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Giving students an informed choice when selecting teams for group work

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Most large scale software projects require team work. However, it is a common problem that, when forming teams in a university setting, students know little about each other, resulting in dysfunctional teams. To help alleviate this, we ran three small preliminary assignments before students formed a team for the last major project. The idea was to encourage students to work with a variety of group members before they could choose their final team. The results showed that half of the final groups had a makeup that changed from their first initial group.

Keywords: group work, student teams, software development, game development

Introduction

Group assignments are commonly used in education as a means of giving students an industry-like group experience. Particularly, large-scale software development jobs require personnel to work as a team, because it is beyond the ability of an individual to finish them. However, to set up an effective team in a group assignment setting is not an easy task. For example, in an industry environment, team mates would be chosen by an interview process for a particular skill set. But in a university setting, students typically do not know each other's capabilities. Therefore the skills of each group member may not complement each other. Also, in an industry environment, with hierarchical management and established team culture, team members are more likely to focus on their task. However, in a university setting, management by peers and lack of pre-existing team culture could result in lack of motivation for some group members.

In this paper, we report on a project where students undertook three small projects with different team members to give them a better idea of who to choose as partners for a final project. The aim was to give students time to get to evaluate each other's capabilities, skills and team culture so that the final project team would contain members with complementary skills and similar levels of motivation.

The rest of this paper is organised as follows: Firstly, the benefits and problems of group assignments as highlighted in existing literature are discussed. Then, we give a detailed description of our experimental setting. Finally, we present the results from our study followed by some conclusions.

Literature review

Previous studies show that group assignments can develop students' interpersonal and team work skills (Kelly, 2008). They can also encourage active, collaborative learning instead of passive learning (Kelly, 2008). The group assignment can be used as evidence of a student's ability to work with real world problems and apply theoretical knowledge. This evidence greatly improves graduate employability (Fearon et al., 2012). Another major benefit of group assignments is that they emulate real world practice and help students to develop transferrable skills, so they will not feel intimidated when they enter the work force (Fearon et al., 2012).

Though group assignments have many benefits, students also encounter problems with group work, with nearly half of the students reported having frequent problems with group assignments (Ford & Morice, 2013). Clashes between group members are one of the major problems in group assignments (Ford & Morice, 2013). Since the group assignments involve more than one person, and each member comes from a different background, it is normal to have different ideas and opinions which could cause conflict at any time (Hede, 2007).

Another problem in group assignments is that members often do not have complementary skill sets. To form an effective group, students must have the mixture of the necessary skills, knowledge, and ability to perform the task at hand (Ettington & Camp, 2002). For example, when creating a computer game, if all the group members are only good at coding, and lack graphic design skills, the game might be fun, but it may not be attractive.

Kelly (2008) has stated that the way groups are selected has an impact upon the outcomes. If the right members are selected, students will enjoy group work as a learning method, and perform better. The data suggest that the more a student believed the group selection process to be fair, the more effective were the outcomes (Kelly, 2008). Kelly also found that to give the students permission to form their own groups is to give everyone an equal chance of working together and being responsible for their own decisions. Therefore, in the work we report here, students attempted small trials with various members before they chose group members for their major assignment.

Method

This study was conducted among the students of a Game Design and Production class. This class is run as part of a Games Programming major, within a Bachelor of Computer Science degree. The class had no pre-requisites, attracting students from art and design disciplines in addition to Computer Science students. Such a mix of students is ideal for this study as development of any software is usually undertaken by multi-disciplinary teams. In past iterations of the unit, we observed that students from the same disciplines were drawn to each other as they knew each other prior to the class.

In the experiment, there were three short (one week) group projects, referred to as "three games in three weeks", run as a precursor to a longer group project. Each week the students created a new game within a different group of three members. Students could choose their own groups, switching members each week so as to work with different people each time. The purpose of these three small trials was to give students the chance to work with a wider variety of others, so they had a better idea whom to choose when forming the final project group. We collected data about the composition of each small group to compare with the final group formation. We also conducted a student survey (using a 5-point Likert scale) to find out for the three initial groups: which groups they thought worked well together; whether they thought the game produced by the group was fun to play; and whether they believed they gained experience by working in the group.

Groups for the major assignment also consisted of a maximum of three people, chosen from anyone in the class, whether they had worked with them before or not. This assignment required finishing a larger game within seven weeks. Since this final assignment was allocated a high proportion of the total marks for the unit, the formation of the final group was critical for the students. Examining the relationship of the group formation between the first three projects and the last project could indicate how the earlier group experience affected the final group formation. We compared the formation of final groups with the formation of three small projects to see if students were more likely to work with an individual group (first, second or last group) and also if they were more likely to work with the group in which they had earned a higher mark.

Results

There were a total of eight groups in the final project. We used the final group formations and compared them with the previous group formations, in order to find the relations between them.

Firstly, we tried to find the factors that may have affected the decisions involved in final team formation. We categorised them as "Higher Marks", "First Group", "Second Group", "Third Group", "Mixed Group" and "New Group". "Higher Marks" meant that the final formation matched one of the small project formations and in that group the students had also gained the highest marks of all three groups. "First Group" meant the final formation was identical with the first group formation. "Second Group" meant the final formation was identical with the second group formation. "Third Group" meant the final formation was identical with the last (third) group formation for the preliminary three games. "Mixed Group" meant the final formation was not identical with any group formation, but two members had worked together before. "New Group" means the final formation is not identical with any of the 3 previous group formations.

We found that only three out of the final eight groups corresponded to groups that the students got the highest mark in. Figure 1 shows the number of groups for the final project based on where the team members had experience working together. This shows that half of the groups (4) corresponded to an identical formation as for the first short assignment. Out of the other 4 groups, one was identical to the groups for the third game. There were two mixed groups and one new group. These results seem to indicate that half of the students did find a functional group to work with in the first project. Importantly however, the other half changed their group makeup for the final project. In a traditional group assignment, where there are no pre-cursor small assignments, such a change would not have been possible.

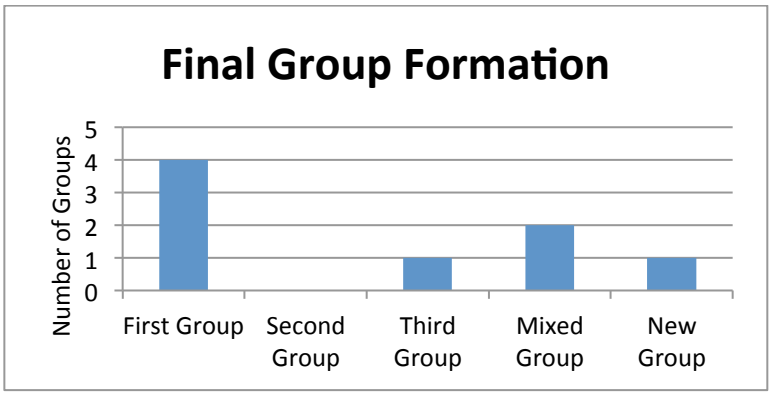

Figure 1: Number of groups for the final project, broken down into which groups the students previously worked together.

An investigation was conducted on the survey data to determine whether there was any significant relationship between the paired scores of the perceived fun of the produced game, whether teams worked well together and whether students felt experience had been gained in these three games. The assumptions underlying of this research were:

- Ho = There is no relationship between the scores of game fun, team worked well and experience gained for these three games
- H1 = There is a relationship between the scores of game fun, team worked well and experience gained for these three games

The data was analysed using non-parametric Spearman's rho correlation. The correlations were found for game 1, 2 and 3 are show in Tables 1, 2 and 3 respectively.

Table 1: Spearman's rho analysis for Game 1, examining paired correlations between whether the students thought the game created was fun (fun), whether they worked well as a team (team) and whether they gained valuable experience (ex).

			fun Game 1	team Game 1	ex Game 1
Spearman's rho	fun Game 1	Correlation Coefficient	1.000	.264	-.187
		Sig. (2-tailed)	.	.201	.372
	team Game 1	Correlation Coefficient	.264	1.000	.214
		Sig. (2-tailed)	.201	.	.304
	ex Game 1	Correlation Coefficient	-.187	.214	1.000
		Sig. (2-tailed)	.372	.304	.

Table 2: Spearman's rho analysis for Game 2.

			fun Game 2	team Game 2	ex Game 2
Spearman's rho	fun Game 2	Correlation Coefficient	1.000	**.516****	-.025
		Sig. (2-tailed)	.	**.010**	.908
	team Game 2	Correlation Coefficient	**.516****	1.000	.145
		Sig. (2-tailed)	**.010**	.	.500
	ex Game 2	Correlation Coefficient	-.025	.145	1.000
		Sig. (2-tailed)	.908	.500	.

**. Correlation is significant at the 0.01 level (2-tailed).

Table 3: Spearman's rho analysis for Game 3

			fun Game 3	team Game 3	ex Game 3
Spearman's rho	fun Game 3	Correlation Coefficient	1.000	**.489***	.124
		Sig. (2-tailed)	.	**.018**	.574
	team Game 3	Correlation Coefficient	**.489***	1.000	.246
		Sig. (2-tailed)	**.018**	.	.258
	ex Game 3	Correlation Coefficient	.124	.246	1.000
		Sig. (2-tailed)	.574	.258	.

*. Correlation is significant at the 0.05 level (2-tailed).

From the results in Tables 1, 2 and 3, it can be seen that the only significant relationships were a moderate positive relationships between 24 students' game-was-fun scores and team-worked-well scores in Game 2, (r_s= .52, n = 24, p < .05), as well as moderate positive relationships between 23 students' fun scores and team-worked-well scores in Game 3, (r_s= .49, n = 23, p < .05). This can be interpreted to mean that, for games 2 and 3, if students thought that they worked together better as a team, they also produced a game they thought was more fun. Interestingly, no such correlation was evident between team work and the fun of the game produced for Game 1. Examining the responses, out of the 25 students, none for Game 1 stated on the survey that their team did not work well together and only three thought the game produced was not fun. This could have resulted from students at that stage not having a good grasp of how well a team could work together or how fun their game could be. In the end, after working with two other teams on Game 2 and 3, half of the final teams were not the same as for Game 1.

Conclusion

Group assignments provide good practice for students before they enter the work force. The task of forming functional groups is however an issue for students who have limited knowledge of each other's skills and motivation. In our experiments, we gave the students three short group projects before the main project of the unit, as a way for them to get to know their peers. Results showed that half of the final project groups were not simply identical to the student's first group, indicating that their first choice of group might not have been an ideal match. Overall, based on student response, the better the group functions, the better the quality of the product. In this case, the game they were creating was more fun. Further research can be conducted to explore different roles of students within groups and their interaction.

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