# Designing Simulated Work for Scanning: A Case Study on the Falkirk Wheel, Scotland

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**Key words**: Scanning, Simulation, Education, Work-based, Employability

## SUMMARY

Designing simulated work for students can often be problematic; this becomes more difficult at Post Graduate level. This paper considers the process using a real project and exposing the students to the full requirements of commercial briefs and timescales.

The students selected had prior experience of using the equipment and preparing contractual documentation. They provided the Client with detailed information on Risk Assessments and Method Statements. Further to this, they had to identify the necessary resources and deliver a project in a live environment dealing with the public and the Client throughout and planning the delivery around commercial activity in a tourist centre.

During the Survey of the Falkirk Wheel, in Scotland the role of the lecturer was only to ensure that no significant risks occurred and to liaise with the Client regarding access and egress to active areas in and around the wheel, whilst in operation.

The outcomes included;
The students applied themselves well to the pre-survey procedures and were sharply focused as the "assessor" was professional, this aligns to past research and shows the mind-set in live situations. The loudest person took the lead at first, but over time a natural leader emerged, with communications becoming more thoughtful. As the team lodged together, a strong bond was created, with roles being formed based on the individual strengths.Problem solving skills, tended to be reactive, with problems arising from distraction by the visitors, e.g. forgetting to save data whilst chatting. Research supports these findings, as student struggle to align academic thinking to the pace or interaction in real scenarios.

The process has lead to a more formal design of work simulation, and with greater industrial contacts, a richer selection of sites to expose Post and Undergraduate student to real projects with real Client interaction. In reflection future projects will ensure that the student have addition pre-survey meeting to establish roles and responsibilities and share roles to ensure the experience provides parity.

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## 1. INTRODUCTION

The Author has had over 15 years' experience in the development of work-based learning and seen many schemes to embed and promote access to the workplace whilst studying including Foundation Degrees, and Learn Through Work. The skills gained doing work-based learning are often invaluable for future employability, however a key limitation can be the amount of responsibility given to the student and subsequent motivation.

Without strong industrial contacts, creating a meaningful experience for the Full time students can be difficult; this leads to the generation of simulated work. The author has provided such learning by various methods including assisting the delivery to 1st year student practical sessions and working with Technicians in the Laboratories. Simulated work of this nature can ensure that the student attains the module learning outcomes. Module evaluation feedback often indicated that these experiences are not considered as "real" as the student was still working at their university. This demonstrates that there is a need to ensure the student is immersed in the process and has the experience of actually going to work and not remaining in their normal environment.

Field trips partly address the environment issues yet such experiences often have large groups and the work elements are simply demonstrations of industrial practice in context. This reduces interaction, leaving some group members on the periphery and not fully engaging, typical session is shown in Figure 1, as can be seen there is not full engagement.

*Figure 1 The students having a demonstration of the UAV (Unmanned Ariel Vehicle) for surveying Spalton D 2016*

## 2. DESIGNING THE SIMULATION

An opportunity arose to scan the Falkirk Wheel, as guests of Scottish Canals (SC).It was proposed to take a group of Postgraduate students. The author selected a group of

4 students who were all undertaking Independent studies around the area of LiDAR scanning, further to this they all had experience of using the universities instrumentation. The Author planned the project to reflect the requirements of a live brief and requested that the Client outline their requirements as if it was a real brief.

Designing the study required that the Author set out a full briefing and treated the selected students as employees. To reflect this the students to undertake pre-survey works, including detailed Risk Assessments and Method (*Rojas, EM and Mukherjee, A; 2005*) Statement (RAMS) (see figure 2), which were approved by SC. They were required to consider all the resources and produce a list of kit and ensure everything worked and batteries were charged. The team size reflected the time limitations and the expected resources adopted in professional practice.

*Figure 2 Student undertaking scans in line with the accepeted RAMS, Brammer L 2019*

The student were provided with scaled Ordnance Survey drawings of the wheel and the operating schedule of the wheel during opening hours. One member of the group did some pre-planning of scan locations and considered the times required for each scan. After their detailed planning all the information was reviewed academically prior to passing to the Client. The Client added a few requirements about working around the Wheel but accepted the RAMS, which allowed the group to progress to the survey.

## 3. FIELD WORKING

The team stayed in a boat moored at the wheel's basin. This removed issues of travelling and allowed unrestricted access outside of the attractions opening hours. The Author took a general overview and only stepped in, if a serious issue occurred. The 3 key areas from Pedagogy were; peer support, problem solving and Health and Safety (H&S).

The design of the study required the team to coalesce working with multiple scanners and ensure that they covered all aspects. As the Wheel is a busy attraction, the team had to deal with lots of survey "noise", with regular trips through the Wheel restricting scanning. The most challenging issue was ensuring that the final model could be tie

together. There were some communication issues and at first the team members worked in isolation.

The problem solving techniques were limited but often reflected the positions of the targets for tying the model together and scheduling moving between points that required two team members.

The H&S in any survey is paramount. The students prepared and produced detailed RAMS and responded to questions from SC, they had to work under real time constraints and deal with the weather in Scotland, which was particularly hot. This had not been factored into the planning and required the Author to issue sun tan lotion and purchase some parasols to provide shading in open areas.

The other fundamental issue was the scale of the project and the large height difference across the site, this had not been factored into planning and impacted on the positioning of the scanners. Figure 3 shows the scale of the site.

*Figure 3 showing the scale of the site Brammer L 2019*

## 4. POST SURVEY WORK

The data gathered was edited during the evenings of the fieldwork and on return further editing was completed by one group member who was proficient in the use of the ScanMaster software. Several omission were identified and it was required to create several tie points to link the differing element together.

*Figure 4 An example of the point cloud data O'Keeffee 2019*

The overall production was presented to Scottish Canals as poster for display and the utilised the modules to address there move toward full BIM compliance Despite the gaps the model worked well as the groups provide a large overlap during the

fieldwork elements. An example of the point cloud is shown in figure 4

## 5. ANALYSIS OF THE STUDY

The students were questioned about their experience during the fieldwork and overall they enjoyed the process but found it quite tiring and generally stated that they had become more proficient with the instrumentation. Two of them stated that they struggled at first to deal with inquisitive tourist, whilst trying to take observations, which they felt led to errors.

The students appear to have quickly grasped the need to organise equipment and plan ahead, although during the field work, a leader was not obvious on the first day, just a lot of shouting.

During the setting up of each scan position and scanning the targets timings were undertaken for each student on each day (see results in Table 1)

| | Student A | Student B | Student C | Student D |
|---|---|---|---|---|
| Day 1 | 24 mins | 21 mins | 27 mins | 20 mins |
| Day 2 | 26 mins | 23 mins | 24 mins | 17 mins |
| Day 3 | 21 mins | 19 mins | 28 mins | 19 mins |
| Average | 23.6 mins | 21 mins | 26.3 mins | 18.7 mins |

Table 1 Set up time over the fieldwork by the students

The data would generally indicate that the team, as a whole, saw improvements as they began to work together. It should be noted that Student C struggled, see discussion later.

## 6. CONCLUSIONS

The students applied themselves well to the pre-survey procedures and were sharply focused as the "assessor" was professional, this aligns to past research (*Race P & Pickford R 2007*) and shows the mind-set in live situations.

The loudest person took the lead at first, but over time a natural leader emerged, with communications becoming more thoughtful (*Dugan, J. P., & Komives, S. R. 2007*). As the team lodged together, a strong bond was established, with roles being formed based on the individual strengths. With a team in the real world one person has to have an overview and provide direction (*Han. H and Johnson. SD 2012*)

Problem solving skills, tended to be reactive, with problems arising from distraction by the visitors, e.g. forgetting to save data whilst chatting. Research supports these

findings, as student struggle to align academic thinking to the pace or interaction in real scenarios. (*Castronovo, F, et al, 2017*)

The H&S of the work allowed the students to integrate the requirements of a client within their own plans, and ensure that they had full compliance. They were in a public area and had to follow their own Method Statements throughout.

The students were all very positive about the experience, in reflection due to the small group selected they possibly reacted well, as they experienced the Hawthorne Effect (*Landsberger H, 1958*)

Student C did not see their performance improve as much as their peers, this did result in some animosity, however after interviewing the student, it became apparent that they had not been feeling well and had had a lack of sleep due to the motion of the canal boat, not everything can have a positive impact.

## 7. FURTHER WORK

Another similar trip is planned, further observations will be made on team building. The Author however, will provide additional development sessions on planning and working with distracts, as these appear to have impacted on the initial parts of the fieldwork.

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