

Teaching Academic Writing to Large Classes of Engineering Students

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Abstract— Good writing is a skill that requires practice and feedback to learn, and is a challenge to teach with limited resources and large classes. We have explored how to stimulate active learning of academic writing through student peer assessment (SPA) consisting of a combination of written and oral feedback. The students review reports based on a set of assessment criterion designed in-line with the grading criteria for a project assignment. We used a design science approach to develop and evaluate this for a software project management course for 3-year engineering students at Lund University. We found that the approach can support learning of writing skills but that it also poses challenges. The teacher's competence is required to provide clear grading and assessment criteria, and to support providing constructive feedback. Furthermore, the learning gains of the approach need to be explained in order to motivate the students.

Index Terms—engineering education, academic writing, software engineering

I. INTRODUCTION

GOOD writing is a skill that requires practice and feedback to learn. However, providing constructive feedback is time consuming and thus a challenge when faced with limited teaching resources and large classes. We experienced this challenge when teaching a software project management course for 3-year engineering students. We also faced challenges in repetitiveness of providing similar review comments, as well as low student motivation for writing. The latter could sometimes result in that review comments were not heeded.

Previous research shows that student-peer assessment (SPA) of academic writing can provide adequate qualitative feedback on par with staff assessment although student comments tend to be more specific and detailed while the teachers provide feedback at a more general level [6]. Furthermore, students who provide peer-reviews improve more in their own writing than students who just receive reviews of their work, even more so for weaker students than for those at higher proficiency levels [3].

We therefor wanted to explore how active learning of writing skills may be stimulated through involving the students in reviewing. We also wanted to explore if receiving feedback from peers may motivate students to put more effort into writing.

We developed a teaching set-up and material for the course in question that incorporates SPA. These were

evaluated through using them in the course.

We outline our research approach in Section II and our teaching methods in Section III. We report our experience of applying SPA in Section IV and conclude with lessons learnt in Section V.

II. RESEARCH METHOD

We used a design science approach [2] for developing SPA-based teaching elements and course material for academic writing. We evaluated these artefacts by applying them in a mandatory software engineering course for third year C and D engineering students at Lund University. Around 130-150 students take this course each year. The results presented in this paper are based on our teaching experiences and on student feedback on the course.

The set-up for teaching academic writing in this course has been gradually improved over three consecutive years; 2014-2016. The approach presented in this paper (see below) was introduced in the second year and improved in the third year. The new material was based on a combination of input from a pedagogical course on teaching academic writing [5], from a course in scientific writing and the experience of the tutors of the (same) course from the first year (2013/14).

During the course the teachers, i.e. the authors, had frequent discussions of how the new set-up was working and made adjustments as the course progressed. The teachers made notes of how the students performed and of ideas for improvements.

III. TEACHING ELEMENTS AND SET-UP

We teach academic writing as part of a project assignment within a software engineering course (4 hp) for third year engineering students. The project is performed in groups of six students. The grading criteria cover writing and technical aspects, with an emphasis on the writing skills for the higher grades. The formal course goals concerning writing skills are assessed through the course assignment. The SPA-related teaching material is available on-line [1].

At an initial exercise class, the students are taught the concept of structuring text in-line with top-down writing. These skills are practiced in class by outlining the introduction section of their project report.

SPA is used during the course to support the students in the writing process by providing feedback on two intermediate versions of the report. These two assessments

are designed as formative evaluations where the reports are reviewed against criteria. Different criteria are used for the two SPA sessions, with a gradual extension to follow the progress of the project work. These review criteria are aligned with the grading criteria of the course project and are presented to the students at the beginning of the course as a way to communicate the expectations and learning goals. The criteria cover both technical and writing aspects of the assignment.

SPA involves the students providing written and oral feedback to their peers. Each report is assigned to two to three other groups that produce written feedback based on the review criteria. This feedback is then provided to the authoring group at an exercise class. In class the feedback is presented and discussed with the support of a tutor. The tutor can also provide additional clarifications and explanations of the assessment criteria.

The final (third) version of the report is assessed by teaching staff according to the grading criteria as a summative evaluation. The students are encouraged to use the review criteria as a checklist and guideline when preparing the final version of their report.

IV. RESULTS

We will now share our experience of teaching writing skills using SPA and how we have gradually evolved the teaching set-up. The course assignment was introduced in 2013/14 when the first author took on the responsibility for this course. The teaching set-up presented in this paper (SPA) was introduced 2014/15 and further refined 2015/16.

An overview of the students' results (pass rate for course and grading of project assignment) and their view on the course (from the Course Evaluation Questionnaire CEQ) is provided in Fig. 1. For comparison, the diagram includes the year prior to when the authors taught the course.

A. Year 0 – 2013/14

The initial version of the course project was defined and introduced this year. The grading criteria had an emphasis on the technical course content. The students received teacher feedback on two initial versions of their project report. The feedback was provided orally at review

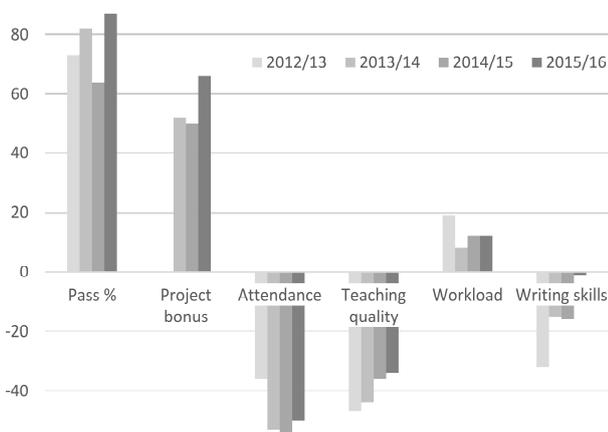


Fig. 1. Overview of students results on course and project (average % of maximum bonus), and student feedback on course aspects (CEQ, scale -100 to +100). The authors started working with the course in 2013/14, and SPA was introduced in 2014/15.

meetings. The teachers produced internal checklists which were synchronized to ensure that similar feedback was provided to the students.

The new set-up resulted in a decrease in attendance and in perceived workload, while students reported an increase in learning writing skills (see Fig. 1). This may indicate a low level of active learning and participation, primarily in the course project, while providing an increased awareness of writing skills through the writing assignment.

We perceived that the teacher-provided feedback was often passively received. It was sometimes ignored, or possibly not understood, and thus improvements were not seen in the updated report. The fact that good writing was not rewarded with higher grades may have contributed to this lack of motivation for improving the report.

B. Year 1 – 2014/15

This year we introduced a class on presentation techniques (see Section III) and the use of SPA for providing feedback on the project report instead of teacher feedback. This was part of an overall aim to improve the teaching of writing skills within the engineering programs. In-line with this, the grading criteria (from the previous year) were adjusted to focus on writing skills rather than on technical aspects. The teachers' review checklists from the previous year formed the basis for developing the assessment criteria for the two SPA sessions. Thus, the SPA criteria represent the review expertise of the tutors and the taught aspects of academic writing.

Each SPA session was performed as an exercise class where reports were reviewed and feedback provided during the lesson. Review forms with the assessment criteria were provided. The students reviewed 2-3 other reports in pairs, noted their comments on a review form and then provided oral feedback to the authoring group. Informal feedback was also given by the teachers.

The logistics of assigning the reports to review was a major challenge and took up the first 10-15 minutes of the class resulting in loss of student motivation. This was due to not knowing in advance how many students would attend since the exercise classes were not mandatory. This also resulted in an uneven amount of feedback provided and received between the groups, which was seen as unfair by the groups who received only a few reviews. The speed at which reports were reviewed also varied a lot and resulted in waiting for reviews. In addition, students were finished at different times and then left, making it impossible to have a final summarising discussion with the entire class.

The response from the students varied. Several students expressed the value of learning from peer-reviewing. Some students were unhappy about not receiving teacher feedback, which was seen as more accurate. There were also comments about having missed/misunderstood criteria that were then not met in the final formal assessment.

C. Year 2 – 2015/16

We improved the SPA sessions by requiring the students to prepare written reviews prior to the class and providing oral feedback during the exercise class. The project groups

handed in their reports two days prior to the exercise and a teacher assigned two reports per group to review. This resolved the issue of assigning reviews live in the class. A few groups missed the submission deadline resulting in a slight delay in assigning reviews.

A tool was introduced to support the review process. The workshop feature of Moodle [4] was used to submit, assign and review reports. Even though the tool provided good support, work-arounds were needed to manage group submissions and reviews. The used set-up meant that the written reviews could not be made available to the authors prior to the SPA sessions. This may be resolved with separate workshop modules per exercise class.

The existing assessment criteria were used for reviewing in the tool. These criteria were also available as a checklist for the students to use in finalizing their report. The assessment criteria were presented and exemplified by the teacher at the start of the exercise class. The students then provided oral feedback to the authoring groups.

Presentation skills became a formal course goal this year and the gains of learning from SPA were explained to the students at lectures and at the exercise classes.

The student response was partly similar to that of the previous year, even though an increase in experienced learning was reported see 'Writing skills' in Fig. 1. The comments ranged from appreciating the learning approach to wanting expert reviews. The students also indicated that the quality of the reviews varied greatly.

The oral feedback sessions were inefficient. With many groups in the room the noise levels went up and the students lost concentration. The learning was affected by this and by the fact that only a few students per group were actively engaged in the discussions. In many groups there was also a lack of discussion and some feedback session reverted to merely reading out the written feedback produced earlier.

V. LESSONS LEARNT AND FUTURE IMPROVEMENTS

We will now share our reflections and lessons learnt on how to use SPA in large software engineering classes with the aim of providing guidelines for others.

Facilitate large-scale SPA by providing clear instructions and good infrastructure for managing the large number of reviews. The *assessment criteria* are the core of the learning material and must be aligned with the learning goals for writing and with the formal grading criteria. They then support the students in improving their writing by actively applying these criteria in peer reviews. *Tool support and good logistics* are required to handle the large amounts of peer reviews. Organising combined written and oral cross-reviews in one exercise class is non-trivial. Weak logistics can disrupt a class and decrease the motivation for actively participating. The teacher needs to have a good system for receiving, allocating and distributing reports and reviews. In addition, it is important to provide clear instructions for how to perform the reviews.

Teacher competence is required to define good assessment criteria but also in providing teaching material

and exercise classes. *Teach writing techniques* by presenting them and letting the students practice on small examples before applying them in a full report. When applying SPA the teacher needs to *explain and exemplify the criteria*. This can further support the students in learning the underlying aspects. The teacher should *support the oral feedback sessions* by encouraging the students to engage in in-depth reflections and constructive feedback. We plan to improve this in the future by providing additional reflection points for the feedback sessions and by organising these sessions into smaller groups.

Student motivation is an important key to facilitate learning through SPA since active participation is required to learn from this teaching technique. The teacher plays a vital role in *explaining the benefits of SPA* and how the teaching elements are designed to support them in learning. This includes motivating why SPA is used rather than teacher feedback. *The importance of writing skills* also need to high-lighted, both now (e.g. clear communication on exams) and in future careers. *Externally motivating factors* can also be used. We recommend including writing skills in the formal learning goals and as part of the formal grading. We are also considering if the reviews should be graded as an incentive for providing good feedback. Furthermore, we recommend rewarding the writing aspects only in the grading of SPA deliverable rather than the technical content so as to avoid the risk of students gaining higher grades by 'stealing' technical solutions from others.

To summarise, we have found SPA to be a good tool for teaching writing skills in large classes, if it is used in an appropriate way. The student feedback indicates an increase in learning writing skills, see Fig. 1. While students report positive experiences of SPA, there are also problems, for example with insufficient tool support, logistics, un-even participation and motivation to actively participate. We are considering how to further communicate the learning advantages of the approach in parallel to further strengthening the oral feedback sessions and possibly providing additional external motivators for reviewing. We believe that teaching writing to software engineering students is an important part of their education. We further believe that it will empower them to better contribute to collaborative efforts in designing and developing future software systems and products.

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