The Writing Circle: A peer-based collaborative approach to improving engineering students scholarly writing skills

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Introduction

There is a realistic expectation that Information Technology (IT) and engineering graduates will be technically competent and effective communicators (Md Saad and Majid, 2014; Palmer, Tolson, Young and Campbell, 2015; Rajala, 2012). For educators, ensuring adequate communication skills development in post-graduate coursework programs is especially difficult given the shorter program duration relative to undergraduate offerings, and the increasing number of students attracted to these courses, many of whom are non-native speakers of English. These exacerbating factors make it very challenging for academics to supervise and mentor their students, ensure development of conceptual theoretical models and/or software, and find the opportunities to provide constructive feedback to students about their critical thinking and writing skills.

IT academics in coursework Masters programs in the engineering faculty at an Australian University increasingly reported, and specifically bemoaned the lack of student ability to critically appraise information and apply professional/technical writing skills. Moreover, this negative trend was seen across all subjects that involved research, analytic and critical thinking aspects to solving industry problems, and report writing. Generally, students lacked skills in: (1) analysing and assessing existing published articles; (2) synthesises and critical thinking; (3) writing up a conceptual piece of work; (4) presenting a new piece of work as part of a professional portfolio; and (5) pitching, marketing and defending opinions/solutions to problems, all of which are key skills in industry today. Although the University has an established writing skills unit catering for the needs of graduate research students, our coursework IT students tended to shy away from the service. Thus, remediation early in a coursework Master's program was needed to address these concerns.

In this paper, we discuss a voluntary participation program titled *The Writing Circle* that was designed for students in their first semester on campus, where they could meet fellow students experiencing similar challenges and be provided with opportunities to improve their written and oral communication skills. The aim of the program was two fold: (1) to improve students' writing skills; and (2) bring students together to create a sense of belonging on campus – a place to share similar experiences and learn from each other. Quade and Harper (2014, p.2) summarize the growing swell of empirical evidence that university students who consistently engage in meaningful, "academic, interpersonal, and extracurricular offerings on campus" reap many rewards, including cognitive and intellectual skill development, accrual of social capital, positive images of self and improved academic performances. Optimal learning environments are those in which students feel connected, and where they are respected and can actively take responsibility for their own learning (Fanghanel et al., 2016; Pittaway and Moss, 2013). This is especially true for international students who face the additional challenges of language and culture differences (Glass, Wongtrirat and Buus, 2015; Krause, 2005; Metro-Roland, 2018).

The following sections describe the design, implementation and evaluation of the Writing Circle program.

The Writing Circle program

The design of the Writing Circle was crafted in consideration of writing research literature which highlights reciprocal peer review as a powerful way of encouraging students to practice writing and to use peer feedback to advance their writing skills (Falchikov and Goldfinch 2000; Mowl and Pain 1995). It is argued that exposing students' work to their peers encourages them to put more effort into their own writing (Jonassen 1996; Vennables and Summit, 2003). Reciprocal peer review allows a student to take on the role of a writer and reviewer. Also, as a type of peer-based collaboration, reciprocal peer review is considered effective in that students working alone are unlikely to detect their own misunderstandings (McCarthy, 2017). By integrating student learning with peer mentoring strategies in an out-of-classroom setting, a positive and supportive setting would be set up for students to obtain feedback from their peers and teaching staff (Falchikov and Goldfinch 2000; Sondergaard and Mulder, 2012; Hardy and Bryson, 2016).

The Writing Circle program was structured around a series of sessions as follows:

Module 1 – What is good writing? This included an introduction to the program goals, and the selection of an assessment task from their Masters course that each participant wished to improve on. Learning to write a report and through discussion, getting to better know their classmates.

Module 2 – Peer-learning approaches: Introduction to the fundamentals of peer-learning approaches. Encouragement and practice on presenting topics as a way of reciprocal learning to pitch their ideas and defend their opinions.

Module 3 – Rubric writing skills: As a team, students write a rubric to assess a report, critical thinking and writing skills to be used in the reciprocal peer review process. As a team, students will explore a rubric for the chosen assessment and learn to assess based on the given rubric. In addition, the team will also develop a rubric to assess how to assess critical thinking and writing skills to be used in the reciprocal review process

Module 4 – Peer-based teaching and feedback: As a team, students present their rubric and provide constructive feedback on other teams' rubrics in a collaborative effort to achieve consensus on the final rubric;

Module 5 –Report writing practice on chosen assessment task, peer-review of another's report providing constructive criticism and feedback using peer-teaching approaches. Mentoring and feedback from teaching staff on student reports.

The inaugural Writing Circle pilot was implemented in Semester 1, 2019 and it was open to a cohort of over 300 students. The five-session program was scheduled for lunchtimes and distributed over a two month period to account for mid semester breaks.

Student feedback about their experiences in the Writing Circle pilot was garnered through survey responses collected at the end of each weekly session regarding:
- perceptions of the program's value in helping their learning of technical writing skills;
- assessment of the degree to which peer collaboration helps build a learning community for participants;
- identification of the weekly activities useful in helping student understanding and analysis of arguments, critical thinking and report writing; and
- overall satisfaction, or otherwise, with the Writing Circle program.

This feedback would help academics evaluate the efficacy for students of the peer collaborative program and its activities, and would also guide the revision of materials and activities for future iterations of the Writing Circle program. Ethics approval from the host university's human research ethics committee was sought and granted to collect anonymous survey responses from students.

Survey instrument

The survey comprised of 19 questions, of which, 16 were statements relating to each session's activities, of which 12 were positive and 4 were negative statements, as listed in Table 1. For all statements, students were asked to indicate whether they Strongly agree, Agree, Neutral, Disagree, Strongly disagree or Don't know. Following, two open ended survey questions asked for written comments and a final question asked if the respondent's participation in the session was either More, Same or Less as previous sessions.

Attendances

The number of students who attended sessions and returned an anonymous completed survey are given in Table 2. Given participation was voluntary and during lunch time, the number of attendees for each module of the program that spanned two months is an endorsement of its value to students. It is hypothesized that poorer attendance in week 4 was most likely because of the high number of assessments that were due that week.

Table 1: Writing Circle survey statements for which students indicated agreement or disagreement.

Positive statements	Negative statements
Q1: Interesting to me	Q4: Irrelevant to my studies
Q2: Helpful to my understanding of today's topic	Q8: Somewhat confusing
Q3: Presented by knowledgeable speakers	Q10: Totally irrelevant to me and my studies
Q5: Helped me arrange my own thoughts on the topic	Q14: A total waste of effort
Q6: Presented clearly	
Q7: Thoughtful and provoking	
Q9: Useful in helping me meet others	
Q11: Designed to help me learn	
Q12: Helpful in becoming connected with other students in this class	
Q13: Relevant to my future studies and projects	
Q15: Helped me learn by reading other's work	
Q16: Useful in helping me structure my own writing	

Table 2: Attendances and survey response numbers across Writing Circle initiative.

Session	Number of attendees	Number of responses
1	65	48
2	52	36
3	36	21
4	7	4
5	36	20

Survey responses across the initiative

Statement questions: Question scores

Examination of survey responses to the 16 statement questions showed a noticeable shift in responses over the program, in that, positive statements increasingly elicited stronger agreement and negative statements progressively drew stronger disagreement. This can be seen visually in Figures 1a and 1b for week 1 and week 5 question scores. The question score is calculated as an average of responses, where Strongly agree response is assigned a value of 5, Agree coded as 4, Neutral as 3, Disagree as 2, Strongly disagree as 1, and Don't know responses as 0, and in of itself has no intrinsic value, but it does allow comparisons to be made of trends to statement responses between questions and across the weeks of the initiative. For the positive statements in the survey (Table 1), the number of statements with questions scores greater than equal to 4.0 (general strong agreement) increased from week 1 to week 5; in fact, by week 5 all positive statements were strongly agreed with across participants. Note that a question score of 3.0 would occur when collectively the cohort does not agree or disagree with a statement. Likewise, there has been a shift across weeks for the question scores of the contrary/negative statements (Table 1) towards lower scores indicating stronger disagreement over time (Figure 1b). These shifts are evident in weeks with similar attendances.

Further evidence that the cohort views become more polarized in support of the Writing Circle initiative are the five positive statements that students strongly agreed with in all sessions. These are listed below with question scores given in session order (session 1/ session 2/ session 3/ session 5). Note: Session 4 is not included due to small sample size.

> Q1: Interesting to me (4.10/4.06/4.33/4.40)
>
> Q2: Helpful to my understanding of today's topic (4.13/4.25/4.24/4.40)
>
> Q3: Presented by knowledgeable speakers (4.51/4.42/ 4.19/4.60)
>
> Q6: Presented clearly (4.35/4.31/4.24/4.50)
>
> Q11: Designed to help me learn (4.19/4.11/4.20/4.55)

Students also strongly disagreed with two of the four negative statements across all sessions, being

> Q10: Totally irrelevant to me and my studies (1.69/1.83/1.55/1.15)
>
> Q14: A total waste of effort (1.56/1.75/1.62/1.10)

Correlations between questions across weeks

For each set of weekly responses, Pearson correlation coefficients (ABS, 2013) were computed between all statement pairs as a check on consistency of student responses. As the Writing Circle program progressed, the number and strength of positive and negative correlations increased indicating that student answers were consistent, and supporting that opinion was becoming more polarized over time.

Participation question

Replies to the Q18 on survey instrument asked students "Was your participation today more than usual, about the same, or less than usual?" A comparison across weekly survey responses indicates that progressively more students self-reported that their participation was increasing over the program, which is perhaps not surprising given the initiative required more and more student engagement with their own assignments over the later sessions.

Open ended questions

Two questions required a written response from students. For Q17: Briefly describe how you participated in today's session and Q19: If your participation has changed, briefly describe the reason(s) why. The highest number of responses for both questions occurred in Session 1, with fewer and fewer responses as the sessions went on.

Positive statements question scores

	Q1	Q2	Q3	Q5	Q6	Q7	Q9	Q11	Q12	Q13	Q15	Q16
week 1	4.10	4.13	4.51	3.90	4.35	4.02	4.02	4.19	4.17	3.98	3.93	3.79
week 5	4.40	4.40	4.60	4.37	4.50	4.35	4.20	4.55	4.25	4.40	4.35	4.45

Figure 1a: Question scores for positive statements (Q1, Q2, Q3, Q5, Q6, Q7, Q9, Q11, Q12, Q13, Q15, Q16) across Sessions 1, 2, 3 and 5 of the Writing Circle initiative.
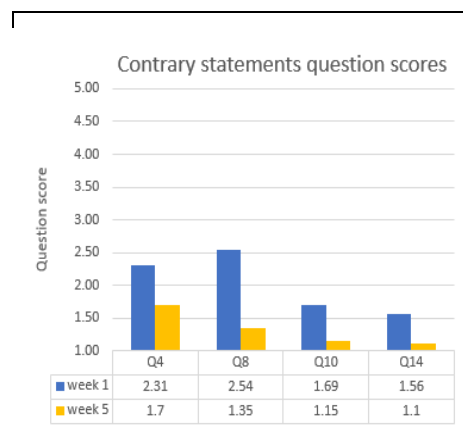

Contrary statements question scores

	Q4	Q8	Q10	Q14
week 1	2.31	2.54	1.69	1.56
week 5	1.7	1.35	1.15	1.1

Figure 1b: Question scores for contrary statements (Q4, Q8, Q10, Q14) across Sessions 1, 2, 3 and 5 of the Writing Circle initiative.

Discussion

Analysis of the perceptions of participants over the program indicate that students progressively came to appreciate more fully the Writing Circle peer-based learning approach, particularly when they had opportunities to practice on their own assessments.

Regarding content and presentation, students found the Writing Circle program

- *design helpful to learning and helpful to understanding the topic*
- *materials were presented clearly by knowledgeable speakers, and*
- *(increasingly more) interesting, thoughtful and provoking,*

Further, there is strong support that the cohort believes that the sessions were useful

- *in organising their own thoughts and in structuring their own writing through reading other's work*
- *allowing connections with others in the class, and it was*
- *relevant and worthwhile to current and future studies and projects*

Comments in response to open ended questions, when given, endorsed that the sessions were friendly, informative and that peer discussion was useful to student learning. From the first session, *"I feel great to learn how to give feedback, distinguish what the important part of writing that need to be given feedback",* was one of 25 responses that mentioned the social aspect of meeting new people in the session, and positively referenced the theme of the session. Over the program, open ended question responses affirmed the positive value and support of engaging with peers and academics outside of the classroom, and it has helped identify activities, like peer review and assessment rubrics, that students found helpful in developing understanding and analysis of arguments, critical thinking and report writing. This information will help modify and improve future Writing Circle programs, and based on this and also to build student speaking confidences, it is proposed to introduce an interactive workshop on professional presenting skills, and possibly altering and tightening program timing to avoid major student assessments.

The goal of the Writing Circle program was to support coursework Masters students in their critical thinking and report writing skills, especially as these students often lack the necessary written skills to produce a minor thesis, conduct a literature review or write software development documentation. The feedback from participants was an endorsement of the Writing Circle approach where an important aspect was the encouragement of students' partnerships and friendships, which are likely to support them in their technical writing endeavours.

Previously, little work has been done towards implementing reciprocal peer review as a way of improving the writing skills of Masters by coursework students within faculties and disciplines, and at the same time creating a sense of belonging for students in their first semester. This program attempted to provide both aspects.The findings from this pilot study add to the growing body of case studies into collaborative peer review, of which relatively few are in the computing and engineering (Sondergaard and Mulder, 2012; Carlson and Berry, 2008), and further, it emboldens us to continue with the Writing Circle program, whilst seeking methods to measure students' actual performances in critical appraisal and professional writing skills in future iterations.

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