Journal of Information Systems Education

Volume 32
Issue 4
Fall 2021

Designing Group Assignments to Develop Groupwork Skills

Mairéad Hogan and Karen Young

Recommended Citation: Hogan, M., & Young, K. (2021). Designing Group Assignments to Develop Groupwork Skills. *Journal of Information Systems Education,* 32(4), 274-282.

Article Link: https://jise.org/Volume32/n4/JISE2021v32n4pp274-282.html

Initial Submission:	5 October 2020
Accepted:	4 March 2021
Published:	15 December 2021

ISSN: 2574-3872 (Online) 1055-3096 (Print)

Journal of Information Systems Education, 32(4), 274-282, Fall 2020

Designing Group Assignments to Develop Groupwork Skills

Mairéad Hogan
J.E. Cairnes School of Business and Economics
National University of Ireland Galway
Galway, Ireland
mairead.hogan@nuigalway.ie

Karen Young
School of Computer Science
National University of Ireland Galway
Galway, Ireland
karen.young@nuigalway.ie

ABSTRACT

The challenges of designing group assignments in university environments, with the aim of effectively developing teamwork skills, are well documented. It is often assumed that simply placing students in assignment groups will facilitate the development of the task and interpersonal skills necessary for teamwork. However, very often students circumvent this aim by dividing the assignment up and simply assembling the resultant work together at the end. This paper examines the impact of two innovative assessment approaches on the development of teamwork skills in a one semester UX (User Experience) module in a university business school. Students elected to attend either a one-day UX Hackathon or to create a tutorial on a topic relevant to User Experience Design (UXD). Both assignments required the submission of a video as the assignment report. The groupwork skills questionnaire (GSQ) was used to assess the impact of the two assignment types on students' teamwork skills. Analysis of the results demonstrated students who attended the UX hackathon exhibited significantly improved task related teamwork skills over those who completed the tutorial assignment. Neither group exhibited an improvement in interpersonal teamwork behaviors as measured by this instrument.

Keywords: Team-building skills, Team-based learning, Creative problem solving, Assessment

1. INTRODUCTION

Group assignments are an accepted part of the curriculum for most university students, particularly as research indicates working collaboratively can lead to a variety of social, psychological and academic benefits. These benefits include social support for learning, increased self-esteem, improved critical thinking skills, increased task success, improved individual student learning, increased creativity, improved motivation, and ownership of the learning process by students (Angelo & McCarthy, 2018; Burke, 2011; Hwang, 2018; Knapper, 2008; Laal & Ghodsi, 2012; Masika & Jones, 2015). Additionally, as work environments generally involve a level of collaboration with co-workers, incorporating opportunities in group assignments to develop collaborative skills, such as communication, teamwork, and leadership, can better prepare students for the workplace (Ashford-Rowe et al. 2013; Brown et al., 2019; Giuliodori et al., 2008).

However, research also reports students working in groups frequently do not achieve the desired goal of enhanced collaborative skills and teamwork (Burke, 2011; LaBeouf et al., 2016). Problems reported include members focussing on the task rather than the team, uneven workload as a result of free-loaders or overbearing team members, "Frankenstein products," which are a collection of individual student efforts, with very little integration or collaboration, participants being pressurized into agreeing with the majority opinion to avoid conflict, and difficulty identifying students who contribute more or less than their fair share (Burke, 2011; Fransen et al., 2011; LaBeouf et al., 2016; Lejk et al., 2006; Wilson, 2017).

As many group assignments are evidently not achieving their goal of developing teamwork skills of use in the workplace, it is important to more clearly identify the types of group work that will achieve this goal. This study examined the literature to identify approaches which enhance group learning outcomes. A group assignment based on these findings was designed and its impact on teamwork skills compared with that of a more traditionally structured group assignment.

1.1 Group Work in Higher Education

Group work assignments are not suited for all types of tasks. Group work is most suited to complex, ill-defined problems with a variety of correct solutions (Wilson et al., 2018). When used appropriately, it has benefits for both lecturers and

students. While most of the research has focussed on student benefits (e.g., social, psychological, and academic benefits), the benefits for lecturers include efficiency, method variation, and reduced workload (De Hei et al., 2014; Strauss & U, 2007).

Working in groups is, however, often unpopular with students (Burke, 2011; Isaac, 2012). Isaac (2012) states: "for many students, especially high achievers, *group work* is not a term to swear by, but rather one to swear at." Students frequently dislike working in groups, mainly due to their perception that it is inefficient, and a resentment of having to rely on peers. Research suggests students may have a valid point. While low ability students often improve their grades in group assignments, high ability students are more likely to attain lower grades (Lejk et al., 2006).

While many students resent working in groups, not all are oblivious to its benefits. Postgraduate students, in contrast to undergraduate students, believe dealing with low contributors and communication issues helps to develop useful skills for the workplace (LaBeouf et al., 2014). Additionally, after graduation, once they join the workforce, students are often able to retrospectively identify many benefits associated with academic group work (Kalfa & Taksa, 2017).

To ensure the benefits of working in groups are realized, group assignments must be designed carefully. Group tasks should be relevant and sufficiently complex to require collaboration. They must also be designed appropriately to ensure team interdependence, interaction between team members and individual accountability. A reward that extends beyond a grade (e.g., a final deliverable with inherent value, such as an article) and small group size are also important factors in ensuring benefits are realized (Angelo & McCarthy, 2018; De Hei et al., 2014; Fransen et al., 2011; Knapper, 2008; Scager et al., 2016).

1.2 Authentic Learning

Assessment for learning, rather than assessment of learning, is a key trend in higher education assessment, and can be used effectively to realize the benefits of groupwork (Brown, 2015). Black et al. (2004) defined assessment for learning as "any assessment for which the first priority in its design and practice is to serve the purpose of promoting students' learning." One such approach is authentic learning and assessment. Authentic learning, or "learning by doing," is not a new approach, having been used in apprentice training for generations. It is an effective approach in the development of competence and effectiveness, and requires the development of knowledge within the context of practice, rather than simply within the classroom (Black & William, 1998). According to Mejías and Monereo (2017), authentic learning is designed to motivate students to "become actively involved in the tasks and connect them to the world outside the classroom." However, it is important to realize authenticity and reality are not necessarily synonymous, thus allowing realistic environments to be simulated for the purpose of the learning activity. Authentic learning requires tasks that are realistic and relevant, a realistic environment, opportunities for socialisation and interaction, appropriate facilitation and guidance, encouragement for learners to take ownership of the process, and self-evaluation and reflection on the part of the learner (Ashford-Rowe et al., 2013; Fox et al., 2017; Mejías & Monereo, 2017; Wilson, 2017). Benefits associated with authentic learning and assessment include improved critical thinking, problem-solving and communication skills (Fox et al., 2017) and improvements in student motivation and their ability to recognize the functionality of materials learnt in the classroom (Mejías & Monereo, 2017).

One specific authentic learning approach, Challenge-Based Learning (CBL), has attracted attention in recent years. A guide to CBL (Apple, 2011) describes it as an approach where students and teachers work together to identify potential solutions to real problems and take resulting action. CBL has been shown to build skills such as leadership, problem solving, flexibility and critical thinking. Additionally, it improves student engagement in learning, and is an effective and efficient method of teaching (Johnson & Adams, 2011).

1.3 Innovative Assessment

Assessment for learning encourages lecturers to use innovative approaches to engage students and increase learning, while the use of innovative, effective assessment enables educators to strengthen their teaching (Burrell Storms et al., 2015). What then constitutes innovation in assessment? Hounsell et al. (2007) state: "that which is innovative in relation to assessment is taken to be that which is novel in the eyes of its begetters or beholders, and entails more than a minor or trivial adjustment or modification." Innovation is defined by students, shaped by diverse assessment experiences and preferences and, therefore, its impact is difficult to predict (Bevitt, 2014). The drive towards innovative assessment has come through a recognition that quality is not simply achieved via quantified learning outcomes but also via a broader, more holistic experience, where the students' perceptions and reactions to the learning situations are central (Zacharis, 2010). When developing innovative assessments, factors such as fairness, validity, reliability, workload (both student and lecturer) and applicability must be considered to ensure a valuable learning experience (Zacharis, 2010).

As with all group assignments, careful consideration of the deliverable is important for authentic assessment. The creation of videos has been identified as an effective approach. Videos improve student engagement with the learning process, improve student achievement, help develop desirable graduate attributes, such as communication skills, and help to simulate authentic situations in a way not possible with traditional coursework and assessment (Fox et al., 2017; Hawley & Allen, 2018; Hounsell et al., 2007) . Effective video assessment design requires alignment with the module learning outcomes (Hawley & Allen, 2018) and the provision of supports for students during video creation, as, for many students, it is an unfamiliar approach to assessment (Hawley & Allen, 2018; Ting, 2013).

1.4 Hackathons in Education

The hackathon is one example of an innovative, authentic approach to learning. A hackathon is an event where people with different skillsets work together intensively in teams to solve a specified problem within a tight timeline (Calco & Veeck, 2015). They work on the assumption participants will self-organize and, through effective communication, develop projects (Duhring, 2014). Some of the key benefits of hackathons to participants include: personal development; enhancement of skills, creativity and critical thinking; innovation; and networking (Calco & Veeck, 2015; Groen & Calderhead, 2015; Komssi et al., 2015).

When used as an educational tool, hackathon participants engage with a specified problem in order to develop relevant skills and knowledge. The hackathon provides an opportunity for experiential learning through the practical, social, and contextual aspects provided (Gama et al., 2018), as well as facilitating peer learning (Gama et al., 2018; Kienzler & Fontanesi, 2016). Multiple examples of hackathons used as an educational tool can be seen in the literature. While mainly used for computer science courses, they can also be used in areas such as User Experience Design (UXD), marketing, and science (Calco & Veeck, 2015; Gama et al., 2018; Kienzler & Fontanesi, 2016; Page et al., 2016; Richard et al., 2015).

When using hackathons for educational purposes, careful design is essential. Gama et al. (2018) suggest structuring in a CBL format with its associated 3 distinct phases: *Engagement*, where students define and explore the *Big Idea*, and, through identification of an essential question, identify a specific challenge; I*nvestigation*, where participants, through the use of guiding questions, research the challenge; and A*ct*, where participants implement a solution targeted at a real audience. Practical issues such as the provision of sufficient wall space to allow collective discussion and display of ideas, ensuring all teams have access to the same resources, a focus on non-technological approaches at the early stages, provision of guidance for the formation of teams and the ongoing provision of guidance throughout to assess progress are all critical to the success of the hackathon as an educational tool (Page et al., 2016).

2. THE UX ASSIGNMENT

The assignments that are the subject of this study were part of the Interactive Systems Design module on an MSc in Information Systems Management programme offered in an Irish university business school. The students on the programme had varied backgrounds (see Table 1). All had a Bachelor's degree, with some coming directly from that, while others had also worked for several years in technical roles. None had a background in UXD. The Interactive Systems Design module is designed to teach students user-centred design techniques such as: user research as a method of understanding user needs; design skills; and evaluation skills to hone and perfect the design.

Characteristic		Number	Percentage
Gender			
	Female	38	44.2%
	Male	48	55.8%
Age			
	24 or under	35	40.7%
	25-30	46	53.5%
	31-30	3	3.5%
	40 or older	2	2.3%

Table 1. Student Profile (n = 86)

As part of the re-design of this module, it was decided to use an innovative approach to the assignment to ensure students fully engaged with the subject and achieved some of the additional social, psychological, and academic benefits of authentic group work suggested in earlier research. Two different innovative assignment options were offered, one of which also offered an authentic learning experience. The first assignment option was participation in a UX Hackathon (Empathy Jam Galway). The full-day event was a collaborative effort involving mentors and judges from academia and industry, with industry involvement considered an important feature of the authentic learning experience for students. The second assignment option required students to choose a UXD topic not covered in the module and create a video tutorial on its use.

This study seeks to extend previous research (Cooley & Cumming, 2013; Cooley et al., 2016; Cumming et al., 2015) by assessing and comparing the impact of a challenge-based group assignment, and a more traditionally structured group assignment, on groupwork skills. Therefore, the following hypotheses are proposed:

- **H1**: Use of a UX hackathon for assessment results in improved groupwork skills.
- **H2**: Use of a traditionally structured group assignment does not result in improved groupwork skills.
- **H3**: Use of a UX hackathon for assessment results in better groupwork skills than a traditionally structured assignment.

3. METHODOLOGY

The educational aims of the re-designed assessment were two-fold: to give the students an opportunity to learn relevant user-centred design skills, and in addition, to develop teamwork skills that would benefit them in their future careers. The first of these was a module-level learning outcome, the second a programme-level outcome.

Authentic learning is an effective approach in the development of knowledge within the context of practice (Black & William, 1998) and is designed to motivate and engage students and connect them to the world outside the classroom (Mejías & Monereo, 2017). Empathy Jam Galway was designed to emulate real interactions and tasks that are carried out as part of a user-centred design process, and to provide an opportunity for experiential learning through practical, social, and contextual aspects (Gama et al., 2018; Richard et al., 2015).

The tutorial assignment required research into a technique used in UXD and necessitated learning how to implement it in practice. The programme-level learning outcome, development of teamwork skills, was addressed by students working together in groups for each of the assignments. The impact of each of the assessment approaches on their teamwork skills was measured using the Groupwork Skills Questionnaire (Cumming et al., 2015).

3.1 Design of Empathy Jam Galway

Empathy Jam (https://www.empathyjam.com), a user research and design hackathon focusing on the UX process, originated in New York in 2016 with the tagline "Empathize, collaborate, and design a better New York." During the hackathon, participants engage with potential users in the locality and perform user research, design, and then test, potential solutions.

The organizers of Empathy Jam were happy to support a similar event in Galway, Ireland. The authors collaborated with the organizers of Empathy Jam New York to bring this user research and design hackathon to Galway. Empathy Jam

Galway was carefully adapted to provide an authentic environment that facilitated development of the skillset required for user-centred design (Hogan, 2020). Guidelines developed by Herrington and Herrington (2007) were used when planning the event to ensure the experience was authentic. The main factors considered were: designing the challenges to ensure collaboration was required; ensuring the students engaged with potential users in a realistic way; providing coaching and scaffolding by mentors; and providing participants with opportunities to articulate their solutions and reflect on their learning. Practical issues highlighted by Page et al. (2016) were incorporated into the design of Empathy Jam Galway. These included the provision of sufficient wall space to allow collective discussion and display of ideas, a focus on non-technological approaches at the early stages, and the ongoing provision of guidance by mentors throughout to assess progress and help groups to solve difficulties and guide them in the correct direction.

As CBL is an effective approach for authentic learning (see Section 1.2 and Section 1.4), the day was planned accordingly, with the participants following the steps of Engage, Investigate, and Act. Participants *Engaged* with the problem and then proceeded to *Investigate* by interacting with potential users. The A*ct* phase required them to consolidate the results of their user research, create paper prototypes, and test them with potential users.

3.2 Design of the Video Tutorial Assignment

The tutorial assignment required students to create an informative and engaging video tutorial on a UXD technique not covered in class. They were tasked with providing the viewer with an understanding of the importance of the technique and how it could best be used in practice. This required research into the theory and practice of the chosen technique. Additional requirements specified the tutorial should be engaging and facilitate the viewer in understanding the importance of the selected technique, as well as offer guidance on how to use it.

Students were provided with a list of suitable topics but were also encouraged to explore any other areas relevant to the module. In order to ensure relevance, students were advised to propose the topic to the lecturer and get approval before creating the tutorial.

3.3 Assessment

Both assignments required a video submission as part of the assessment. When designing the video assignments, the advice of Hawley and Allen (2018) to ensure the assignment aligns with the module learning outcomes, was followed. In this study, the assignment learning outcome was to demonstrate a clear understanding of UXD techniques in the development process.

Students who participated in Empathy Jam were tasked with producing a 7-minute video to demonstrate what they did, and what they learned, on the day. They were required to detail how they planned their user research; their findings and how they applied these to the design of their prototypes; how they conducted the usability testing and applied the results of the evaluation; and details of their final solution. They were encouraged to take notes, photos, and videos to demonstrate how they engaged on the day.

Students who created the video tutorial were also required to produce a 7-minute video that explained the technique, its importance to the UXD field, and how to use it. They were also required to submit a list of references used in the development of the tutorial.

Given the importance of providing support for the process of video creation (Hawley & Allen, 2018; Ting, 2013), students were pointed to vlogs created by attendees of previous hackathons and to video tutorials created by students on other courses. In addition, they were given advice on copyright, pointers to potential tools to create the video, and made aware of resources such as drones, gimbals, and cameras, all available to borrow within the university. Training sessions on mobile phone video production were also provided. Finally, as reflection can extend the development of skills and attributes learned (Ajjawi et al., 2019), and is an important part of authenic learning (Ashford-Rowe et al., 2013; Fox et al., 2017; Mejías & Monereo, 2017; Wilson et al., 2017), students were required to submit a short reflective journal describing what went well, what could be improved, and their main personal learnings. An additional benefit of a reflective journal is its use as an artefact to evaluate student learnings (Tucker & Abbasi, 2016).

3.4 Groupwork Skills Questionnaire

Fransen et al. (2011) stress the importance of team and task elements for effective teamwork. However, they note students working in teams tend to focus on the task elements and neglect the team elements. Cumming et al. (2015) describe the development of a groupwork skills questionnaire (GSQ) to assess both task and interpersonal groupwork skills. The purpose of the GSQ is to determine if specific group assignments are achieving the desired outcome of improved teamwork, or groupwork, skills. They state the terms teamwork, collaborative, or small-group skills are all used to describe the behaviors leading to effective groupwork. They use the term *groupwork skills* to "describe the set of skills that individuals employ to enhance group functioning." The focus of the GSQ is on the skills employed by individuals to contribute effectively to groups in both academic and work environments and has been used and validated in a variety of settings (Cooley & Cumming 2013; Cooley et al., 2016; Cooley et al. 2018).

GSQ has a two-factor structure consisting of task groupwork skills and interpersonal groupwork skills. Task skills focus on behaviors contributing to the management of the group (e.g., setting goals, strategies and schedules, and establishing roles for group members) while interpersonal skills focus on behaviors contributing to the interpersonal dynamics of the group (e.g., providing emotional support and being sensitive to the feelings of others). This separate evaluation of task management and interpersonal skills is a strength of the GSQ over many other groupwork measurement skills. Interpersonal skills are key for user-centred designers, and, as such, measuring the effect of the assignment on interpersonal skills is a valuable component of the learning experience for this module. The GSQ was therefore chosen as an effective methodology for assessing the students' pre- and post-assignment groupwork skills in this study.

The students were asked to complete two questionnaires. The first of these was completed at the beginning of the semester and assessed their normal group work behavior when working on previous group assignments. The second was completed at the end of the semester and assessed how they felt they had behaved on this specific assignment. This approach

addressed one of the potential limitations of self-report measures, namely exaggerated reporting of behavior due to social desirability (Kormos & Gifford, 2014) and sought to mitigate its effect by comparing pre- and post- self-reported behaviors.

The 10 question GSQ assessed their perceived use of groupwork skills. The questionnaire is divided into two 5 question subscales which measure task and interpersonal groupwork skills (see Table 2). The pre-assignment questionnaire asked the students to rate the questions between 1 (never) and 5 (always) following the stem "When working in groups I tend to..." The questionnaire was repeated at the end of the semester using the stem "When working in this group I…" An average for each of the subscales (task and interpersonal) was calculated for pre-assignment and post-assignment scores.

Task questions	Interpersonal questions
1. Remind the group how important it is to stick to schedules.	1. Provide emotional support to my group members.
2. Construct strategies from ideas that have been raised.	2. Be sensitive to the feelings of other people.
3. Clearly define the roles of each group member.	3. Show that I care about my group members.
4. Move the group's ideas forward towards a strategy.	4. Be open and supportive when communicating with others.
5. Evaluate how well the group is progressing towards agreed goals.	5. Be there for other group members when they need me.

Table 2. Groupwork Skills Questionnaire

4. RESULTS

While the main aim of this study was to compare the impact of two innovative assessments on student groupwork skills, it was important to ensure the assignments also met the module level learning outcomes. Therefore, the assignments were examined to determine their effectiveness in developing both user-centred design skills and groupwork skills.

4.1 User-Centred Design Skills

User-centred design skills were assessed through the video submissions and the reflective journals. Short debriefing interviews were also conducted on the day with students who participated in Empathy Jam where they were given an opportunity to air their immediate feelings on the event. While no objective measures were used to assess these skills, it was clear from comments and the language used by the participants, while giving feedback and during presentations, that many of the students had made the jump from knowing user involvement is important, to really understanding why, and how, user involvement contributes to the design process. Their comments provided evidence that they had begun to recognize the challenges were human problems, rather than simply technical problems. Recognizing the importance of user involvement and empathy in the design process seemed to enhance their confidence in the use of the process.

The Empathy Jam participants' videos also demonstrated the students' enthusiasm and engagement. They engaged with users in a way that emphatically demonstrated their ability to empathize with users and to conduct user research effectively. It was clear the prototypes were designed based on the user research, and testing was conducted in a way that effectively garnered user feedback to improve the design.

Prior to the module redesign, students completed a project where they were required to conduct user research, develop paper prototypes and evaluate the prototypes. In principle, the activities were the same as those for Empathy Jam. However, in previous years it was obvious from the reports that many of the groups simply divided the work and did not productively engage with potential users. In contrast, participants at Empathy Jam were extremely vocal in stating how it helped them recognize the importance of user involvement. It was clear from the video reports and the reflective journals that participants of Empathy Jam engaged wholeheartedly with teammates and with potential users during user research and testing. Creating an authentic learning environment, aided by mentors from industry and academia, encouraged this interaction with users. Mentors are an important component of the process as they can help groups to solve difficulties and guide them in the correct direction (Richard et al., 2015). The participants were extremely positive regarding the mentors, believing they brought practical, real-world experience to the process, thus aiding them to maximize the learnings from the event. It also required all group members' involvement at all stages of the process, leading to their recognition of the importance of user involvement as well as an understanding of how and when to use a variety of user-centred design skills.

In contrast, those working on the tutorial did not fully engage with the use of their chosen techniques in practice and focussed mainly on an academic description of the subject. While they did learn how to use the technique in theory, evidence of practical learning and implementation was missing. As such, they only partially met the learning outcome of understanding user-centred design techniques.

4.2 Groupwork Skills

A total of 93 students completed the assignment over a two-year period (two cohorts), 86 of whom completed the pre- and the post-assignment questionnaire. Of those, 24 opted for the video tutorial and 62 opted for Empathy Jam Galway.

The pre- and post-assignment scores for task and interpersonal groupwork skills can be seen in Table 3 and Table 4. They were compared using t-test. No significant difference was evident between the two groups for either task or interpersonal behaviors prior to participation in the assignment.

Assignment	Pre-task	Post-task
Empathy Jam	3.9935	4.4129
Tutorial	3.7040	3.8750

Table 3. Groupwork Task Scores

Assignment	Pre-interpersonal	Post-Interpersonal
Empathy Jam	4.1065	4.2645
Tutorial	3.9520	4.1280

Table 4. Groupwork Interpersonal Skills

Paired t-tests were then conducted to determine if either assignment type impacted on individuals' groupwork behaviors. For Empathy Jam, no significant difference was observed for individual interpersonal groupwork behavior (see Table 5). However, students rated their task groupwork behavior higher on the Empathy Jam assignment than on assignments they worked on previously. A paired t-test showed the difference between conditions was significant and the effect was moderate ($t = 5.068$, $df = 61$, $p < 0.001$, $d = 0.647$). Therefore, H1 (Use of a UX hackathon for assessment results in improved groupwork skills) was partially accepted.

For the tutorial assignment, no significant difference was observed for either task or interpersonal groupwork behaviors for individuals, suggesting working on this assignment did not significantly improve the students' skills when working in groups. Therefore, H2 (Use of a traditionally structured group assignment does not result in improved groupwork skills) was accepted.

Pre-task		Post-task		t	p	d
M	*SD*	*M*	*SD*			
3.9935	.615	4.4129	.499	5.068	.000	.647

Table 5. Task Groupwork Scores for Empathy Jam

Groupwork behaviors were then compared for both groups post-assignment (see Table 6). There was no significant difference observed between the assignment groups for individual interpersonal groupwork behavior. However, the individual rating for task groupwork behavior was considerably higher for those who did Empathy Jam. A t-test showed a significant difference between conditions and the size of this effect was large ($t = 4.039$, $df = 85$, $p < 0.001$, $d = 0.958$), indicating Empathy Jam was a more effective assignment than the tutorial assignment at improving task groupwork behavior. Therefore, H3 (Use of a UX hackathon for assessment results in better groupwork skills than a traditionally structured assignment) was partially accepted.

Empathy Jam (n=62)		Tutorial (n=24)		t	p	d
M	*SD*	*M*	*SD*			
4.4129	.499	3.8750	.795	3.761	.000	.647

Table 6. Post-assignment Task Groupwork Scores

5. DISCUSSION

Many of the students reported high baseline scores for both task ($m = 3.9231$, $s.d. = 0.66984$) and interpersonal ($m = 4.0571$, $s.d. = 0.67744$) groupwork behaviors. There was no significant difference in baseline behaviors between students who chose the Empathy Jam assignment and those who chose the tutorial assignment. Both assignments were innovative. One was innovative due to presentation method, whereas the second assignment was innovative due to the authentic learning approach used, in addition to the video submission assessment method. In this study, neither of these innovative assignment approaches improved the interpersonal groupwork behaviors of the students. Analysis of the possible factors that could contribute to this lack of improvement requires recognition of the already high baseline for interpersonal groupwork behaviors recorded by students before the assignment. This may be due to the age profile in the class being older than might normally be seen in an MSc class (age ranged from 21 to 43, $M = 25.27$, $S.D. = 3.536$) and many having previous professional work experience. There was no significant difference between the mean age of those who participated in the different assignment types. Another potential explanation may be due to the levels of complexity of interpersonal behaviors, and individual difference in these behaviors (Bedwell et al., 2011). The development of these skills is complex and takes time and effort, thus one single intervention may be insufficient to show any marked improvement.

Task groupwork behaviors, by contrast, improved substantially for those who did the Empathy Jam assignment (3.9935 -> 4.4129), with a demonstrable significant difference, while the tutorial group only showed a slight improvement on their baseline (3.7040 ->3.875) and no significant difference. Additionally, the students who completed the Empathy Jam assignment reported significantly better post-task groupwork behaviors on the assignment than those who completed the tutorial (4.4129 vs. 3.8750). While both assignments adopted an innovative approach, the tutorial assignment still enabled students to divide the work separately amongst the group in a way not possible in Empathy Jam. In addition, the lack of time pressure in the tutorial assignment also meant that these students could undertake the work at a time and pace of their own choosing, rather than working together to achieve their goals. Empathy Jam was designed for authentic learning and required full participation by all group members during the event and for the subsequent video report. Additional characteristics of Empathy Jam that were not part of the tutorial assignment, namely the time pressures of the day, the structured nature of the event, and the guidance of mentors may have encouraged more focus by participants on the task related skills. The engagement with real end users, and the requirement to complete certain tasks in advance of these engagements, may also have encouraged more emphasis on the task related skills. Finally, the pressure of live presentation in front of peers and mentors at the end of the Empathy Jam event is likely to have led to more emphasis on completing tasks effectively and efficiently.

These findings make a significant contribution to the existing body of literature that examines the use of hackathons as an authentic learning approach. While research (Heikkinen et al., 2008; Kienzler & Fontanesi, 2016; Mielikäinen et al., 2018; Nandi & Mandernach, 2016) has examined the effectiveness of hackathons in developing groupwork skills, it has rarely been the main focus of the research and is often only reported descriptively without any analysis. Heikkinen et al. (2008) state that a majority of participants reported moderate to good levels of group cooperation and interaction, while Mielikäinen et al. (2018) report improved groupwork skills. However, neither presented any analysis beyond a descriptive report. Nandi and Mandernach (2016) reported improved groupwork skills based on mentor observation and participant comments. This study, by using statistical analysis to measure teamwork, and by using an instrument that breaks teamwork into interpersonal and task related skills, provides a more robust and nuanced examination of the impact of hackathons on groupwork skills in an educational setting.

From this study, there is strong evidence to support using an innovative, authentic learning approach, that has been designed to encourage the use of task related groupwork skills, to build task related groupwork skills whereas using an innovative assessment approach on its own will not impact on these skills. Angelo and McCarthy (2018) state groupwork should be designed to facilitate students' groupwork skills. The authentic learning approach applied to the assignment in this study appears to facilitate this learning, at least for task related behaviors.

6. CONCLUSION

Many university courses have groupwork or teamwork skills listed as a learning outcome and it is often assumed simply putting students in groups will result in the development of these groupwork skills. This study clearly demonstrates that this is not the case and an authentic group assignment that models workplace group interactions is more likely to result in improved task related groupwork behaviors than simply placing students in a group and assuming they will work as a team.

The design of such group assignments is critical to their success. To maximize the benefits of this approach, the authors recommend: careful planning of the event, using a CBL approach, and following the recommendations of Herrington and Herrington (2007); industry partnership to ensure practical relevance; mentors who can keep the process on track; and provision of appropriate resources throughout the event, such as talks and tools. It is essential to design the assignment in a way that requires participation by all group members. An appropriate innovative assessment technique should be used for this purpose. In this study the use of video assessment was successful in achieving this goal. However, adequate guidance and tools for video production must be provided to students to support the creation of these videos. Finally, as research has clearly shown the benefits of maintaining a reflective learning journal to help consolidate learnings (Ajjawi et al., 2019), this practice should be incorporated into the assignment. Overall, the use of a UX Hackathon for a class of this nature was very successful and could be easily adapted to other subject areas, such as coding, market research, and product/service design.

The data in this study were self-reported, thus raising the potential for participant bias and social desirability bias, resulting in over-reporting of behaviors. While the comparison of self-report measures was used to mitigate this effect, future research could incorporate an additional objective measure of teamwork skills. Additionally, the participants were not randomly assigned into groups or to assignment type, which may affect the generalizability of the results.

One noteworthy finding in this study was the lack of improvement in interpersonal groupwork skills for those participating in Empathy Jam. The focus of Empathy Jam is helping participants develop empathy with potential users and thereby enhancing their ability to understand and communicate with them. As such, improved interpersonal groupwork skills might be expected as a result of Empathy Jam participation within the group. The lack of improvement in these interpersonal group skills is potentially explained by a combination of the already high level of pre-existing skills of the participants in this study and the complex nature of interpersonal skills which require both time and effort to develop. The study participants were more mature than typical university students and many had significant professional experience. These factors likely impacted on the high rating for interpersonal groupwork skills of participants prior to their Empathy Jam participation. In order to determine whether hackathons or other such events impact on the development of interpersonal groupwork skills, the authors will repeat this study with a group of undergraduate students who are unlikely to have such extensive experience of working in groups outside an academic setting. Additionally, a further study using repeated interventions should be carried out to ascertain whether multiple events of this nature contribute to an improvement in students' interpersonal group skills. The results of these studies will give a richer and more representative view of the impact of Empathy Jam, or other similar authentic learning experiences, on the development of both interpersonal and task related groupwork skills in an academic setting. Finally, a further area of analysis being considered is to examine the impact of demographics on the development of teamwork skills. In particular, the impact of age and gender will be examined in further research.

7. REFERENCES

Ajjawi, R., Tai, J., Huu Nghia, T. L., Boud, D., Johnson, L., & Patrick, C.-J. (2019). Aligning Assessment with the Needs of Work-Integrated Learning: The Challenges of Authentic Assessment in a Complex Context. *Assessment & Evaluation in Higher Education*, 45(2), 304-316.

Angelo, R., & Mccarthy, R. (2018). Group Assignments as a Class Element to Promote Performance in Virtual Groups. *Information Systems Education Journal*, 16(4), 4-12.

Apple. (2011). *Challenge Based Learning A Classroom Guide*. https://images.apple.com/education/docs/CBL_Classroom_Guide_Jan_2011.pdf

Ashford-Rowe, K., Herrington, J., & Brown, C. (2013). Establishing the Critical Elements That Determine Authentic Assessment. *Assessment & Evaluation in Higher Education*, 39(2), 205-222.

Bedwell, W. L., Fiore, S. M., & Salas, E. (2011). *Developing the 21st Century (and Beyond) Workforce: A Review of Interpersonal Skills & Measurement Strategies*. NRC Workshop on Assessing 21st Century Skills.

Bevitt, S. (2014). Assessment Innovation and Student Experience: A New Assessment Challenge and Call for a Multi-PerspectiveAapproach to Assessment Research. *Assessment & Evaluation in Higher Education*, 40(1), 103-119.

Black, P., Harrison, C., Lee, C., Marshall, B., & William, D. (2004). Working Inside the Black Box: Assessment for Learning in the Classroom. *Phi Delta Kappan*, 86(1), 8-21.

Black, P., & William, D. (1998). Inside the Black Box: Raising Standards Through Classroom Assessment. *Phi Delta Kappan*, 80(2), 139-144.

Brown, R., Zuo, N., Shockley, J., & Buck, S. (2019). An Authentic Learning Approach to Group Assignments: An Analysis of Student Attitudes. *Applied Economics Teaching Resources*, 1(2), 1-13.

Brown, S. (2015). *A Review of Contemporary Trends in Higher Education Assessment*. *@tic. revista d'innovació educativa*, 14(43).

Burke, A. (2011). Group Work: How to Use Groups Effectively. *The Journal of Effective Teaching*, 11(2), 87-95.

Burrell Storms, S. L., Labonte, M. T., Siscar, A. M. N., & Martin, S. F. (2015). Collaborative Learning and Innovative Assessment in Humanitarian Studies. *International Studies Perspectives*, 16(2), 107-126.

Calco, M., & Veeck, A. (2015). The Markathon: Adapting the Hackathon Model for an Introductory Marketing Class Project. *Marketing Education Review*, 25(1), 33-38.

Cooley, S. J., Burns, V. E., & Cumming, J. (2016). Using Outdoor Adventure Education to Develop Students' Groupwork Skills. *Journal of Experiential Education*, 39(4), 329-354.

Cooley, S. J., & Cumming, J. (2013). Outdoor Education Increases Students' Groupwork Skills, Attitudes and Self-Efficacy During Higher Education. *The Sixth International Outdoor Education Research Conference - Future Faces: Outdoor Education Research Innovations and Visions*. Otago, New Zealand.

Cumming, J., Woodcock, C., Cooley, S. J., Holland, M. J. G., & Burns, V. E. (2015). Development and Validation of the Groupwork Skills Questionnaire (GSQ) for Higher Education. *Assessment & Evaluation in Higher Education*, 40(7), 988-1001.

De Hei, M. S. A., Strijbos, J.-W., Sjoer, E., & Admiraal, W. (2014). Collaborative Learning in Higher Education: Lecturers' Practices and Beliefs. *Research Papers in Education*, 30(2), 232-247.

Duhring, J. (2014). Hackathon Pedagogies as Educational Technology. *OPEN, the Annual Conference of National Collegiate Inventors and Innovators Alliance*.

Fox, J., Freeman, S., Hughes, N., & Murphy, V. (2017). "Keeping It Real": A Review of the Benefits, Challenges and Steps Towards Implementing Authentic Assessment. *All Ireland Journal of Teaching and Learning in Higher Education*, 9(3), 1-13.

Fransen, J., Kirschner, P. A., & Erkens, G. (2011). Mediating Team Effectiveness in the Context of Collaborative Learning: The Importance of Team and Task Awareness. *Computers in Human Behavior*, 27(3), 1103-1113.

Gama, K., Alencar, B., Calegario, F., Neves, A., & Alessio, P. (2018). A Hackathon Methodology for Undergraduate Course Projects. *IEEE Frontiers in Education Conference*. San Jose, CA, USA.

Giuliodori, M. J., Lujan, H. L., & Dicarlo, S. E. (2008). Collaborative Group Testing Benefits High- and Low-Performing Students. *Advances in Physiology Education*, 32(4), 274-8.

Groen, D., & Calderhead, B. (2015). Cutting Edge: Science Hackathons for Developing Interdisciplinary Research and Collaborations. *eLife*, 4, e09944.

Hawley, R., & Allen, C. (2018). Student-Generated Video Creation for Assessment: Can it Transform Assessment Within Higher Education? *International Journal for Transformative Researc*h, 5(1), 1-11.

Heikkinen, K., Porras, J., & Ikonen, J. (2008). Introducing Code Camp Process. *MSCI 2008-2nd International Multi-Conference on Society, Cybernetics and Informatics, Proceedings.*

Herrington, A., & Herrington, J. (2007). What is an Authentic Learning Environment? In: Tomei, L. A. (ed.) *Online and Distance Learning: Concepts, Methodologies, Tools, and Application*s Hershey, PA: Information Science Reference.

Hogan, M. (2020). From Time Square to Eyre Square: Hackathons as Authentic Learning for Information Systems Students. *Sixth International Conference on Higher Education Advances*. Valencia, Spain.

Hounsell, D., Falchikov, N., Hounsell, J., Klampfleitner, M., Huxham, M., Thomson, K., & Blair, S. (2007). Innovative Assessment Across the Disciplines: An Analytical Review of the Literature. *Final Report.* The Higher Education Acadamy.

Hwang, M. I. (2018). Relationship between Teamwork and Team Performance: Experiences from an ERPsim Competition. *Journal of Information Systems Education*, 29(3), 157-168.

Isaac, M. L. (2012). "I Hate Group Work!" Social Loafers, Indignant Peers, and the Drama of the Classroom. *The English Journal*, 101(4), 83-89.

Johnson, L., & Adams, S. (2011). Challenge Based Learning: The Report from the Implementation Project. *The New Media Consortium*.

Kalfa, S., & Taksa, L. (2017). Employability, Managerialism, and Performativity in Higher Education: a Relational Perspective. *Higher Education*, 74(4), 687-699.

Kienzler, H., & Fontanesi, C. (2016). Learning Through Inquiry: a Global Health Hackathon. *Teaching in Higher Education*, 22(2), 129-142.

Knapper, C. (2008). Changing Teaching Practice: Strategies and Barriers. *Taking Stock: Symposium on Teaching and Learning Research in Higher Education*. University of Guelph, Ontario.

Komssi, M., Pichlis, D., Raatikainen, M., Kindström, K., & Järvinen, J. (2015). What Are Hackathons For? *IEEE Software*, 32(5), 60-67.

Kormos, C., & Gifford, R. (2014). The Validity of Self-Report Measures of Proenvironmental Behavior: A Meta-Analytic Review. *Journal of Environmental Psychology*, 40, 359-371.

Laal, M., & Ghodsi, S. M. (2012). Benefits of Collaborative Learning. *Procedia - Social and Behavioral Sciences*, 31, 486-490.

Labeouf, J. P., Griffith, J. C., & Roberts, D. L. (2016). Faculty and Student Issues with Group Work: What is Problematic with College Group Assignments and Why? *Journal of Education and Human Development*, 5(1), 13-23.

Labeouf, J. P., Griffith, J. C., & Schultz, M. C. (2014). The Value of Academic Group Work: An Examination of Faculty and Student Perceptions. *The Business Review*, Cambridge, 22(2), 32-39.

Lejk, M., Wyvill, M., & Farrow, S. (2006). Group Assessment in Systems Analysis and Design: a Comparison of the Performance of Streamed and Mixed-Ability Groups. *Assessment & Evaluation in Higher Education*, 24(1), 5-14.

Masika, R., & Jones, J. (2015). Building Student Belonging and Engagement: Insights into Higher Education Students' Experiences of Participating and Learning Together. *Teaching in Higher Education*, 21(2), 138-150.

Mejías, E., & Monereo, C. (2017). As Life Itself: Authentic Teaching and Evaluation of Professional Consulting Competencies in a Psychology Course. In: Cano, E. & Ion, G. (eds.) *Innovative Practices for Higher Education Assessment and Measurement*. IGI Global.

Mielikäinen, M., Angelva, J., & Tepsa, T. (2018). Hackathon as a Kickstart for Integrated ICT Engineering. *The 46th SEFI Annual Conference*.

Nandi, A., & Mandernach, M. (2016). Hackathons as an Informal Learning Platform. *Proceedings of the 47th ACM Technical Symposium on Computing Science Education*.

Page, F., Sweeney, S., Buruce, F., & Baxter, S. (2016). The Use of the "Hackathon" in Design Education: An Opportunistic Exploration. *International Conference on Engineering and Product Design Education*. Aalborg, Denmark.

Richard, G. T., Kafai, Y. B., Adleberg, B., & Telhan, O. (2015). StitchFest. *Proceedings of the 46th ACM Technical Symposium on Computer Science Education - SIGCSE '15*.

Scager, K., Boonstra, J., Peeters, T., Vulperhorst, J., & Wiegant, F. (2016). Collaborative Learning in Higher Education: Evoking Positive Interdependence. *CBE - Life Sciences Education*, 15(4), 1-9.

Strauss, P., & U, A. (2007). Group Assessments: Dilemmas Facing Lecturers in Multicultural Tertiary Classrooms. *Higher Education Research & Development*, 26(2), 147-161.

Ting, N. C. (2013). Classroom Video Project: An Investigation on Students Perception. *Procedia - Social and Behavioral Sciences*, 90, 441-448.

Tucker, R., & Abbasi, N. (2016). Bad Attitudes: Why Design Students Dislike Teamwork. *Journal of Learning Design*, 9(1), 1-20.

Wilson, B. G. (2017). Constructivism for Active, Authentic Learning. In: Reiser, B. & Dempsey, J. (eds.) *Trends in Instructional Design and Technology*, Boston, MA: Pearson.

Wilson, K. J., Brickman, P., & Brame, C. J. (2018). Group Work. *CBE - Life Sciences Education*, 17(1), 1-5.

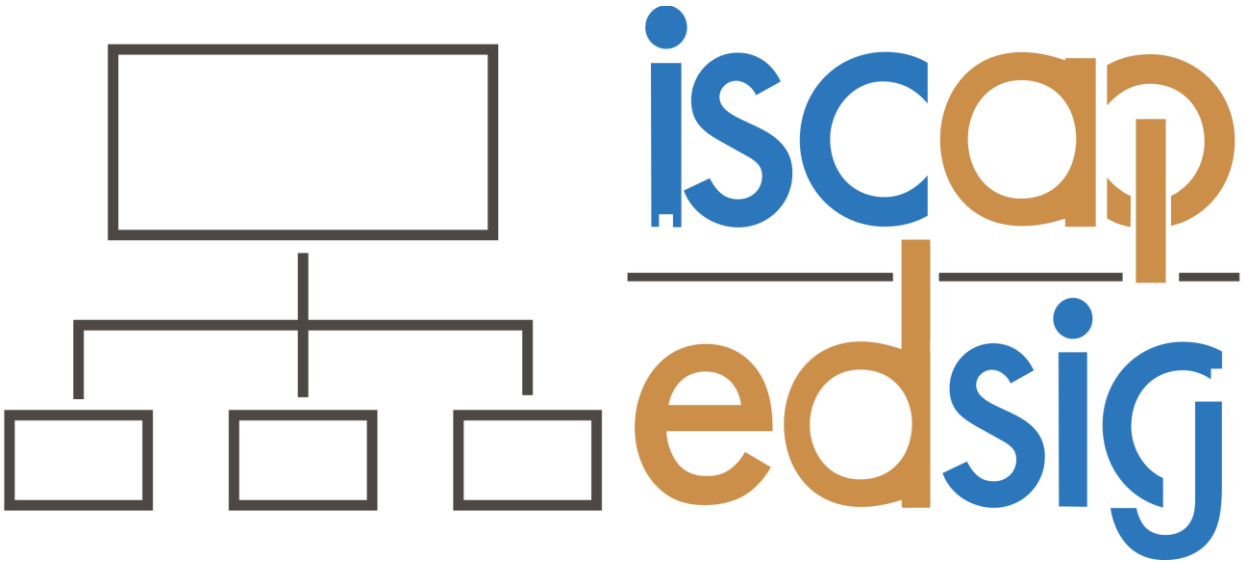
Wilson, L., Ho, S., & Brookes, R. H. (2017). Student Perceptions of Teamwork Within Assessment Tasks in Undergraduate Science Degrees. *Assessment & Evaluation in Higher Education*, 43(5), 786-799.

Zacharis, N. Z. (2010). Innovative Assessment for Learning Enhancement: Issues and Practices. *Contemporary Issues In Education Research*, 3(1), 61-40.

AUTHOR BIOGRAPHIES

Mairéad Hogan is a lecturer in business information systems within the J.E. Cairnes School of Business & Economics at National University of Ireland, Galway. She teaches courses in User Experience Design (UXD) and Business Systems Analysis and Design. Her research focuses on dark patterns and UXD, as well as Information Systems education.

Karen Young is a lecturer in computer science at the National University of Ireland, Galway. She teaches courses in Software Engineering, Systems Analysis and Design, and Human Computer Interaction to both undergraduate and postgraduate students. Her research is concerned with the effective collaboration of human and digital agents across diverse application domains (digital health, e-government, education).



Information Systems & Computing Academic Professionals

Education Special Interest Group

STATEMENT OF PEER REVIEW INTEGRITY

All papers published in the ***Journal of Information Systems Education*** have undergone rigorous peer review. This includes an initial editor screening and double-blind refereeing by three or more expert referees.

ISSN 2574-3872