Preliminary study on the influence of collaboration on the success and efficiency of postgraduate students

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Abstract: Postgraduate research calls for a novel contribution to the existing literature, which should be made independently by the researcher. In many institutions, the traditional approach does not encourage or promote collaboration with others as it is thought that a student of higher education should be able to function independently. This paper argues that postgraduate students could be more successful through increased collaboration with both other PhD students and their supervisor. This proposition is supported by a survey, which shows that students are highly in favour of increasing the extent of their collaboration with others. It is envisaged that collaboration should take place from the early stages of a PhD in the form of mentoring and working closely with a supervisor to the later stages, where experience enables guidance of others to more efficient methods and analysis techniques. Increased collaboration can also provide side-benefits such as better communication and leadership skills.

Introduction

Collaboration is a broad term used to describe individuals working together towards common goals. It may seem to be a contradiction that PhD students could benefit from working in collaboration since they are required to complete a novel piece of work individually. However, it is unwise to assume that all PhD students begin their studies with a clear direction, refined methodology and all the necessary skills to make a novel contribution to their research area. Johnston and Broda (1994) found that students felt as though they had not been sufficiently prepared for the autonomous work expected in their PhD. In addition, Rogers *et. al.* (2007) observed that most students were not prepared sufficiently for their research endeavours and that this did not change until the first year of study had been completed. Whilst it is possible to acquire the necessary skills for fruitful research on an individual basis, this is not necessarily the most efficient approach and students have the potential to achieve much more through real-time collaboration with others than they would alone (Whitelock *et. al.*, 2008).

This paper is a preliminary study, which seeks to demonstrate that increased collaboration with supervisors and peers could benefit postgraduate students without impeding their opportunity in making a significant contribution to the research field. It is envisaged that working with others could serve a multitude of purposes including: efficient transfer of knowledge, effective management of tools and equipment, motivation, greater sense of community (Wisker *et. al.*, 2007), creativity (Whitelock *et. al.*, 2008) and leadership skills. All of these factors are not necessarily directly related to the novel contribution required by the student but they are all important aspects in facilitating the research process.

Collaboration with Supervisors

Lack of emotional support and insufficient social interactions between supervisors and students are often found to lead to discontent on the part of the students (Leder, 1995; Wisker *et. al.*, 2007). While a supervisor can provide a wealth of knowledge to students, there are other important characteristics that a supervisor can cultivate to assist students in their journey towards PhD completion. Several useful ideas were presented by Whitelock *et. al.* (2008), who interviewed six supervisors of postgraduate students. These ideas included: talking about their own research; providing data for students to work on and analyse to assist them; jointly presenting at a conference; offering emotional support to overcome blocks to creative thinking; encouraging a student's confidence; and providing examples from their own work of the kind of creativity that they had been capable of in the past. Wisker *et. al.* (2007) suggested that it is invaluable for students to engage in problem-solving dialogues with their supervisor. Rather than imposing their own ideas and methodology supervisors could challenge and extend the ideas of the students, offering them new possibilities (Whitelock *et. al.*, 2008) and prompting innovative thinking.

Collaboration with Peers

As PhD students reach various stages of their degrees, the type of collaboration that they can benefit from will change. According to Lave and Wenger (1991), developing a community of practice allows new PhD students to function on the periphery of the community until they are prepared to become fully-active members. In this way, students have the opportunity to capture and take advantage of the past experience of others. Furthermore, by developing a culture of collaboration, students will identify themselves with a community having shared values and goals to which all members can contribute (Wisker *et. al.*, 2007). Other benefits of collaboration with peers include: opportunities for more publications; exposure to different projects (thus broadening expertise); and becoming familiar with different approaches, methodologies and creative ways of thinking.

The current lack in feeling a sense of community is highlighted by Beiber and Worley (2006), who conducted a survey related to graduates' perspectives. It was found that most respondents were unable to imagine themselves as "part of a larger professional group, whether within an academic discipline, an institution, or a profession" (Beiber & Worley, 2006, p. 1022). A similar observation was made by van der Heide (1994) who found that few students felt part of the faculty.

Data Collection

In order to develop a greater understanding of students' perceptions in regards to certain aspects of their PhD, directly or indirectly related to collaboration, a survey and questionnaire were prepared. This document was distributed to thirty five PhD students from two different engineering faculties, which were located in two different universities. Results were combined to represent a greater variety of students. The survey asked for some background information, identifying how long they had been doing their PhD and at which stage, if at all, they had begun to feel a part of the academic community. The questionnaire was designed to cover various stages of the PhD in order to ascertain a comprehensive perspective of the whole process. Respondents were asked to indicate their level of agreement to a series of statements on a five-point Likert scale (i.e. strongly disagree [-2], disagree [-1], undecided [0], agree [1], strongly agree [2]). The questions were further broken down into three generic categories for analysis, including: 1. Collaboration with peers (CP), 2. Student-supervisor relationship (SS), 3. Future possibilities (FP). A short form of the questionnaire statements is shown in Table 1.

Table 1 - Questionnaire

S1	Lack of clear direction	CP
S2	Feel more isolated	CP
S3	Beneficial to assist supervisor in paper	SS
S4	Supervisor gives examples from his/her work	SS
S5	Supervisor tries to understand your methods	SS
S6	Easy to find necessary tools	CP
S7	Supported by expertise	SS
S8	Learning from more advanced students	CP
S9	Collaborations with other phD students	CP
S10	Benefit from advanced courses	CP
S11	Being a leader in the workplace by PhD	FP
S12	PhD for better opportunities	FP
S13	Pursue as academic	FP

Results

The following graphs depict some general information about the respondents, including how long they have been doing their PhD (Figure) and their gender (Figure). The majority of respondents were in the initial stages of their studies but there were also representatives from many other stages. A gender bias was expected due to the male-dominated nature of engineering.
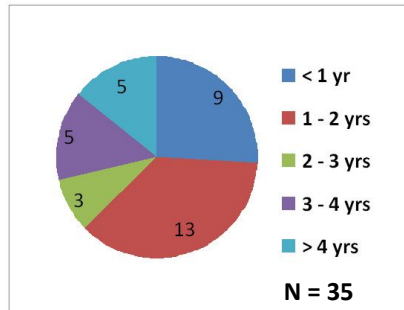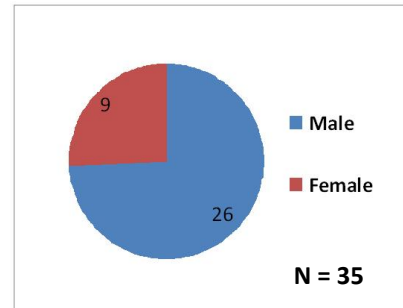

Figure 1 - Length of study in PhD

Figure 2 – Gender

Acceptance

Using the Likert scale in numerical form, it is possible to construct a graph which represents the degree of acceptance for each question. The degree of acceptance refers to the total score of a given statement, considering all respondents, using the numerical values for various responses discussed in the Data Collection section of this paper. It can be seen in Figure below that there was a largely positive response to the questionnaire statements. It should be noted that while some statements were written in such a way as to establish the extent of the existing collaboration, others were designed to ascertain whether students would benefit from further collaboration. There was an overwhelming positive response to Statement 9, which indicates that the respondents are largely in favour of collaborating with other PhD students. Other highly scoring statements were related to benefiting from advanced courses and also experiencing greater development by assisting one's supervisor in publishing a paper.
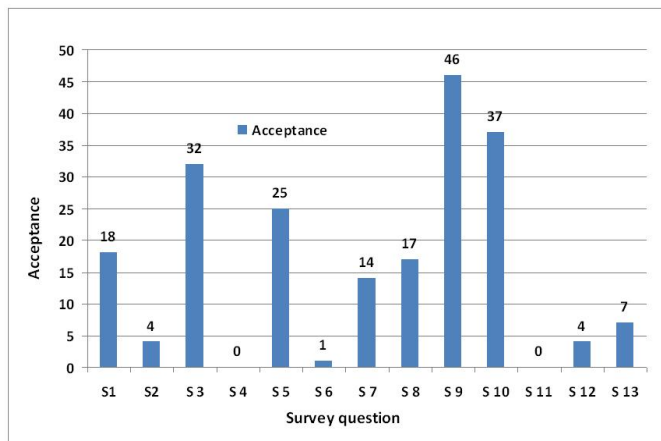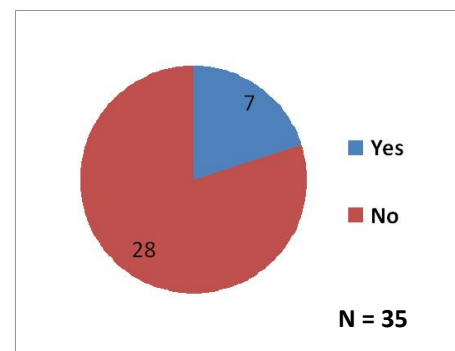

Figure 3 - Level of acceptance

Figure 4 – Paper published with supervisor

Collaboration with supervisors

Generally, the respondents expressed that they were satisfied with the support that they received from people of relevant expertise. Respondents agreed that their supervisor tried to understand their methodology rather than imposing his or her own. However, despite the high level of acceptance to the concept of improved development through publishing a paper with one's supervisor, the majority of students (75%) had not been given this opportunity (Figure). There was a relatively even distribution of respondents in agreement and disagreement with the statement that their supervisor often gives

examples of creativity that the supervisor has been "capable of" (Whitelock *et. al.*, 2008, p. 149) in the past.

Collaboration with peers

As mentioned earlier, respondents expressed a strong agreement that they would benefit from increased collaboration with other PhD students. There was also a high degree of support for the idea of advanced courses providing benefits for PhD students. These courses would allow students to learn together and thus develop relationships with others with whom they could discuss concepts on a more complex level. Respondents also indicated agreement with the statement that they would have benefited from learning about experimental apparatus and computer programs from more advanced students.

Feeling part of academic community

As indicated in Figure 5 below, there was a wide spread of responses in regards to how long it took for respondents to feel a part of the academic community. The majority (63%) of students took at least 1 year to experience this feeling or still did not feel part of this community.
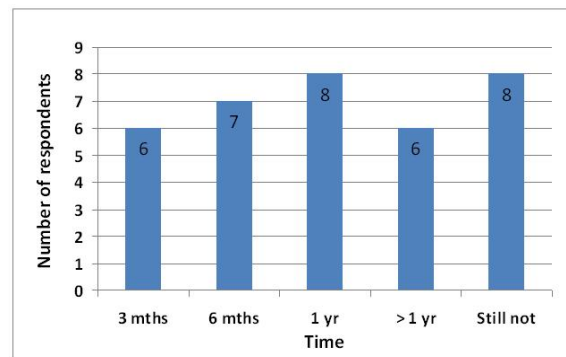

Figure 5 – Time taken to feel part of academic community

Correlation

The extent to which certain statements from Table 1 are related can be deduced by calculating the correlation coefficient, where the range of correlation coefficient is from -1 to 1. Referring to Table 2, it can be observed that the responses to some questions followed similar trends and for this analysis, the discussion will focus on relationships that are correlated by greater than 0.9. In some instances, the correlations were ignored when they occurred between statements which were from different categories (see Introduction for explanation of categories).

Table 2 - Correlation coefficients between questionnaire statements

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13
1	0.828	0.492	0.791	0.815	0.836	0.855	0.924	0.717	0.758	0.233	-0.099	0.279
	1	0.076	0.881	0.497	0.862	0.609	0.695	0.242	0.287	0.327	-0.089	0.291
		1	0.139	0.603	0.143	0.533	0.544	0.792	0.874	0.344	0.431	0.531
			1	0.741	0.987	0.830	0.846	0.181	0.393	0.612	0.210	0.541
				1	0.793	0.989	0.968	0.645	0.859	0.492	0.268	0.518
					1	0.872	0.888	0.268	0.458	0.513	0.104	0.443
						1	0.988	0.585	0.802	0.527	0.253	0.536
							1	0.639	0.814	0.469	0.170	0.490
								1	0.921	-0.132	-0.174	0.029
									1	0.230	0.159	0.363
										1	0.898	0.975
											1	0.921
												1

The strongest correlation was found between statements five and seven, which refer to the students' perceptions of how well their supervisors understand their methods and the degree of support they

receive from experts in their field. This could be explained as indicating that a supervisor with relevant expertise would be more likely to be capable of understanding concepts from the perspective of the student than one who is less familiar with the field. In addition, if students are supported by experts other than their supervisor, the supervisor is more likely to accept the student's approach as it has been verified. Another strong correlation was found between statements one and eight, concerning lack of clear direction and learning from advanced students. This could imply that through experiencing more support from advanced students in the early stages of a PhD, students could establish their pathway more clearly. There is also a high correlation between statements nine and ten, which cover collaboration and learning from advanced courses. This could possibly arise from students sub-consciously or consciously connecting advanced courses with the opportunity of communicating with their peers on an advanced level. Finally, the last three statements concerning leadership, employment opportunities and interest in academe are highly correlated. It appears that the respondents are generally undecided about these statements, especially in regards to whether colleagues who have graduated are satisfied with their employment opportunities after PhD completion.

Discussion

The results of this study show that students are receptive to the idea of increasing the extent of collaboration that they experience during their postgraduate studies. However, the shift to a more collaborative culture requires cooperation from all levels within a particular discipline. According to Haworth and Conrad (1997), an effective way of introducing collaborative practices is through "engagement theory." This theory is characterised by a participatory culture, which is defined as requiring a shared view of program direction. It also specifies the need for interactive teaching and learning, cooperative peer learning and connected program requirements. These last specifications could include the implementation of advanced courses, which was a strongly accepted idea in the questionnaire.

Many respondents to the questionnaire experienced a lack of clear direction in the initial stages of their PhD, a finding which is in agreement with Johnston and Broda (1994) and Rogers *et. al.* (2007). It is suggested that this problem could be mitigated if students were part of a collaborative community, as they would learn more quickly from others who had already been exposed to a similar situation (Lave & Wenger, 1991). In addition, respondents strongly supported the idea that assisting their supervisor in preparation of a paper would have benefited their development as postgraduate students. This is another potential way in which students could establish a clear direction in their PhD. Both collaborating more with their supervisor and feeling a part of a research community in the earlier stages of their studies may also enable postgraduate students to feel a part of the academic community sooner, which would solve another problematic issue that was observed in the questionnaire responses.

Given that the respondents in the current research were largely undecided in relation to all aspects of possible future benefits arising from PhD completion, it appears that this could be a symptom of a lack of collaboration currently experienced by these students. Collaboration is important not only for enhancing student satisfaction but also for the later career prospects of academic researchers (Asmar, Peseta, 2001).

PhD programs are often criticised for producing over-specialised graduates who struggle to adapt to the workplace (Manathunga & Lant, 2006). In order to target this deficiency, Manathunga and Lant (2006) proposed a system of attribute development, which included the idea of "inter-disciplinary collaboration." While the system of attribute development offers a very thorough approach to ensuring that PhD students graduate with broader expertise, it is necessarily a time-consuming process. According to Whitelock *et. al.* (2008, p.151), supervisors "experienced tension resulting from increased pressure to monitor and report on students' progress" and at times, this process was in conflict with "their desire to ensure adequate time for other important aspects of supervision."

Another approach addressing this over-specialisation is developing a research community where students are actively involved in collaborative activities with other researchers in their discipline. Kiley (2005, p. 1) reported that such a community would lead to benefits such as "timely completion, development of skills, and the preparation of future academics."

Conclusions

This study explored the acceptance of postgraduate students to the concept of increasing collaboration with both supervisors and peers. It was found that students are highly in favour of increasing the extent of collaboration with peers and they also strongly agreed that assisting their supervisors in preparation of a paper would have been beneficial to their development. The paper has discussed some effective methods of introducing collaborative practices found in the existing literature. It appears that in order to promote collaborative practices, it is necessary to develop a research community. Such a community would enable students to have more in common with their peers and promote more opportunities for collaborative activities, advanced courses and mentoring. In addition, students could develop a clearer sense of direction in the earlier stages of their PhD as well as gaining a sense of feeling part of a community.

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