FOSTERING COLLABORATIVE LEARNING THROUGH POSTGRADUATE GROUP PROJECTS IN STATISTICS EDUCATION

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Master of Science (MSc) research projects are an important constituent of learning in the postgraduate journey for most curricula. This article reports on the implementation of MSc group work projects for the final postgraduate thesis. To evaluate and measure students' attitude towards this idea, a two-level approach was designed: first a focus group to gauge students' attitudes and second, a detailed survey incorporating comments from the focus group. The survey addresses learning styles, attitudes, and issues of plagiarism and collusion. Results show that most students favour the group MSc project, whereas concerns have been raised about possible plagiarism/collusion issues and group arrangements. Results allowed us to develop detailed guidelines for MSc group projects that will be offered in the next academic year.

INTRODUCTION

Master of Science (MSc) research projects are an important constituent of learning in the postgraduate journey for most curricula. In many universities, the final postgraduate (PG) project is the last formal step for postgraduate qualification. At University College London (UCL), the postgraduate study of statistics is a one-year degree programme for full-time students (two years for part-time students). Students must complete a final project during the summer term after successfully completing all postgraduate courses. The project involves research related to select and specific fields.

All students are provided with the list of potential projects at the beginning of their studies so that, along with their supervisors, they can determine the most suitable project for them. Students are invited to choose up to five potential projects and to rank them. This method has been recently implemented to allow students enough time to carefully select their desired field of research and to meet with their supervisors. Nevertheless, some of our students still end up with an undesirable project due to the increasing ratio of students assigned to supervisors.

The increasing numbers of students in the recent years, the high student to staff ratio, online and hybrid classes, and students' limited interactions with staff and students has affected student performance and their level of engagement with individual projects. We decided to propose a more collaborative method for the final postgraduate research project (Ibeas et al., 2006). In addition to reducing the student to staff ratio, MSc students in statistics should be provided opportunities to learn collaboratively because collaboration is essential in professional settings (Belli, 2001; Kirk, 1991; Love-Myers et al., 2015).

Research studies indicate that supervisor "time availability" was the single most determining factor leading to success or failure for a MSc thesis (Del Río et al., 2017). Corcoran (1984) and Rodrigues (2005) identified that certain student characteristics and attitudes can determine the success of a master's thesis project: (a) students' academic ability; (b) students' judgement and cognitive capacity; and (c) student's tolerance for ambiguity. Hence, students' attitudes are the most important factor in our research. The group project will allow students to have more freedom in choosing projects that are more suitable to their abilities and hence will enhance their attitudes towards thesis work. Most importantly, working collaboratively during the MSc project will prepare students to embrace teamwork in their workplace.

There is a significant difference between group work projects in a classroom setting and MSc projects. For the former, assessment and final grades tend to be the same for all group members; however, for a groupwork MSc project, the final assessment and feedback is determined on an individual basis. Given the nature of statistical projects that involve data analysis and implementing statistical methodology, a group project allows students to work on an individual basis while communicating and collaborating with peers on methods or using the same dataset to enhance learning and interpersonal skills.

To offer such projects, we endeavored to investigate students' perspectives and their general attitudes towards this idea. Incorporating suggestions from students' surveys and a focus group along

with supervisor suggestions has provided the department with clear guidelines on the structure of the proposal to be offered in the next academic year. Students are very much interested in taking part in MSc group projects, which entail several students completing similar projects (for example, all using a common dataset or a complex computer simulation), each with different objectives.

In this paper, we investigate students' perspectives on implementing MSc group projects in the department of Statistical Science via a focus group and pilot survey. Analysing the results, most students favour the group MSc project, whereas their main concerns relate to plagiarism/collusion issues and project arrangements.

METHODOLOGY

Discussions with the Statistical Science Department's Teaching Committee showed that staff favour MSc group projects (a) to promote collaborative and cooperative learning in an analogous way to workplace settings and (b) to optimize the student to staff ratio. The plan is to introduce MSc group projects for the next academic year and to monitor its implementation and execution using regular feedback from both students and instructors. Particularly important for fostering partnerships between staff and students is designing and implementing the MSc projects in ways that allow their different voices to be heard. Hence, the design incorporated a two-level approach involving a focus group and a survey (Iarossi, 2006; O'Brien, 1993).

The purpose of the focus group was to determine students' attitudes towards group work. The survey needed to touch on all possible concerns about the project and a variety of factors that might interest students (Morgan, 1996; O'Brien, 1993). As part of a UCL Changemakers fund, we first advertised the investigation to MSc students and hired seven students for the student-led focus group. Although we had a limited number of applications, we hired students with diverse backgrounds and experiences to discuss survey questions, guidance for students, and guidance for supervisors.

Following the focus group, we designed and prepared a 22-item survey that was circulated to all MSc students via email and social media via students reps. The aim of the survey was to collect students' opinions on different aspects of the implementation and functioning of the MSc group project. In particular, questions addressed meeting arrangements, group formation, supervisor and peer feedback, peer assessment, and collusion and plagiarism issues. Due to time constraints, we were not able to circulate the survey to alumni but will do so during the summer term. The response rate for the survey with MSc students reached 47%, which reflects students' interest in the topic.

The focus group and the survey allowed us to hear students' perspectives on the topic and to adjust guidelines for both students and staff, especially with regards to plagiarism and collusion issues, to ensure the MSc group projects can evaluate individual understanding with information comparable to that from traditional group projects.

OVERVIEW

Data Collection

Data were collected during March and April 2021. Following consent from all seven participants, the focus group session was recorded. Five part-time and 42 full-time MSc students from the Statistical Science department completed the survey questionnaire. The sample included 46 students who were studying for statistics-related degrees and one student who was studying for an engineering degree.

RESULTS

Focus Group

A total of seven students took part in the focus group that raised three main concerns. They were concerned about how much extra work a group project might require when compared to an individual project. They suggested regular group meetings in which students might give a short presentation every few weeks, although they raised a concern that some students might not be willing to share progress with group members and that planning presentations would be time consuming without contributing to the project. Another suggestion was that group meetings should be voluntary (Biajone, 2006), with students attending only if they had questions or to report their progress to the supervisor.

A second major concern was assessment of MSc group projects. Because the projects involve peer interaction, the focus group suggested capturing this component in an assessment (Nordberg, 2008;

Topping et al., 2000). They suggested that part of the final grade (5% for instance) could be peer assessment, which will encourage collaboration among students. Fairness could be a problem, however, because individual and group projects would likely require different marking schemes. A related concern was whether students should discuss the project in the presence of a supervisor. Interaction with peers can be assessed by a supervisor to a certain extent. If the supervisor attends group meetings, they can take collaboration into account when grading the project.

A third concern raised by the focus group was plagiarism (Hayes & Introna, 2005). Students were concerned about the extent to which group members can help each other without colluding. Because students would work on similar projects, a certain degree of similarity could be expected. Thus, students might share useful papers and textbooks. However, students' capability of finding useful resources might not be assessed fairly if group members are sharing the resources (Carroll, 2002).

To address these concerns, survey questions and guidelines for students and supervisors were also discussed by the focus group. Proposed guidelines would advise students to aim for inspiration through their collaboration without copying or assisting with large parts of other's projects. The projects should try to maintain a degree of "individuality" but in the spirit of fruitful collaboration and mutual inspiration. For the detailed guidelines that were developed, we refer the reader to the appendix.

Finally, students acknowledged that this is an interesting experience for MSc students, and can particularly encourage students to investigate, gain research skills, and boost statistical and critical thinking. It is also a good way for our MSc students to receive more help because they will be able to meet and work constructively and collaboratively to reach a conclusion and/or to get peer feedback. The advantages of group work seem to outweigh the drawbacks as reflected by the survey below.

Survey Analysis

The survey was used to investigate students' perspectives on MSc group projects (Anderson et al., 2008). Survey results aligned with our expectations that students would favor MSc group projects provided that some arrangements were guaranteed. In fact, 91.66% of respondents agreed with the statement "An MSc group project will help me develop not only my research skills but also my ability to collaborate, communicate, and manage my workload more efficiently." Overall, only 33.3% of the respondents preferred a MSc group project over an individual project at the beginning of the survey. About 19.4% of the respondents found a group project less desirable than an individual project, whereas 47.2% of the respondents expressed no preference. The latter number dramatically decreased at the end of the survey when responding to: "Would you now consider being part of a MSc group project if the arrangements you voted for are implemented?" Only 16.67% of respondents were not willing to join a group project compared to 83.3% of respondents who would like to be part of a group project. Figure 1 shows how students' answers changed after considering further arrangements for implementing MSc group projects. About 60% of the respondents who found MSc group projects less favorable were now willing to be part of an MSc group project compared to about 80% of those who had no preference and were now willing to consider the option of MSc group projects.

A key finding here is that a significant proportion of respondents would only be willing to consider MSc group projects if certain arrangements were implemented by the department (Kiley & Cumming, 2015). The arrangements related to the main concerns raised by the focus group: (a) meeting arrangements and collaborative work assessment to mitigate extra work, (b) supervisor and peer feedback, and (c) plagiarism and collusion.

Meeting Arrangements and Collaborative Work Assessment

In response to a question on group size, students preferred group sizes of two or three, with 41.7% and 38.9% of the votes, respectively. A majority of respondents, 66.7%, agreed that they would be more likely to get involved in a group project if they could work with peers they already knew or with whom they previously collaborated.

Among all survey participants, 58.3% prefer to have a mix of individual meetings and joint meetings to collaborate on or get feedback on the group project. Of the remaining respondents, 11.1% prefer to have individual meetings only, and 30.6% prefer to have joint meetings only. The majority of respondents, 72.22%, would prefer to have the option to drop out of the group meetings during their project, which would require supervision flexibility. In the context of joint meetings, 57.1% of the respondents would like to have the meeting under supervision, whereas 28.6% of respondents prefer not

to be supervised during joint meetings. The remaining 14.3% of respondents do not mind whether joint meetings are supervised or not. With regards to project assessment, in most of cases, the supervisor would be able to judge and assess student collaboration and interaction as suggested by the focus group. In the context of joint meetings, 77.8% of respondents reported that they prefer to give a short presentation and discuss their progress with groupmates, whereas the rest do not care or are not willing to give short presentations about their progress during joint meetings. We believe this would still offer supervisors opportunities to gauge student participation and collaborative skills for feedback and assessment. It is reassuring to see that most students are willing to share their progress, which facilitates assessment and alleviates the first and second concerns discussed by the focus group.
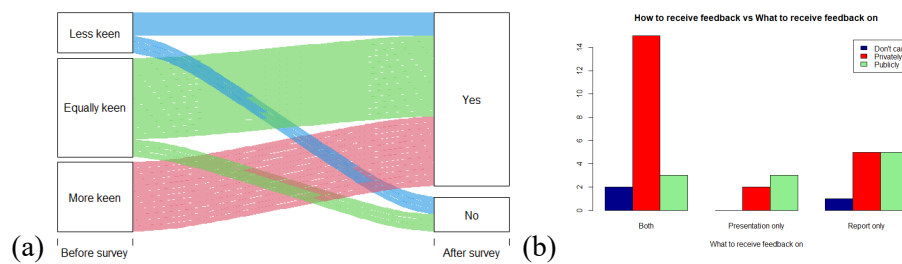

Figure 1. (a) Survey respondents stratified by preferences for MSc group projects at the start and end of the survey and (b) Participant preferences for feedback in terms of privacy and work product

Supervisor and Peer Feedback

Receiving feedback from either supervisor or peers during the MSc project should help to flag any potential plagiarism and collusion issues early enough to resolve the issue before final submission. Additionally, feedback effectively helps with continuous monitoring and assessment of projects. Most survey participants, 61.11%, reported that they would prefer to receive feedback in private compared to 30.55% that would prefer public feedback. The remaining 8.34% did not express a preference. (See Figure 1(b).) With respect to the frequency of peer feedback, survey respondents preferred feedback midway through the project as their first choice and then after the first draft and immediately after their project is finished. The least popular choices were every two weeks and monthly, which also reflects the focus of students' thoughts with respect to increased workload. Further, 63.88% liked the idea of peer assessment compared to 33.33% who are opposed to it and potentially concerned about collusion issues.

Plagiarism and Collusion

Although the majority of the participants do not have a problem sharing their work and see benefit in the group meetings, they are worried about possible plagiarism issues. The survey results suggest that one solution to this problem might result from citing other group members' contributions; the majority of survey respondents were in favor of this idea. Figure 2(a) shows that 55.56% of the participants suggested giving both written and verbal credit to other group members for their ideas or contributions, whereas 16.67% would prefer to give credit verbally and 16.67% would prefer to give credit in written form. Of the remaining respondents, 8.33% would choose a different way to give credit, and 2.78% did not respond to this question. A large majority of the participants, 86.11%, would like to submit a summary of each group meeting to avoid plagiarism, compared to 8.33% who are opposed to it and 5.55% that did not respond. A clear majority of respondents appreciate the idea of citing others' contributions, and the majority of these respondents would prefer to give both written and verbal credit.

Other Effects

Figure 2(b) reveals no noticeable difference in the proportion of students who prefer a group project compared with an individual project. The results of a chi-squared test analysis also confirm this point. From the chi-squared analysis, differences between first year and second-year students are not discernible (p-value=0.83, χ^2=0.51). We can conclude that there is no evidence of a significant difference between preferences for a group project or individual project between the two groups.
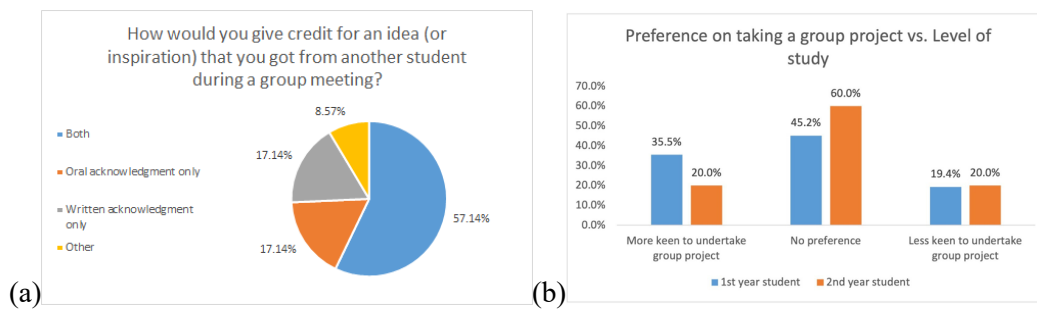
Figure 2. (a) Acknowledging peers' contributions preferences and (b) Stratifying respondents by status

CONCLUSION AND FURTHER RESEARCH

About one third of the respondents favored undertaking MSc group projects initially, but if the proposed arrangements were to be implemented, more than 80% of the participants would be willing to participate in a group project. Focus group participants expressed three main concerns about implementing MSc group projects. First, group work might involve extra work, especially when communicating progress and preparing presentations during joint meetings. Second, focus group members were concerned that assessment of collaborative work might be difficult to quantify. Third, group projects would be more prone to collusion because students work on similar datasets or with similar concepts. To implement group projects in a way that addresses these concerns, the survey gauges student interest in some of the proposed solutions. For instance, meeting arrangements can be made to mitigate the first and second concerns. Participants prefer a mix of individual and joint meetings so that the workload is reduced while still being able to share progress under supervisor assistance on occasion. Under this framework, assessment of collaborative work can also be guaranteed to a certain extent because participants seem to appreciate the presence of a supervisor during joint meetings. Students also favour peer assessment to assess their contributions to a project. Finally, plagiarism and collusion concerns can be alleviated by ensuring that group members' contributions are acknowledged. To conclude, this is an authentic experience for MSc students that can be particularly encouraging for students not only to investigate, gain research skills and boost statistical and critical thinking, but also to promote self-directed learning, deep learning, and consolidated learning by explaining their work to others. The current work will successfully enable us to offer this option to students and regularly monitor the functioning of these projects.

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APPENDIX: GUIDANCE FOR SUPERVISORS OF GROUP PROJECTS

This document provides guidelines and tips for supervisors organising BSc or MSc projects. The practice is common in the department; usually includes several students exploring a specific dataset, model, or research topic; and joint group meetings might be organised. In the case of BSc or MSc projects, supervisors need to pay particular attention to make sure the projects work well for each student.

- Joint supervision meetings are in no way mandatory but may be of interest to some supervisors and students.
- If organising joint meetings, the supervisor should ensure that each student also has one-to-one meetings at least once every three weeks (or more regularly where possible). If the student struggles with the format of joint meetings and requests one-to-one meetings as a default, the supervisor should take this into account and grant the requests whenever possible.
- The supervisor must always make sure that the students understand the plagiarism and collusion guidelines of the department and how they apply in this particular case. For example, students should be clear on how much, and how, they are allowed to communicate with students whose project(s) relate to theirs, and what would be considered either plagiarism or collusion.
- At the stage where the supervisor first proposes projects, they may want to outline when several projects are related. This is not mandatory, but students may prefer to be aware of this before selecting such a project. This is particularly relevant in cases where joint meetings will be organised by the supervisor.
- If organising joint meetings, the supervisor may find it useful to ask students to each write a brief summary of the meeting, including what they are expected to do before the next meeting. This is in no way mandatory, but supervisors may find it useful to ensure everyone's expectations are clear.