Group work in IT: Investigating the student learning experience

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It is well known that students dislike working in groups. However, preparing students for the workplace is important and part of the graduate attributes for each university. As such, group work can be seen as an integral part of university assignments for many students. This paper reports on the group work experiences of IT students who complete a team work assessment as part of one of their subjects. Most students in the cohort study online which can add some complexity to the team work process. Most students felt that all members of the team were given an equal opportunity to contribute, with students reporting they generally worked at least adequately well together. One of the obstacles to working together was reported as working together online due to not being able to meet face to face. Overall, with scaffolding, working as a team does not have to be a negative experience for students and can provide deep learning.

Keywords: online learning; teamwork; group work; project-based learning

Introduction

It is well known anecdotally that 'group work' in an educational setting is disliked by students and staff. This is often due to the belief that less capable students do not fully participate or contribute, relying on more capable students to complete the required work (Sofroniou & Poutos, 2016). The capable students therefore spend time resenting other group members and less capable students are possibly being rewarded for work they did not do. Poor design of learning activities significantly increase the likelihood of such problems arising (Weimer, 2016). Thus, in this study it was therefore the aim of the lecturer to design a series of learning tasks that reduced the likelihood of these problems occurring. This paper shows the results of the study in which students reflect on their team work experiences and how it assisted them to complete the team assignments.

With this in mind, two subjects taught by the School of Computing and Mathematics ITC218 ICT Project Management and its paired subject ITC505 ICT Project Management have been identified within their subjects as suitable for addressing team work so that it may further foster deep learning. Based on constructive alignment and using a learning design approach, the subject assessments have been modified to incorporate team work and peer to peer interaction. A backward design approach was used to develop assessment items, resulting in the constructive alignment of learning outcomes (Biggs & Tang 2011), while the use of scenarios and team work has enabled authentic learning.

This project investigated student perception of team work before engaging in the team work activities and after they have completed the learning activities including an assessment item, were designed using a learning design approach. Specifically, the project investigated whether students report:
- learning from their peers and teaching or sharing knowledge with their peers;
- learning more or differently through gaining different perspectives from team members, than they would have working on their own;
- the re-designed learning tasks have overcome, some or all of the known problems experienced while participating in team work in an educational setting.

One of the key concepts of learning design is the ability to re-use frameworks or templates. This is so that innovation and best practice can be shared, whilst conserving resources. It is envisaged that if the re-design of the learning tasks are deemed successful, that the framework, or learning design may be re-used in other subjects and disciplines to enable successful peer to peer learning.

It is the intention of the researcher when designing the assessment tasks for students to not only gain knowledge of project management theory, but to experience project management through team work. The aim was also for students to be able to reflect on the theory they learned in the subject and compare the reality of their team work

experience (both positive and negative) and learn how they could improve their practice in future project and team work situations.

Literature review

Constructive alignment is not a new paradigm, however it has only recently gained traction in higher education (Biggs & Tang, 2011). Unlike traditional subject design that focuses on what topics are to be taught, constructive alignment uses an outcomes-based approach that focuses on which learning outcomes students are to achieve and to what level (Biggs & Tang, 2014, Biggs & Tang 2011). When using a constructive alignment approach, teaching activities and assessments are then designed to achieve those outcomes and assess the standard to which they have been achieved (Biggs & Tang, 2014).

Authentic activities can be defined as the kinds of activities "that people do in the real world that are completed over a sustained period of time, rather than a series of shorter disconnected examples" (Herrington & Kervin, 2007, p. 223). Using constructive alignment to design authentic learning tasks can provide students with real world relevance. Through collaboration and reflection, students can be given the opportunity to examine learning tasks from a number of perspectives, using a range of resources (Herrington, Reeves & Oliver, 2006). While poor design of learning activities significantly increases the likelihood of problems arising in collaborative activities (Weimer, 2016), there are a number of benefits to students when engaging in such activities. These benefits of students engaging in collaborative learning activities, include, but are not limited to:

- Engaging in subject specific discussions with peers
- Learning how to work cooperatively and support each other
- Developing effective team work and communication (including interpersonal and cross-cultural awareness) skills
- Assimilating multiple views to deepen knowledge and promote critical thinking
- Fostering individual accountability to the team
- Developing independent learning strategies
- Structuring out-of-class learning
- Mitigating learner isolation (Curtin University, 2015).

In addition, in an online space, collaboration has additional benefits for both teacher and student, such as flexibility, managing student participation and behaviour, trackability and student autonomy (Curtin University, 2015). It is widely known, that over the past 15 years, that technology-supported teaching, learning (*e-learning*), and assessment has been increasingly used in open, distance, and flexible learning. As a result, there has been significant investment in the development of learning technologies, systems, and resources (Donald, Blake, Girault, Datt & Ramsey, 2009). Although researchers have developed several definitions for the term learning design, one definition refers to the variety of ways that student learning experiences can be designed, specifically online learning experiences. It is also worthwhile noting, learning design can be described as a 'framework' to make explicit the conceptual and practical underpinnings that form a sequence of educational type activities in an online environment (Dalziel 2008). Learning Design has also been described as "the act of devising new practices, plans of activity, resources and tools aimed at achieving particular educational aims in a given situation" (Mor & Craft, 2012, p.86). It should be informed by:

- subject knowledge;
- pedagogical theory;
- technological know-how; and
- practical experience

Additionally, learning design should also encourage innovation within these areas while supporting learner efforts and aims (Mor & Craft, 2012).

Learning design as a framework supports student learning experiences ("Learning Design: The Learning Design Construct," 2003), including those online, with Oliver (1999) suggesting a learning design can be comprised of three key elements. These are: the tasks the learner is required to do, the resources that support learners to complete the task and the support mechanisms that exist from the teacher implementing it. It is learning design as a framework that provides a means of sharing innovation and best practice of successful learning activities and tasks (Campbell & Cameron, 2009). By removing subject content from successful learning activity and then breaking it down to its integral pedagogical tasks, a 'generic template' or 'learning design pattern' can be re-used. Adding content and resources to this underlying structure allows the template to be customised and therefore shared in other contexts (Cameron & Campbell, 2010).

From the literature review the following research question was developed:

1. Were the students in the subjects able to overcome common team work obstacles to work effectively as a team?

Methodology

This project uses design-based research for the methodology as it provides a "systematic, but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation" (Wang & Hannafin, 2005, p. 6). This iterative process allows for the design, redesign and development of both the teaching and data collection methods for the subjects. Thus, this paper reports on just the first iteration with the one subject with the second iteration currently being conducted.

A pre and post survey was conducted with the students. The pre-survey was conducted at the beginning of Session 2, 2017 and contained seven questions, with 19 participants responding. Background questions were asked of the students such as what year of study, age range and if post graduate or undergraduate or if studying online. They were then asked seven Likert scale questions on how they think they learn and work as a team member from their previous experience in completing group work.

The post-survey, asked at the end of the semester, contained 14 questions with 24 participants responding. Background questions were again asked as well as Likert scale questions on various aspects of team work. Students were also asked open ended questions about working in a team and about what they learned in their group and what knowledge they shared.

Results

From the 19 students who completed the pre-survey 58% (n=11) students were male and 37% (n=7) students were female and one student identified as other. Student ages ranged with only 5% or one student 21-24, 21% of students being 25-29, 16% were 30-39 and there were 37% identifying in the 40-49 age group. This suggests a very mature age cohort which is perhaps dissimilar from many other student cohorts for similar types of subjects. The students were asked to identify if they were undergraduate or postgraduate as the assessment was delivered in both of the paired subjects with 84% (n=16) checking they were post graduate students, which may in part suggest why the cohort is older than other cohorts. All of the students who completed the pre-survey were studying online.

In this survey students were asked, based on their previous experiences, whether they thought team work was a good idea. Of the 18 respondents 10 agreed, while one strongly agreed and two disagreed. The other five respondents neither agreed, nor disagreed. Students were also asked whether based on previous experience if they think they will learn more about the subject matter working in a team than they would if they worked by themselves. The results were mixed, with four who agreed or strongly agreed, and six disagreed or strongly disagreed, while nine were undecided. When asked whether they enjoyed taking part in team work, eight agreed or strongly agreed, four disagreed or strongly disagreed and seven were undecided.

At the completion of the subject students were surveyed again, and 24 students responded to the survey. All students who completed the survey studied online with only two students indicating they were undergraduate with 22 students being post graduate. The age distribution was mature with 25% of students in each of the 30-39, 40-49 and 50-59 age group with the others less than 29 years of age.

Students were asked whether they felt they learned from working as a team during the subject with eight students agreeing or strongly agreeing while 10 disagreed or strongly disagreed and another six were undecided. Students were also asked whether they learned more in a group than on their own, of which eight agreed or strongly agreed, 14 disagreed or strongly disagreed and two were undecided. Of the five respondents who strongly disagreed when asked what team members learned from them, two of the students commented *"I fed them a lot of information about the course [subject] readings, terminologies, assignment, etc."* and *"possibly just general knowledge about how the business processes in the case study would work in practice and how to work out reasonable estimates for various metrics (from experience)"*. Indicating while they thought they hadn't learned anything from their peers, other participants had learnt from them. This was supported by statements from those that somewhat disagreed who indicated that their peers learned from them both skills and subject specific content, for example *"what the assignment was actually about", "various project management knowledge from my past experience"* and *"how to use Slack."* These students who 'somewhat disagreed' that they learned more in a group, indicated that they had in fact gained new knowledge and skills from their peers

such as *"learned [a] good way to present learnings in table [sic]"* and *"how other people think about setting up a project and what it would look like, so a different perspective."*

Students who strongly agreed that they learned more in a group indicated that their peers also learned subject specific knowledge and team work skills from them, regardless of their background with quotes from students including *"software development guidance, as I'm a software developer. So was able to actually discuss the processes involved as if it were a real project"* and *"I had some knowledge of team values and organisation that come from my teaching background."*

Other students who strongly agreed indicated that they took on a leadership rather than peer to peer role with one student commenting *"making sure all members know what we are all working toward. Example first meeting one member was missing, it was up to me to bring him to speed about what have been discussed during meeting."* While other students were more unsure of their contribution to peer learning with one student suggesting at length *"unsure - all the team members were very capable and gave the impression of being able to think through problems and issues without panic or giving up. I really do think that they would have done a great job even if they were just working by themselves"*. These students indicated that they had a positive experience and learned from their peers team work, skills and subject specific knowledge including *"how willing people can be to help each other in a, as a team"* and *"how to properly write up a code of ethics."* and *"time management, since we were all working on* [the] *same assignment it was critical that each individual submits parts on time before next task. Also you could share different ideas and learn somethings concept that you didn't know before"* [sic].

Survey participants generally felt that all members of the team were given an equal opportunity to contribute with 62.50% (n=15) strongly agreeing and 21% (n=5) somewhat agreeing. Interestingly, from the 19 participants who completed this question in the pre-survey only 26.3% (n=5) strongly agreed and 31.5 (n=6) agreed to this same question. This suggests the way the group work was set up for members of the team to have an equal opportunity improved greatly within this subject. Finally, students generally felt they worked together on the project adequately with 37.5% (n=9) stating this and 25% (n=6) stating they did this well and then 16.9% (n=4) stating they did this extremely well.

Some members of the group mentioned overcoming obstacles during the group work in order to learn more about group work with one student commenting *"team collaboration with unfamiliar faces and different geography present unique challenges, in that, it is much more challenging to collaborate in a team where each member has prior personal engagements with work/family. This in turn reflected on the time and commitment we invested as a team to fully understand and agree on the final outcome of the project document"*, while another student commented they learnt *"how you can have a functional group work assignment by everyone taking turns to lead, and work on different parts cooperatively"*. This suggests lessons learned were important to the students, particularly in overcoming some of the challenges.

Discussion and conclusion

Ensuring the learning activities and assessment were constructively aligned (Biggs & Tang, 2011) allowed students to know what they needed to do in order to succeed in the subject and achieve relevant graduate attributes. Results indicate that all team members were given an equal opportunity to participate and they worked together on the project suggesting that they knew what was expected of them in order to do this.

Based on prior experiences only 60% of the students thought team work was a good idea, while after the team work had concluded students generally felt they had worked well together and had an equal opportunity to contribute. Student comments suggest that authentic learning occurred through the team work assessment and activities they completed. They also reported overcoming obstacles in their team work, suggesting the students they engaged in the project collaboratively as reported above (Curtin University, 2015). Their new skills in working collaboratively may assist them in the workforce in the future. This suggests that some of the university graduate attributes were achieved for the subject.

Only some of the students felt they had learned from working in a team at the conclusion of the group work. Interestingly those who thought they had learned from being in a team also thought their peers had learned from being in the group. It may be beneficial to directly teach team work benefits in the future so that all team members are more able to articulate what they learnt. Future research in this area may also be beneficial.

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