

Students as Reviewers and Lecturers as Editors: The Peer Review with Scaffolded Assignments Model

Research-in-Progress

Daniel Schlagwein
UNSW Australia Business School
UNSW Sydney, NSW 2052, Australia
schlagwein@unsw.edu.au

Abstract

Well-designed peer review and assessment tasks have been shown in several studies to increase students' engagement in courses and to help their ability to critique and evaluate work. These positive effects are primarily achieved through a "change of hats", from writer to reviewer. Peer assessment by three to five students has been shown to be as valid as marking by teaching staff (e.g., lecturers or tutors). In this paper, I share an information technology (IT)-enabled peer review model with scaffolded assignments. The model is based on the idea of scaffolding peer-assessed assignments. That is, reading other students' assignments becomes relevant for the reviewing student's next assignment to make undertaking the review more interesting and relevant. In addition, the model considers several peer review quality assurance measures, including detailed marking rubrics, marks for review quality and meta-review by teaching staff. The model shifts the role of the lecturer from the lone marker of a text to that of a higher-level "editor" and the role of students from authors to "reviewers" in an inclusive process. While I have designed the model for and use it in the context of information systems (IS) education, it will be applicable in higher education more broadly.

Keywords: Education, teaching, learning, curriculum design, course design, assessment design, peer-to-peer, peer review, peer assessment, peer marking, peer learning, scaffolding, scaffolded assignments, experiential learning, active learning, IT-supported education, Moodle, workshop, learning management systems, inclusiveness, transparency, crowdsourcing in education.

Introduction

Peer review and assessment is one particular educational approach within the broader framework of peer learning that considers forms of learning which involve the direct interaction of students (Boud et al. 2001). Peer review and assessment (for a discussion of terminology, see Tahir 2012) is a strategy in which students as peers (i.e., people of similar standing and knowledge in a particular context) comment on and evaluate each other's work.

The peer review and assessment approach in general has benefits for both students and teachers. For students, the approach has the potential to develop increased motivation and improved meta-cognitive skills (such as the ability to critically reflect on one's own work and that of other people) – training them in the skills most highly valued in Bloom's taxonomy (Bloom et al. 1956; van Zundert et al. 2010). The approach also constitutes a power shift (the power to decide marks is central to the authority of the lecturer) and creates a sense for students of being taken seriously (Boud et al. 1999; Boud et al. 2001). Peer review develops students' skills in critiquing text through a "change of hats", from writer to reviewer, from receiving to giving feedback. For teachers, the approach may positively impact on workload without compromising student learning and experiences and may allow for contemporary course designs and teaching styles (Boud 2001; Boud and Falchikov 2007; Lehmann et al. 2015).

In this paper, I share a specific IT-enabled approach of peer review and assessment design that I have called "peer review with scaffolded assignments model". While academics generally show interest in using peer review and assessment for education, our knowledge tends to be patchy in areas such as the designs and models through which it can best be implemented (Sadler and Good 2006; van Zundert et al. 2010). Hence, my purpose in sharing the model is to make it accessible for other higher education teachers who may find it useful. In this model, the role of the lecturer shifts from the lone marker of a text to that of a higher level "editor". The lecturer ultimately gives the marks and makes final judgement but, in doing so, strongly considers the outcomes of a blinded process in which students act as "reviewers" and evaluate the work of their peers. The model has been developed and used in my context of teaching undergraduate IS courses; however, it is sufficiently general to be applicable in higher education more broadly.

The paper is organized as follows: the second section provides a brief overview of the broader framework of peer learning. The third section discusses the context in which the model was developed. The fourth section describes the peer review aspect of the model that is central to this paper. The fifth section describes the scaffolding assignment part of the model. The sixth section discusses the impacts of this model, based on both existing studies of comparable models and personal reflection on the particular model proposed in this paper. The paper concludes with a brief outlook.

Peer Learning

Peer review and assessment is part of a set of educational approaches within the broader framework of peer learning. In addition to peer review and assessment, the set of peer learning approaches also includes student mentoring, study groups and discussion seminars (Griffiths et al. 1995). The unifying aspect of peer learning is that learning with and from one's peers is the central concern (not lecturer-focused teaching) (Boud 2001).

The key value of peer learning is that students are trained to learn as they would in their professional lives and, especially in the case of peer review and assessment, they are trained to read texts and evaluate work more critically (Boud et al. 1999; Boud et al. 2001). One can hardly put it more directly than Boud: *"[a]s teachers, we often fool ourselves in thinking that what we do is necessarily more important for student learning than other activities in which they engage. Our role is vital. However, if we place ourselves in the position of mediating all that students need to know, we not only create unrealistic expectations but we potentially deskill students by preventing them from developing the vital skills of effectively learning from each other needed in life and work. The skill of obtaining accurate information is not learned by being given accurate information by a teacher but through practice in discerning how to judge the accuracy of the information we receive"* (Boud 2001, p. 2).

Peer learning should be designed into courses, including specified tasks and dedicated marks (Boud et al. 1999). Certainly, peer learning could appear naturally, without formal organization: it could involve students asking other students for feedback on their assignment drafts (i.e., a form of peer review and

assessment). For an educator, reliance on such *laissez-faire* approaches to peer learning and peer review is problematic. Students may perceive neither the value nor the opportunity; they may not manage their time appropriately or may not have the necessary social relationships with peers in their course. Formally designing and awarding marks to peer learning is hence useful. Awarding marks to peer learning tasks also increases the perceived value of these tasks for students (Boud et al. 1999).

Peer review and assessment, as a form of peer learning, has been found useful and valid across studies (van Zundert et al. 2010). Peer review is not only used in education. In research, for example, a structure of peer reviewers and editors is widely used for the evaluation of research papers for publication (e.g., as the reader will be aware, the peer review model is used at all IS conferences and journals affiliated with the Association for Information Systems, the sponsor of this conference) (for a critical reflection on peer review, see Hardaway and Scamell 2012). Peer review is also recognized as a valuable practice in professional sectors, including in accounting (American Institute of CPAs 2015), health care (Milgrom et al. 1978), medicine (Dans 1993), law (Martindale-Hubbell 2014) and software development (Raymond 1999).

The model proposed in this paper is a particular model of peer review and assessment for education, providing a well-designed and structured approach for how educators could foster peer learning in their courses.

Context of Model Development and Use

Educational models are not “stand-alone”, nor do they exist in a vacuum: they need to consider both the educational context as well as the person who is the educator (e.g., Biggs and Tang 2011). Hence, it is useful and necessary to provide both the educational setting in which the “peer review with scaffolded assignments model” is used as well as a basic characterization of my teaching style (so the reader can evaluate if the proposed model matches his/her context).

The model was developed and is used in an educational setting which comprises undergraduate (primarily final-year) IS courses at a leading Australian university, UNSW Australia in Sydney. To be specific, in this paper, I describe the model used from 2012–15 in the courses Innovation and Technology Management and Information Systems Project 1. Innovation and Technology Management is an IS course that focuses on technological innovation, whereas Information Systems Project 1 is a project-based system development course. Both courses are third-year courses with relatively mature, often international undergraduate students and each has a course size of approximately 80 students. For developing peer review and assessment, UNSW was a very supportive environment. In addition to providing access to other resources such as workshops in which I participated both as attendee and presenter, UNSW Australia developed an enhancement to Moodle, the UNSW Workshop Activity module (Cox et al. 2012), that can be used for the model proposed in this paper (the model can also be used with the standard Moodle Workshop Activity module, Blackboard or Turnitin).

IS is by now an academic discipline with a tradition of healthy and useful discussion on the most appropriate philosophical lens through which to research IS (e.g., Orlikowski and Baroudi 1991), and IS professors are expected to be conscious of their research philosophy as part of their “research persona”. Correspondingly, to my mind, IS professors should also be clear about the different philosophical lenses through which to teach IS (see further Ashworth et al. 2004): being consistent will help them to develop a defined “teaching persona”. Considering that IS is a multidisciplinary field (e.g., Willcocks et al. 2008) and that it is concerned with a professional discipline (e.g., Lee 2010), I found constructivist and pragmatist thinking in higher education (in the sense of Dewey and Piaget) to be most appropriate for IS education. This line of thinking places in question the usefulness of the traditional “frontal teaching” style (which is inclined to be purely cognitivist in its underlying values) and better matches with engaged experiences (e.g., Andresen et al. 2001; Boud 1993; Kolb 1974; Kolb 1984), that is, with education approaches that achieve “action” and “reflection” in addition to “cognition” (i.e., peer review, project work, developing an actual system, discussions/debates, etc. should be used in addition to frontal teaching). Graduates in IS will work in multi-layered environments (with aspects of technology, business, law, etc.), facing complex decisions and diverse inputs, and will need to make judgements and conduct evaluations (e.g., different opinions about the potential of a new technology). Peer review is one measure by which to train students in judgement and evaluation skills.

Peer Review Aspect of the Model

In the peer review aspect of the model, students act as peer “reviewers” expressing their opinions on a peer’s work. The lecturer (or tutor or other teaching staff member) acts as an “editor”, meta-reviewing the opinions (evaluating the quality of the review and, if necessary, weighting or overruling judgements). This second-order editor role is also common, and is considered useful, in other instances of peer review. For example, in peer reviews of academic papers, it is widely considered that such a senior, second-order role is necessary for final decisions and that junior scholars, especially, who take part as reviewers or authors learn much from the peer review process including from these senior comments (Venkatesh 2011).

Figure 1 shows the peer review structure of the model within one assignment.

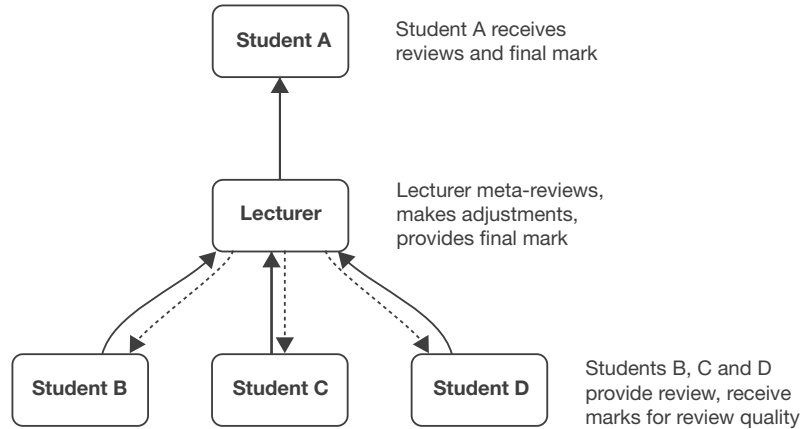


Figure 1: Peer Review Aspect of the Model

As shown in figure 1, students as peers are asked to review the assignments of other students. They are asked to provide comments and ratings within a certain time frame. The review process can be “one-way blind” (the reviewed student does not know the reviewers) or “two-way blind” (both do not know each other). Two-way blinded review is not always possible, for example, in cases where assignments involve class presentations. While a study of the effects of reciprocity in peer review found that less than 1% of variance in ratings could be explained by social relationships even without blinding (Magin 2001), one-way blinding, at least, is held to prevent possible effects of collating, reciprocity or social relationships (Bostock 2000; Boud and Tyree 1980).

The peer review model requires the use of contemporary IT in order to be scalable for large cohorts and to be efficiently manageable by teaching staff. Essentially, the learning management system (LMS) must allow for the allocation of reviewers to papers, for the distribution of papers to reviewers, for reviewers to enter their reviews and for reviews to be distributed back to authors. The LMS should allow the steps to be scheduled (different due dates for the assignment, reviews and the revealing of outcomes). Current 2015 versions of LMSs such as Blackboard or Moodle provide the necessary functionality. As explained above, I use the UNSW Workshop Activity module of Moodle (Cox et al. 2012) for this purpose (the standard Workshop Activity module of Moodle can also be used). Blackboard (Blackboard Software 2015) or Turnitin’s Peer Mark function (iParadigms 2015) provide similar functionality.

To conduct the actual review, students need to provide qualitative comments and quantitative ratings on the reviewed assignments. Comments and ratings are based on rubrics which are a range of criteria with defined performance levels, usually across several criteria (Stevens and Levi 2011). Students need to justify their ratings of the performance of their peers based on these rubrics. It is important that a clear marking guide with clearly defined rubrics is provided to students for their peer review efforts (Boud and Falchikov 2007; Falchikov and Goldfinch 2000). The full rubrics (including the criteria for quality reviews) are made available to students with the assignments (i.e., upfront) to increase the fairness and transparency of the process.

After completion of the peer review process, the lecturer (or tutor) evaluates and provides meta-comments on the peer reviews. In addition to meta-comments, the lecturer can adjust the individual ratings of reviewers, can weight reviewers differently or can take out one of the peer reviewers completely in order to

finalize assessment. Moodle does presently not support this, hence I have developed and, on request, can provide, my own solution in Microsoft Excel. The meta-review serves both as a quality assurance process (for the reviewed students) and a marking process (for the reviewing students). The final report (reviews, ratings, meta-review and final mark) goes to the reviewed student (student A in figure 1). The peer reviewers (students B, C and D in figure 1), in their own reports, receive feedback on, and marks for, the quality of their reviews. Naturally, student A also performs peer reviews on the work of other students (not shown in figure 1). Typically, a student does not review the work of their own reviewers but other students are randomly allocated from the cohort. The workload for the peer review process (three to five reviews per assignment) is accounted for in the design of the assignments. That is, the main assignment text may have fewer words/pages compared to similar assignments without the peer review process. This is to avoid a perception of “additional work”: the peer review needs to be communicated to students as being an integral part of the assignment and of the course. As above, awarding marks to peer assessment as part of the course, as well as having peer assessment recognized as part of the course workload, also increases the perception of the process being valuable (Boud et al. 1999).

The purpose of the peer review is to train students to “change hats” from writer to reader; to make the process in which evaluation comes into place inclusive, fair and (to some degree) transparent to students; and to foster their critical thinking, evaluation and judgement skills. These are the skills most highly valued in Bloom’s taxonomy (for further details, see Anderson and Krathwohl 2001; Bloom et al. 1956).

Scaffolded Assignments Aspect of the Model

As the name indicates, the “peer review with scaffolded assignments model” presented in this paper uses a scaffolding extension to the above basic peer review design. Generally, scaffolding of assignments refers to the building of assignments onto one another. This relates to the idea of “backward design”, which refers to designing a structure of assignments backward from the ultimate learning goals of a course, so that earlier assignments act as scaffolds towards later assignments and these goals (Wiggins and McTighe 2005).

The model presented in this paper combines the ideas of peer review and scaffolding of assignments. This combination of peer review and scaffolded assignments is new and unique (at least, I have not previously seen it implemented or described in this form anywhere).

Figure 2 shows the scaffolding structure of the model between assignments.

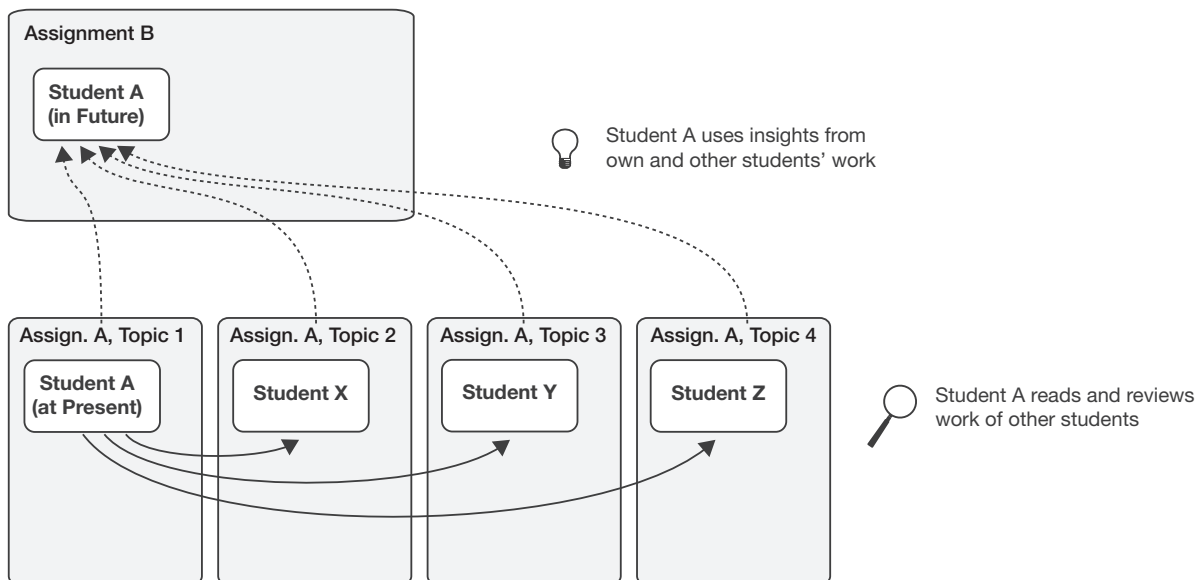


Figure 2: Scaffolded Assignments Aspect of the Model

The key idea is that assignments need to be designed in such a way that reading the work of other students is meaningful and useful for the reviewing student (i.e., performing the review provides benefits in

addition to receiving marks for the quality of the review). The reason is that peer reviewers will then have a genuine interest in reading other students' work, and for the work to be of good quality, because the work will actually help their own future work (such as the next assignment).

To achieve this effect, the model uses two complementary measures:

Firstly, the earlier assignment (assignment A in figure 2) is organized in such a way that students work on different topics. Peer reviews allow students while researching and working only on *one* topic themselves (a topic they have self-selected or have been allocated) to be exposed to *all* (or at least many) other topics. This measure already makes the review process more interesting for the reviewing student simply because they read about different topics relevant to the course, instead of re-reading about the same topic.

Secondly, in addition, the topics of the earlier assignment need to be useful for performing the *next* assignment (assignment B in figure 2). This makes the review meaningful for reviewers because they benefit from reading (good) assignments for their own next assignment. This design provides a clear purpose for writing and reading, and defines a clear target audience for the text and trains students to see their texts from the reader's perspective) Reviewers are intrinsically interested in high quality work by their peers, and will be less pleased if reading poorly researched or poorly written work because reading poor work "wastes their time" and does not help them with their own next assignment.

As the scaffolded assignments part of the model might be less familiar to the reader, it is further illustrated with examples from my own implementation of the model.

For example, in the course Information Systems Project 1, for assignment A, my students research one of the many IS user requirements study methods and prepare a concrete proposal for how this specific method could be used in the next assignment, assignment B, which is an actual IS development. The proposal needs to not only include a generic description but should also outline specific action steps, dates, etc. in relation to the next assignment. Students then actually use one or more proposals for the user requirements study methods in assignment B. They are free to choose their own proposal, or that of another student whose work they have reviewed, or a combination thereof.

In another example, in assignment A in the Innovation and Technology Management course, my students analyse the business models and technologies used by different crowdsourcing marketplaces. Next, in assignment B, students are required to create their own new crowdsourcing marketplace (i.e., creating a business model and its prototypical technical implementation). In assignment B, they can "remix" ideas and best practices coming from their own analysis of existing marketplaces as well as from the analysis of other marketplaces performed by their peers whose work they have reviewed in assignment A.

Impact and Validity

The purpose of this paper to present an educational approach, the "peer review with scaffolded assignments model". The paper is meant as a guide: it is not intended to be an empirical research report. Nonetheless, the reader will certainly be interested in evidence of the impact and validity of the model. This section briefly summarizes the available evidence from research studies as well as my personal evaluation and reflection.

In terms of the impact on students, prior studies suggest that the use of peer review makes a positive contribution to student learning. Through the process of both reviewing assignments and receiving reviews on one's own assignment, and through knowing that one's peers will read the assignment, the effort and quality of student assignments increase (Brakel Olson 1990; Sung et al. 2003; Tsai et al. 2001). With experience and training in peer reviewing, the quality of peer reviews increases (van Zundert et al. 2010). Students are positive about peer review and assessment once they have had their first experience of this process; that is, the attitude towards peer review and assessment generally improves through doing it (van Zundert et al. 2010). Overall, peer review provides meta-cognitive improvement by "forcing" students to take a higher-level, evaluation point of view (Tahir 2012). On an anecdotal note, to my amusement, I found that students often mimic a "lectorial" tone: some of their reviews read more like the carefully worded statements of a senior scholar, not those of an undergraduate student.

In terms of the impact on teaching staff, peer review models may positively impact on workload without compromising student learning and experiences (Boud 2001; Lehmann et al. 2015). This model allows for

contemporary course designs and teaching styles, such as those focused on peer learning (Boud et al. 1999; Boud et al. 2001) and experiential learning (Boud 1993; Kolb 1984). As with the student side, experience and training in running peer reviews increases the quality of outcomes of the peer reviews process (Sluijsmans et al. 2004). The above model did not save me substantial amounts of time; however, it allowed me to shift time previously spent commenting and marking from scratch for individual students to higher value work (meta-commenting and adjusting marks to effect the learning of several students, both reviewers and reviewed). In addition, I was able to shift attention particularly to struggling students or groups (putting more effort into assignments with poor or conflicting ratings, and spending less time on uniformly positively received assignments). However, if a lecturer chooses a quality control regime that relies on measures other than individually controlling and commenting (e.g., only checking for substantial disagreement in rating and not checking cases on which reviewers agree; or relying on statistical controls or pre-tests), then peer review is also suitable for substantially reducing marking time (Cox et al. 2012; Lehmann et al. 2015; Sadler and Good 2006).

In terms of validity, several systematic studies of the quality of peer review show that peer reviews produce quality outcomes (Dochy et al. 1999; Falchikov and Goldfinch 2000) and that the mean mark, even without quality assurance, is almost identical to that given when marked by an experienced academic (Sadler and Good 2006; Stefani 1994). While naturally dependent on the specific design and context, peer assessment is generally shown by studies to be valid, when taking traditional lecturer marking as the “correct” baseline (van Zundert et al. 2010). This is in line with my own experience across three courses and three years, when marking outcomes based on peer review have been compared to assignment marks awarded in parallel by other teaching staff or myself. The qualitative feedback received by students is much more comprehensive in the model proposed in this paper because students receive three to five peer reviews plus one meta-review as opposed to a single review. The model allows students to find a better balance between time spent on working on an assignment in a narrow sense and time spent on reflection on that assignment.

Conclusion and Outlook

The peer review and scaffolded assignments model provides a new and useful design that can be used by educators in IS, in higher education in general and in other settings with students who are sufficiently mature. I am continuously developing this model (e.g., I have recently used training with past assignments and gamification with “best assignment” and “best reviewer” awards). As this work moves forward, it is my intention to provide a detailed implementation guide as well as a more systematic evaluation of the impacts of this particular model in the future.

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