upload, allowing instructors to create a spreadsheet of students and staff to be assigned as reviewers within activities, and;
- Reviewer Calibration, allowing instructors to rate the expertise of students in marking by having them mark samples assignments, which the instructor has already determined how the samples should be marked.

While not available in current versions of Moodle, these modifications have been submitted to Moodle HQ for incorporation into Moodle Core code, making the modifications available globally to all users of Moodle.

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