OUTSTANDING TEACHING, LEARNING AND ASSESSMENT TECHNICAL SKILLS NATIONAL PROGRAMME

Nuclear Behaviours Object of Learning Report
Created by: Lakes College
January 2019

Managed by

ASSOCIATION OF COLLEGES
Embedding Sector Specific Behaviours to Improve the Work Readiness of Students
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTSTANDING TEACHING, LEARNING AND ASSESSMENT</td>
<td>1</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>5</td>
</tr>
<tr>
<td>WHAT ARE NUCLEAR BEHAVIOURS?</td>
<td>7</td>
</tr>
<tr>
<td>HOW ARE WE EMBEDDING BEHAVIOURS</td>
<td>9</td>
</tr>
<tr>
<td>CASE STUDY</td>
<td>13</td>
</tr>
<tr>
<td>FEEDBACK</td>
<td>18</td>
</tr>
<tr>
<td>CONCLUSION</td>
<td>20</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>22</td>
</tr>
<tr>
<td>APPENDIX 1</td>
<td>23</td>
</tr>
</tbody>
</table>
**Figures**

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The NCfN Experiential Learning Model</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>NCfN Northern Hub</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>NCfN Northern Hub</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>NCfN Northern Hub Project Room</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>NCfN Northern Hub Project Room</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>NCfN Northern Hub Project Room</td>
<td>13</td>
</tr>
<tr>
<td>7</td>
<td>The Big Rig</td>
<td>14</td>
</tr>
<tr>
<td>8</td>
<td>Students in PPE</td>
<td>16</td>
</tr>
</tbody>
</table>
INTRODUCTION

This report will discuss the utilisation of Nuclear Behaviours within the boundaries of Experiential Learning (EL) and will highlight the effectiveness of embedding key behaviours within a Learning Environment.

Experiential learning is not a new concept and has been seen in many different forms. These iterations are usually based around Kolb’s learning model and the National College for Nuclear Experiential Learning Model (NCfN ELM) is no different, as can be seen below in Figure 1. It still encompasses Kolb’s model, but expands on the pedagogical approach of EL.

![Figure 1 - The NCfN Experiential Learning Model](image)

**Figure 1 - The NCfN Experiential Learning Model**
Lakes College is a primary delivery partner of the National College for Nuclear (NCfN) and have been utilising the NCfN ELM alongside the new NCfN Northern Hub building to deliver curriculum that has been designed to meet the requirements of the Nuclear Industry.

The ethos of NCfN is to utilise the NCfN ELM to enhance the employability skills of the learners on NCfN programmes (Levels 3 to 6). This means that EL has to be embedded within the curriculum being delivered and this report will discuss how Nuclear Behaviours have been embedded.

*Figure 2 - NCfN Northern Hub*
WHAT ARE NUCLEAR BEHAVIOURS?

The requirement to remain safe and professional at all times is integral to the Nuclear Industry. Nuclear Behaviours is a term used to encompass the key behaviours and traits that the Industry would like its workforce to exhibit in all operational arenas. These behaviours may be simple such as walking up and down the stairs on the left hand side and always holding on to the hand rail. There are other behaviours that have more substance to them such as showing integrity and confidentiality in the workplace environment and taking responsibility for challenging unsafe behaviours.

There have been two lists generated by the Nuclear Team at Lakes College. They highlight two areas:

- Building Rules
- Student Standard and Expectations.

The NCfN Northern Hub building has been designed and laid out in such a way as to feel like a Workplace/University, rather than have a College feel.

The **Building Rules** are as follows:

- Student/Staff/Visitor badges are to be on show at all times whilst inside the NCfN building.
- There is a designated eating area on the ground floor, no food is permitted to be consumed outside of this area.
- There is a designated smoking area, there is to be no smoking around the entrances to the building.
- Mobile Phones are to be on silent at all times within the building and should only be used in work hours for work/college work.
- Mobile Phones are only to be used in the classroom when advised by the tutor.
- A Permit to Work is required when working with specific equipment within the designated C1, C2 and C3 areas. Refer to the local rules for the Permit to Work officer for that area.
• When using the stairs, always walk on the left hand side and hold the hand rail.
• Hot drinks being carried up the stairs, must have a secure lid.
• Appropriate clothing is to be worn whilst working in the NCfN building.
• Professional behaviour is expected at all times.

The **Students Standards and Expectations** are as follows:

• Manage your time effectively by being on time to lessons, being ready to learn and being able to plan and complete work to schedule.
• Demonstrate reliability, integrity and respect for confidentiality on work related and personal matters to staff and fellow students.
• Take responsibility for personal development, demonstrating commitment to learning and self-improvement, be open to feedback and reaching your potential.
• Demonstrate a strong commitment to personal safety behaviours and understanding the consequences of failing to meet the required Safety Standards.
• Take responsibility to actively challenge unsafe behaviours and conditions in the workplace to help reinforce nuclear, radiological and conventional safety.
• Understand the impact of work on others, especially where related to diversity and equality.
• Demonstrate a supportive attitude to change and respond positively to change management processes.
• Demonstrate compliance by following rules, procedures and principles to ensure work completed is fit for purpose and pay attention to detail and carry out error checks throughout work activities.
• Be an enthusiastic advocate for the nuclear industry with the ability to represent this industry to a variety of audiences.
• Behave professionally and appropriately at all times when working in the NCfN building.
• Challenge anyone who is not wearing a visible ID badge or a Visitors Pass whilst in the NCfN building.

A number of Standards and Expectations above have been directly pulled from the Level 6 Nuclear Scientist / Engineer Apprenticeship Standard. This Apprenticeship Standard (Level 6 Competencies) was written by the major employers within the Nuclear Industry including Sellafield Ltd, the Nuclear Decommissioning Authority, the Ministry of Defence, Électricité de France and significant others.

By incorporating these Behaviours into our delivery as well as day to day operations within the building, we are ensuring that the students studying with Lakes College in the NCfN Northern Hub building are developing their work readiness.

HOW ARE WE EMBEDDING BEHAVIOURS

The students studying within the building have a range of experiences within the Nuclear Industry. The full time students studying on the ECITB Level 3 Nuclear Engineering and Science course (developed by NCfN), have never worked in the Nuclear Industry. There are other students such as the Bachelors Degree students, who have more than 5 years of experience in the Nuclear Industry up to 20 plus years of experience. When groups of students are working in the open access areas in the Northern Hub building, they share tables with other groups and share their experiences.

The Project team believe that this is a key advantage of having open access areas and embedding the desired behaviours in to everything that is done within the building. The more experienced students already exhibit the desired behaviours, but the less experienced students see the positive behaviours being exhibited and will naturally follow suit. This is a classic case of
Pavlovian Conditioning. In effect, all students studying in the NCfN Northern Hub building are being conditioned to ensure they are work ready for the Nuclear Industry.

This is important as it takes a lot of coaching and therefore time to train and condition people to the behaviours required, time which the Nuclear Industry can not spare. ‘The nuclear workforce is ageing and attrition rates are high and growing as a result. Industry’s own research forecasts that the workforce must grow by 4,700 people a year over the next 6 years. Over the same period 3,900 people are expected to leave the sector, mostly due to retirement. This means that the sector must recruit 8,600 people every year.’ (DECC, 2015). With this in mind, training should be delivered in such a way that encompasses the requirements of the Nuclear Industry, at the earliest opportunity.
In the Multifunctional Project Room, the Nuclear Team have created a Permit to Work system, which provides the students the means to Gain permission from staff to use the equipment. This is mirroring Industry, but the paperwork is different. The Nuclear team want to ensure that the students understand that there has to be a change of behaviour when working with equipment.

Figure 4 - NCfN Northern Hub Project Room
All staff based in the NCfN Northern Hub building are aware of the Building Rules and Student Expectations. They have been given the mandate to challenge students they feel are falling short of meeting these requirements. This ensures that the environment the students are working in are the same as what they would encounter in the Nuclear Industry and this is invaluable for the students who do not currently work in the Industry. Essentially, the students are experiencing experiential learning from just working within the NCfN Northern Hub building. They are experiencing the working environment that they should expect to experience once they enter workplace environment within the Industry.

*Figure 5 - NCfN Northern Hub Project Room*
Case Study

In June 2018, the Project Team delivered a Continual Professional Development course for the Nuclear Graduate Scheme (sponsored by the NDA). We used this course as a Pilot scheme for testing the NCfN ELM within an Industrial style scenario, rather than an academic environment. The scenario was developed by the experienced Nuclear Team within Lakes College, who were employed for their Industrial experience and knowledge. A number of employers were also involved in the development of this scenario and had a valued input in putting the scenario together. The scenario brief has been attached to this report as Appendix 1.

Lakes College have a full sized flow rig that can be used by academic teams across the College. Please see figure 7. This rig has been used for CPD training sessions in the past, but it was based on the Operation of the Rig. The Nuclear Team decided that this was not challenging enough and
set the graduates the task of coming up with a detailed plan as to how they would decommission the rig.

The group was split into two competing ‘companies.’ The task was designed to follow a typical tendering process within the industry. Both companies would be invited to an ‘on plant’ walk down so that the scale of the task at hand could be weighed up by each company. Each company was given a budget and a menu of services that they could choose from. They would then be given the opportunity over a number of days to formulate their decommissioning plan.

The Learning Outcomes for the course were as follows:

1. Analyse the construction of the “Big Rig” and develop a decommissioning strategy
2. Estimate the cost and duration to complete the decommission task
3. Summarise the engineering strategy, challenges, cost and duration and present findings.
4. Compare the use of Virtual Engineering to conventional engineering practices.

![Figure 7 - The Big Rig](image)
The Nuclear Team utilised the Big Rig in a way that it had never been used previously. Firstly, they changed the classification of the area to that usually seen on a Nuclear facility. This meant that anyone entering into the fenced area had to be dressed in appropriate PPE for that location, which included, body suit, wellies, gloves and respirator, as can be seen in figure 8. The team installed a simulated radioactive source on the Rig and the students wore an Electronic Personal Dosimeter, designed to detect the radio waves the simulated source was emitting.

Dose rates are in integral part of working in the Nuclear Industry and understanding how this can affect the amount of time available to complete a task is an important skill to develop. The students were unaware of what the intensity of this simulated dose was set to and they were unaware as to the location of the source. Understanding and locating potential hotspots of radiation is also an important skill to develop. By understanding where the hotspot may be, the students could then minimise their dose uptake, which in turn allows the students more time in the ‘active’ area to collect the information they require to aid them in completing their project.

To complete the project, the students needed to check whether the schematic drawings they were given were correct. The Nuclear Team had purposefully omitted key items of equipment and pipework from the schematic drawings. This was to simulate receiving drawings that were incomplete and surveys being required to be completed to ascertain the actual state of the plant. The students could also book time with a number of dedicated advisors that would give them advice on certain aspects of their project. This time cost each company and was deducted from their budget.
As well as having the experience on plant, the students could also utilise the VR facilities in the NCfN Northern Hub building. A full VR representation of the Big Rig was developed by the Nuclear team to enable the students the opportunity to utilise the VR facility to fill any information gaps they may have.

Please see VR Object of Learning Report for more information.
Within this CPD course, the graduates covered all aspects of the Experiential Learning Model:

**Spotlighting** – The graduates were taken for a visit on to the Big Rig, so that they could understand the Layout of the Rig and to help contextualise the brief given.

**Sensing and Experiencing** – The students were then given time on the Rig in appropriate PPE as discussed above. This gave the students experience of working on a full scale Rig, climbing up a Cat ladder for the first time and experiencing what it is like to wear full PPE including respirator and having to concentrate on the task at hand.

**Reflection** – The graduates were then given time to reflect on what they have experienced and identify what further information they need to start to develop their plan.

**Rationalising** – With the time the graduates are given, they also have the opportunity to pay for time with identified specialists to reinforce their findings and reflections.

**Applying** – The graduates must identify a strategy for decommissioning the Rig by utilising all possible sources of information available to them.

**Consolidating** – The graduates were also tasked with presenting their decommissioning plan, which must consider the implications of completing the work in the order they have chosen, as well as identifying any key assumptions that they have made.

**Adapting and Adjusting** – The graduates were having to adapt and adjust throughout the CPD course. The Nuclear Team included some curve balls in the delivery as well as omitting key information to test how they would react to certain situations.
**FEEDBACK**

The feedback from the CPD session was very positive. The following are quotes collected from a Survey Monkey, created by the employer.

“I found this to be an interesting exercise and a good opportunity to experience the sort of “on-site” environment that would be found in decommissioning projects like at Sellafield. The open-ended nature of the project meant that we could all be pushed beyond our current capabilities and learned new things.”

“I feel I have gained more of an appreciation of the complexities of decommissioning work, especially in how the timescale and cost of even a simple task in an active area can quickly rack up. The team-working element, and particularly the people management element after the apprentices joined us was really good, and will help support my future CEng application in the area of leadership and management.”

“It was good to get a hands-on experience of the rig - we were able to dress up in full PPE as one would in a real decommissioning scenario. The virtual reality demonstration of the rig was also useful in training the apprentice in our team before experiencing the rig for themselves. I also learned a lot about planning and safety cases - something I haven’t had much exposure to in my current secondment.”

“Self-awareness and reflective learning Very good - we were left to work things out on our own on the last day with the occasional input from the course leader. We were able to use our budget to ‘buy time’ to talk to a specialist. The previous 2 days had a fairly flexible schedule however there were a few ‘waiting’ times before the previous team had come back from the rig for our turn.”

“The facilitators had experience in the nuclear industry and used this to help us tackle our problems. They were able to provide us with specifications on various bits of technology that we
weren’t aware of which was really interesting. One of the facilitators was very knowledgeable in CAD and was able to design one of our requirements from a simple sketch. Another facilitator covered conventional and nuclear safety that would need to be considered.”

Name 3 learning points which you will take into the workplace:

Learning Point 1 Importance of three-way communication and phonetics

Learning Point 2 Importance of safety cases and risk assessments

Learning Point 3 Managing time to ensure we had enough information before putting our bid together.

There were two areas that the graduates felt that could be improved:

“More people within each team so that roles can be allocated. PPE that fits - no small available but was given a choice of large or extra-large, the respirator needs to be available in different sizes, some couldn’t wear this due to it being too big. More time to put together the bid (presentation).”

“Teamwork and Leadership Element Not very good - Since there were only 2 in the team it felt unnecessary to delegate roles, so we ended up working on everything together. This would have worked better in larger teams, and the benefits of competing with another team would have been realised.”

The point about there being more people involved in the course was out of the Nuclear Teams control, but discussions have occurred since and larger groups have been identified to attend future CPD courses. In terms of the PPE, that was an operational issue and one that the Nuclear Team have taken on board and have procured more PPE for the future courses.
CONCLUSION

Although the OTLA projects are about testing new methodology of teaching for Technical Level delivery, this Pilot scheme ran with a group of graduates. The Project Team have utilised this Pilot scheme to test the embedding of the ELM methodology within a real work based scenario. The learning from this pilot scheme, will then be embedded into the Level 3 delivery. Some of the activities that were developed for this training course will also be utilised by the Nuclear Team for Level 3 delivery. Without the learning from this Pilot scheme, the Level 3 delivery would not have had the successful activities embedded within the modules.

As well as this, Lakes College have been approached by the NDA and also Sellafield Ltd to organise and deliver the same CPD course for their Level 3 Apprentices and their Graduate Schemes. This now means that a further four CPD courses are going to be delivered to a range of students from Level 3 to Post Graduates.

The Project Team believe that this is a fantastic endorsement of the NCfN ELM along with the skills and knowledge of the Nuclear Team. The Project Team believe that this Pilot scheme was absolutely pivotal to securing future business and that these extra courses wouldn’t have been organised if it wasn’t for this project.

The points below are feedback from the employers based on the use of Nuclear Behaviours within the building and the use of the NCfN ELM.

“Utilising the NCfN ELM has given current employees (Degree Level students), the focus as to why they are studying a particular subject. Due to the content being embedded within Industrial scenarios, the employees are in a better position to relate their learning to their workplace.”
“This has given us (the employers) more focused employees.”

“We (the employers) have noted that the Level 3 students (some of which are now degree students), had a better appreciation for the industry than other new employees entering the industry.”

“This means that by utilising the NCfN ELM, we as an organisation are giving students the best possible chance of entering the industry with the necessary skills required.”

“From an employers prospective, this is enabling new employees to enter the industry, who are already exhibiting the Nuclear behaviours required for the Industry.”

“This ensures that the employers are receiving new staff that won’t take as long to train than other new starters.”
REFERENCES

# ASSIGNMENT BRIEF

<table>
<thead>
<tr>
<th>COURSE TITLE</th>
<th>Nuclear Graduates Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIT TITLE</td>
<td>Big Rig Decommissioning Challenge</td>
</tr>
<tr>
<td>ASSESSOR</td>
<td>Stephen Blackwell</td>
</tr>
</tbody>
</table>

## LEARNING OUTCOME(S)

1. Analyse the construction of the “Big Rig” and develop a decommissioning strategy
2. Estimate the cost and duration to complete the decommission task
3. Summarise the engineering strategy, challenges, cost and duration and present findings.
4. Compare the use of Virtual Engineering to conventional engineering practices.

## TASK OUTLINE

- Organise a project team and resources.
- Assess the given data and create a strategy.
- Develop a decommissioning strategy.
- Calculate decommissioning cost and duration.
- Present engineering proposal to NCfN team.
**Background information**
You and your colleagues have been given a small enterprise grant to setup engineering services companies.
Your first bid opportunity has arisen in the form of a decommissioning task at the National College for Nuclear (NCfN), the task is to develop a strategy and present it to the NCfN board.

**Task detail**

**Budget**
Each team has been awarded £10000 to setup a SME and produce a viable technical proposal for the decommissioning opportunity.

**Business management**
Each team will be granted 1 hour of free accommodation at the college, following this they will be offered office space and services which must be paid for from the enterprise grants.

**Tender documents**
Upon set up of the businesses, a detailed tender document with technical data, plant layouts, drawing package and an invitation to attend a site visit to perform a physical survey.

**Opportunity**
The opportunity is to develop a decommissioning strategy for the safe and effective dismantling of the “Big Rig”.
The Big Rig was an experimental nuclear rig developed to test contaminated liquids. The rig spans two floors and has numerous vessels and pumps. The system is located in a secure C2R2 facility. All items have been cleaned as far as practicable and the majority of waste is hoped to be Low Level Waste (LLW) or Very Low Level Waste (VLLW). The completion criteria are for all items to be safely stored in suitable waste containers and transported to the Low Level Waste Repository at Drigg (LLWR).
Teams are responsible for the development of an engineering strategy to decommission the “Big Rig”, they will have to evaluate available engineering data, survey the plant items, and develop procedures utilising Virtual Reality technology.

**Specialist support**
As the teams are a newly established SME’s they may buy in specialist services, these must also be funded from the grant if required.

**Technology**
Each team will be allocated 1Hr of Virtual Engineering to aid the development task, further time can be utilised through the team’s fictional budgets.
Duration
Each team will have 3 days in total to formulate a decommissioning strategy. The presentation will be scheduled for the final afternoon.

Tender award
The successful team will be awarded the work on the final day.

Tasks:

Task 1
Assign each team member a position and responsibility within your company. Name your fictional company and develop your bid strategy including promotion of your company.

Task 2
After evaluation of design data, visiting and surveying the plant you will be required to develop a decommissioning strategy to safely and effectively decommission and dismantle the Big Rig located at Lake College Construction Centre.

Your strategy should include
- Engineering risk analysis
- Decommissioning sequence
- Approximate cost
- Approximate duration

Task 3
Present your proposal to the NCfN board and employers. Your team is required to give a 30-minute presentation and present all of your findings.

Success criteria
Your team will be assessed through the duration of the assessment on the following criteria.
- Team work
- Engineering merit of decommissioning strategy
- Financial merit of decommissioning strategy
- Planning of decommissioning strategy
- Use and evaluation of Virtual Reality engineering techniques.