

# *Constructionarium Scotland.....*

## *Turning theory into practice: Experiences and Outcomes*





*"What I've gained from taking part in Constructionarium, is an insight into what it's going to be like being a civil engineer in industry"*

**Student**



*"this is about how things work in real life not just the theory that you learn in the classroom"*

**Student**



*"Its key that the students develop the skills they need once they graduate"*

**Consultant Engineer**



*"I've been hugely impressed with what I've seen. The students seem to get a lot from taking part"*

**Managing Director**



*"Students are coming out of University without any experience. How do you run a job without experience?"*

**Project Manager**



*"what is good is seeing real life problems and how you solve them, putting what you learn in the class into real life"*

**Student**

*"I've learned what my strengths are and the strengths of my team"*

**Student**



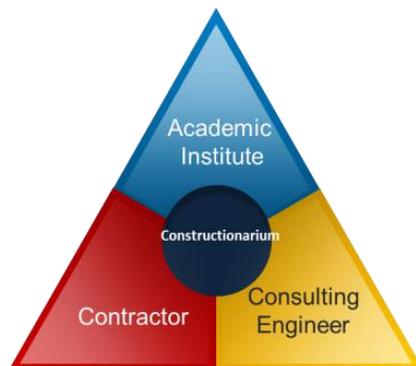
*"Some of the students have never had a hammer in their hands, now they are building full structures"*

**Senior Lecturer**



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*Glasgow Kelvinside College tell their story and share their experiences of Constructionarium (Scotland).*



*The University of Abertay tell their story and share their experiences of Constructionarium(Scotland).*

# Acknowledgements

Established over ten years ago, Constructionarium provides a “hands-on” construction experience for students and professionals; where participants construct scaled down versions of bridges, buildings, dams and civil engineering projects from all around the world. The principle is to link academic institutes with industry and to ensure that the students are able to apply the knowledge they have gained in a practical, safe and relevant environment.

The basic model consists of a triangle formed by an academic institution, a contractor and a consultant; working in partnership to deliver a new learning experience which combines the academic perspective with those of the design professional and practical site delivery. Constructionarium Scotland is a collaboration between Industry, Education and Government and without whose support these projects would not be possible. Many of these organisations have provided evidence and information to support this evaluation and include:



## Case Study – Lloyd (Civil Engineering Student)

Lloyd had an interest in maths and physics at school and had originally wanted to do architecture when he left school but his love of science sparked an interest in civil engineering.

He left school and was successful in gaining a place at the University of Strathclyde studying Bachelor of Engineering with Honours. During his academic studies, the opportunities to gain practical hands on skills and knowledge were limited and he found the focus on theory and academic studies began to diminish his enthusiasm and levels of engagement.

In his 3<sup>rd</sup> year of study, he had the opportunity to take part in a Constructionarium (Scotland) Project which he hoped would provide an opportunity to see theory being applied in the real world of engineering.

*“My peers elected myself to be Project Manager for the event and it was the best thing that could have happened, the sense of responsibility and delegation really ignited my interest. It finally made me appreciate the theory at university by putting it to practice.”*

Taking part in the Constructionarium Project reignited Lloyds passion and interest in Civil Engineering and gave him the confidence and underpinning skills and knowledge to realise he could be an engineer.

Lloyd successfully completed his degree and is now employed as an Engineer. He feels that the experienced gained through Constructionarium was what made the big difference when it came to looking for a job.

*“Not only did I learn so much but I also grew a strong bond with all my classmates who I am still friends with today!”*

Figure 1. Student Case Study

# Executive Summary

The Constructionarium Programme is a hands-on construction experience for students and young professionals. It is designed to be part of a 21st Century engineering education, linking the world of academic theory with contractors and consultants from industry. The course has been running successfully since 2003 with almost 1000 students taking part each year.

It provides the opportunity for groups of students to construct with their own hands, scaled down versions of iconic bridges, buildings, dams and civil engineering projects from around the world. The students work in a controlled environment supported by both academic and industrial staff. It provides a unique link between the theory and practice giving the students the opportunity to experience just how things work in the real world.



A 'Constructionarium' course runs for 6 days with 5 days spent on site, on a full-time residential basis. During the week, students are guided by a professional team through real construction projects, working typically at a scale between 1:20 and 1:10.

At the end of the course the students have gained a huge amount practical site based knowledge, skill and experience and will have dealt with a number of challenges that they will face in their future careers. Some of the Key Outcomes that the Programme delivers for participants and partners include:(Fig 2, 3)

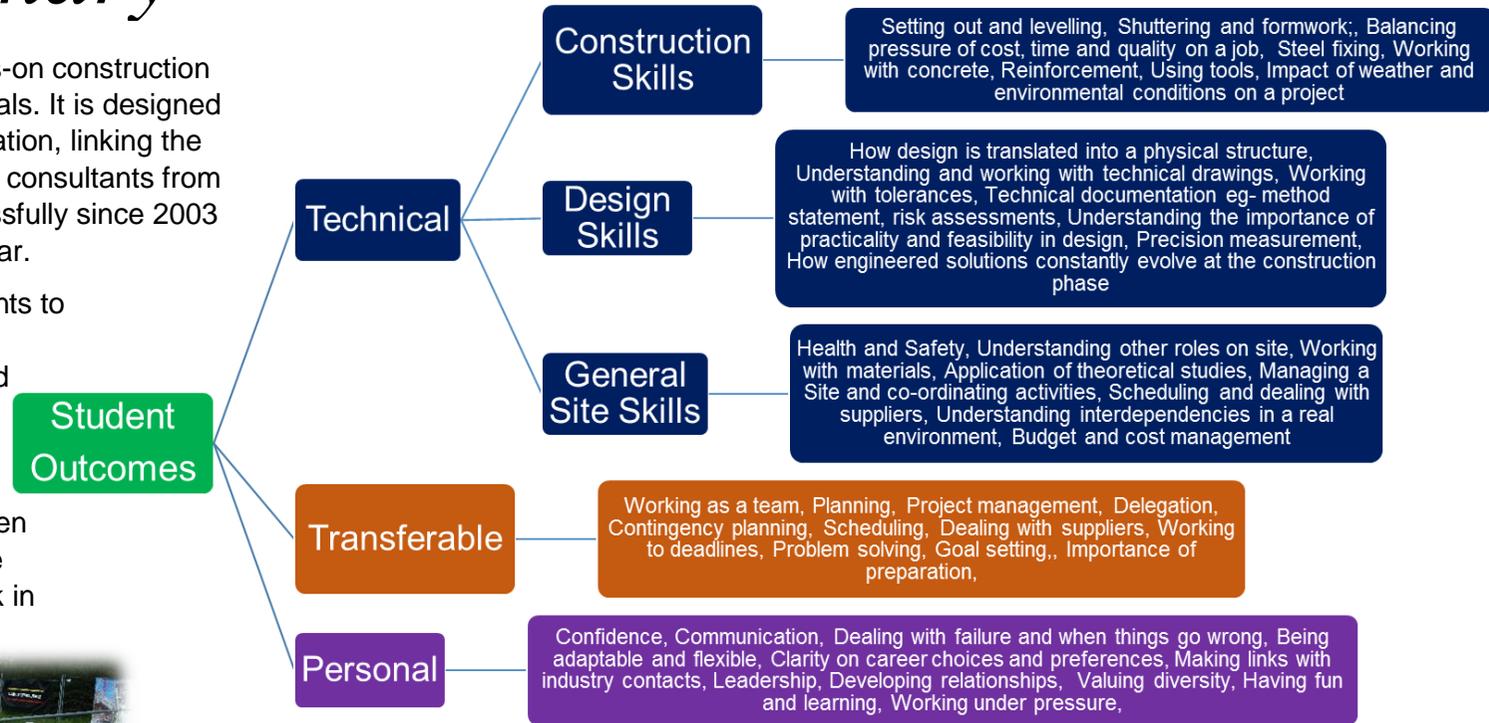


Figure 2. Student Impact Map

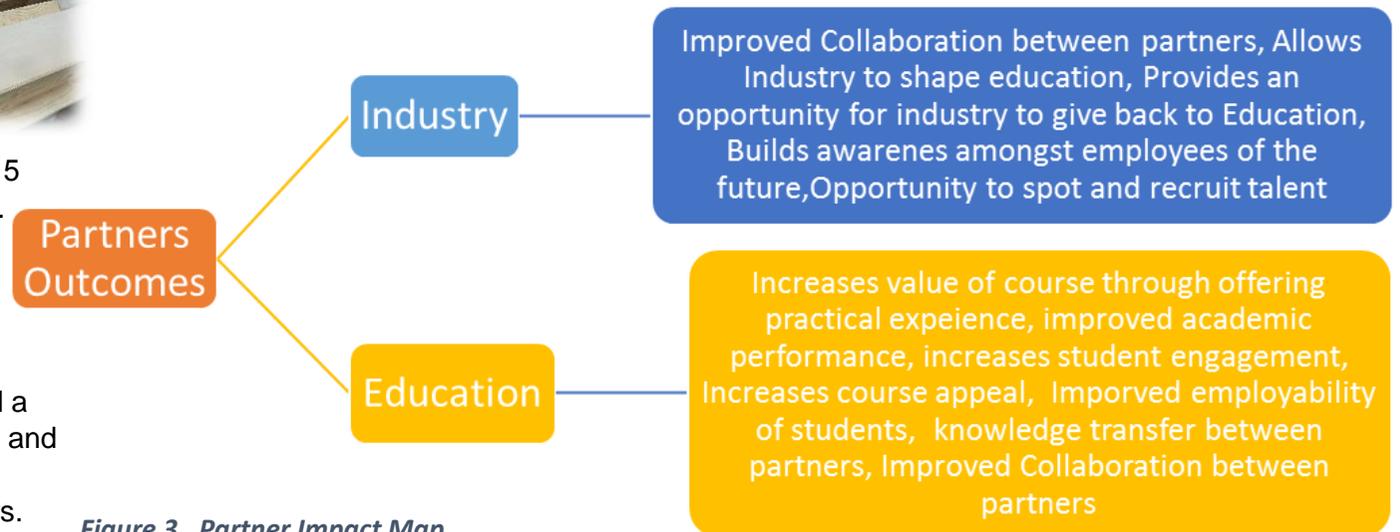


Figure 3. Partner Impact Map

# *The need for Constructionarium – Where does it fit?*

Constructionarium (Scotland) is a partnership between Industry, Education, Government and Individual Students. The programme is designed to enhance the students learning experience whilst attending a programme of academic study at College or University. It aims to develop the practical skills, knowledge and experience of students by exposing them to working on a real construction site on a live project.

The Constructionarium (Scotland) Programme is an example of how different sectors can successfully combine, working in partnership and co-producing to deliver on a range of National Outcomes, Educational Outcomes and Construction Sector priorities and strategies.

At a National Outcome level the Scottish Government have identified:

***“We are better educated, more skilled and more successful, renowned for our research and innovation”***

***National Indicators*** which support this outcome include:

- *Improve knowledge exchange from university research*
- *Improve the skill profile of the population*
- *Increase the proportion of young people in learning, training or work*
- *Increase the proportion of graduates in positive destinations*

“strengthening partnerships and collective responsibility between public, private and third sectors to help improve skills and the contribution they make towards achieving Scotland’s social and economic aspirations”

- The Scottish Government National Indicators

The part that Universities are expected to play in support of this National Outcome is highlighted in the University Single Outcome Agreement Aims 2015-16 and include:

- High quality, efficient and effective learning
- Developed workforce – Skills and Enterprise
- University – Industry Collaboration
- Governance and Management, Environmental Sustainability, Equality and Diversity

Individuals and their ability to learn, work and contribute to society and the economy will help us achieve sustainable economic growth by improving productivity levels. We need demanding employers who understand what skills development can contribute to their performance. We also need individuals capable of capitalising on their own abilities in the workplace.

-The Scottish Government Skills for Scotland Strategy

College Single Outcome Agreement Outcomes 2015-16 include:

- Deliver a high quality relevant curriculum that meets the needs of the region, and provides progression opportunities to more advanced study and exit points to employment.
- Provide learning opportunities which contributes towards the creation of high retention, attainment and achievement.
- Deliver an integrated learning and employability experience that effectively compliments the ‘senior phase’ school curriculum, and prepares the way for progression.
- Grow our intellectual property, commercial profit and student opportunity through collaborative partnership with the business sector and other organisations.

Its recommendations span the education and training system and call for more effective joint working between schools, colleges, training providers and employers. The aim must be to provide the best possible blend of learning for young people to equip them for work.

- Commission for Developing Scotland’s Young Workforce, Education Working For All - Final Report

# *The need for Constructionarium – Where does it fit?*

The CITB Strategic Plan and Scottish Strategic Plan detail a range of priorities which are important to the Construction Sector and its long term success. The Constructionarium (Scotland) Programme makes a significant contribution to delivering on many of these priorities which are listed below:

- **Image and Recruitment**

- Improve the industry's image and raise awareness of construction career pathways
- Provide opportunities for people to experience construction careers
- Enable the industry to engage with education providers
- Support skills and careers events, facilitate the Construction Ambassador programme, work experience programmes, and engage with careers influencers.

Employers are in a unique position to help give young people the inspiration, knowledge, skills, and motivation they need to transition successfully from education to the workplace.

- Commission for Developing Scotland's Young Workforce, Education Working For All - Final Report

- **Industry Engagement**

- Promote the benefits of investing in training.
- Provide increased opportunities for developing work readiness.

- **Training and Development**

- Promote talent management and continuing career development through structured CPD
- Develop a competent and safe workforce
- Support up-skilling, re-skilling and conversion
- Work with industry to develop and deliver relevant training in new technologies and contemporary working practices.
- Engage with the providers of training in Great Britain to ensure that the management of the training supply develops the skills construction demands
- Align the provision of construction education and skills across the wider built environment so it is more joined up and effective for employers
- Improve the work ready quality of training at all levels
- Agree paths for professional development and career progression in UK construction, guided by skills and training.

Fundamentally, this is about ensuring a work relevant educational experience for our young people. It is about all of us valuing and understanding what a rich blend of learning, including vocational education, can offer. It is about employers playing an active role, both shaping and benefiting from Scotland's education system by helping to create the talent pool they need and recruiting young employees. Ultimately, it is about the future workforce, our young people, making informed and ambitious choices about jobs and careers, ready to take their place in the world as effective contributors

-The Scottish Government Youth Employment Strategy

Increasing the opportunities for individuals to develop and use their skills as best they can is not just a strategy for improved economic performance. It is also an effective way of improving the satisfaction and security of work, promoting the health and well-being of individuals and enhancing the fabric of our communities.

-The Scottish Government Economic Strategy

**Not only does the Constructionarium (Scotland) Programme represent a unique collaboration opportunity that serves to build co-operation between the education sector, industry and individual students around national and sector priorities. It also delivers on a set of Key Outcomes that clearly align the interests of key stakeholders and have a significant and lasting impact on those that take part in the programme.**

# What we are doing – Our Inputs & Activities

The Inputs are the resources that are required to deliver a successful Constructionarium Programme. Due to the complexity of the programme and the many partners involved, the resources required are significant. The key components required include:

## Engineering students:

- To organise, manage and build the projects on site.
- Students may come from civil engineering, university or related professional bodies and companies.

## Design professionals:

- To design and specify the projects in advance.
- To guide the students and help them run the projects on site.
- To assist in assessment.

## An enlightened contractor:

- To provide the materials, plant, specialist labour and supervision.
- To set up the site in advance, and run it during the course.
- To decommission the site on completion.
- To brief and control health and safety matters
- To act as contract manager for each of the student teams and monitor their performance in terms of cost and programme management.

## A willing academic or professional host:

- Who wants to broaden the taught curriculum so that theory, design and construction are well integrated.
- To provide academic assessment criteria.
- To help the design professionals in the choice of project.
- To supervise the administration arrangements regarding students' accommodation, transport, health, risk assessment, information, etc.



## Learning Methods

The learning methods used by students on the 'Constructionarium' are experiential learning, role play, reflective learning and project-based learning.

- The experiential learning (learning from experience) and reflective learning takes place on site, with students having to respond to practical challenges of matching theoretical knowledge and vacation work experience to the engineering task they have been set.
- Project-based learning methods are applied for learning management, leadership, delegation and identifying knowledge gaps.
- Role play learning is built in: the students take on all roles from chartered engineer and project manager down to general labourers (this distinguishes a Constructionarium from ordinary work experience as a student labourer or student engineer).



## Teaching Methods

Students are given real drawings of real projects and organised into groups of 16 and 24. An essential objective of the 'Constructionarium' is the self-management and organisation of students, where they take responsibility for allocating tasks within the separate teams. For example it is left to the student group to resolve issues such as project management, economics of a project, time management and materials delivered on time.

Members of the teaching team are available for on-site consultation to develop the brief so that students receive immediate feedback as to their progress. The teaching team consists of both industry-based academics supplemented by input from technical consultants. The student teams of 16 or 24 act as contracting companies and have to deliver their projects to time and budget within the five day on site period (although the event runs for 6 days, the first day is arriving and induction, with no site work). The site teams are required to do all the work, establish a programme for the works and provide a schedule of costs.

One 'Constructionarium' student felt the experience was “..typical of the real world i.e. our supplies might not turn up”

# What we are doing – How did we gather evidence?

The purpose this independent evaluation was to gather existing information and evidence together, identify some of the key outcomes that the programme delivers for stakeholders, learn what could be done to improve the programme and provide a foundation for a more robust and focused evaluation framework moving forward. The evaluation exercise was carried out retrospectively on Constructionarium (Scotland)

Programmes which have taken place over the last couple of years. The evidence was gathered from a range of sources and was supplemented by some additional primary research carried out with representatives from Education and Industry Sectors and individual students.

- **Desk Research**

We looked at sources of information and evidence that were available through programme partners and on the internet.

- **Primary Research**

Surveys were carried out with students from a number of academic institutions along with industry partners and academic staff.

- **Pictures**

Pictures of participants were taken in a wide variety of activities and situations, capturing examples of skills performance, emotions, achievements and behaviours.

- **Listening**

We listened carefully to individuals to better understand what mattered most to them and what difference was made through participating in the Programme.

- **Video**

Groups and individuals were filmed participating in some of the activities and a range of brief interviews were conducted with participants.

- **Observation**

Programme film archives were used to carefully observe and record the ways in which participants changed, experienced the activity and interacted.

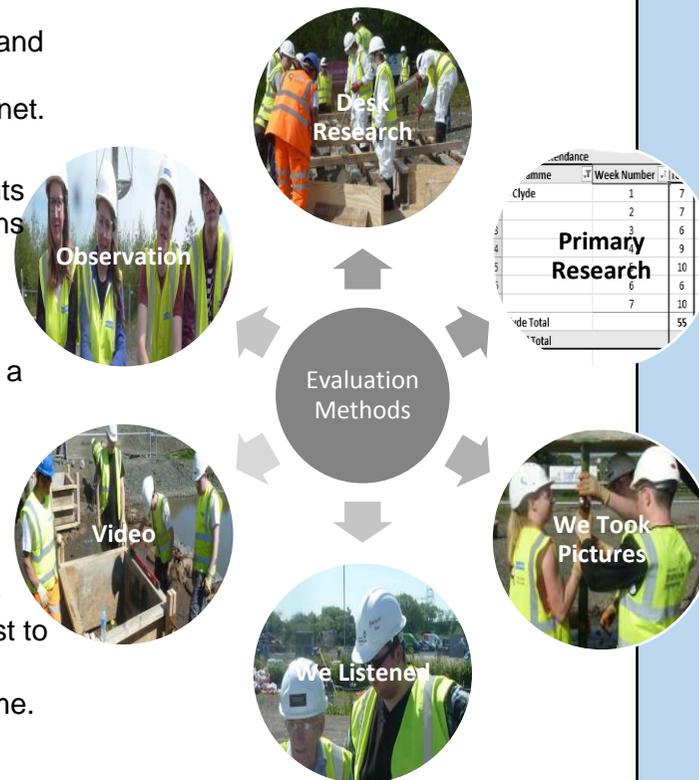


Figure 4. Evaluation Methods

## Case Study – Shannon (Civil Engineering Student)

Shannon had an interest in engineering throughout her school education but it was only towards the end of 6<sup>th</sup> year that she developed an interest in construction.

On leaving school, she went on to study at Glasgow Kelvin College doing an HNC/HND in Civil Engineering before going on to her B ENG in Civil engineering at Napier University.

Early on in her studies, she recognised that the lack of practical hands on experience was something that she needed to address. So when the opportunity to take part in the Constructionarium (Scotland) Programme presented itself, she jumped at it.

*“As I had no previous experience, I thought I would benefit from the extra help and supervision on site”*

*“The programme helped me understand the process of rebar and formwork and a lot more. It has really helped me with my studies and I learned that I really enjoy site work!”*

Having taken part in Constructionarium she was better placed to understand the process of construction and how all the different stages come together to form a completed project. Shannon thinks that all engineering students would benefit from taking part on Constructionarium but being able to do something like this in 1<sup>st</sup> year would allow students to get the maximum benefit throughout the duration of their academic studies.

Shannon has yet to complete her studies but feels that the experience and confidence that she gained on the Constructionarium Programme will be a big benefit when she comes to looking for employment.

*“Hard work, worth it, fun, wish I could do it again!!”*

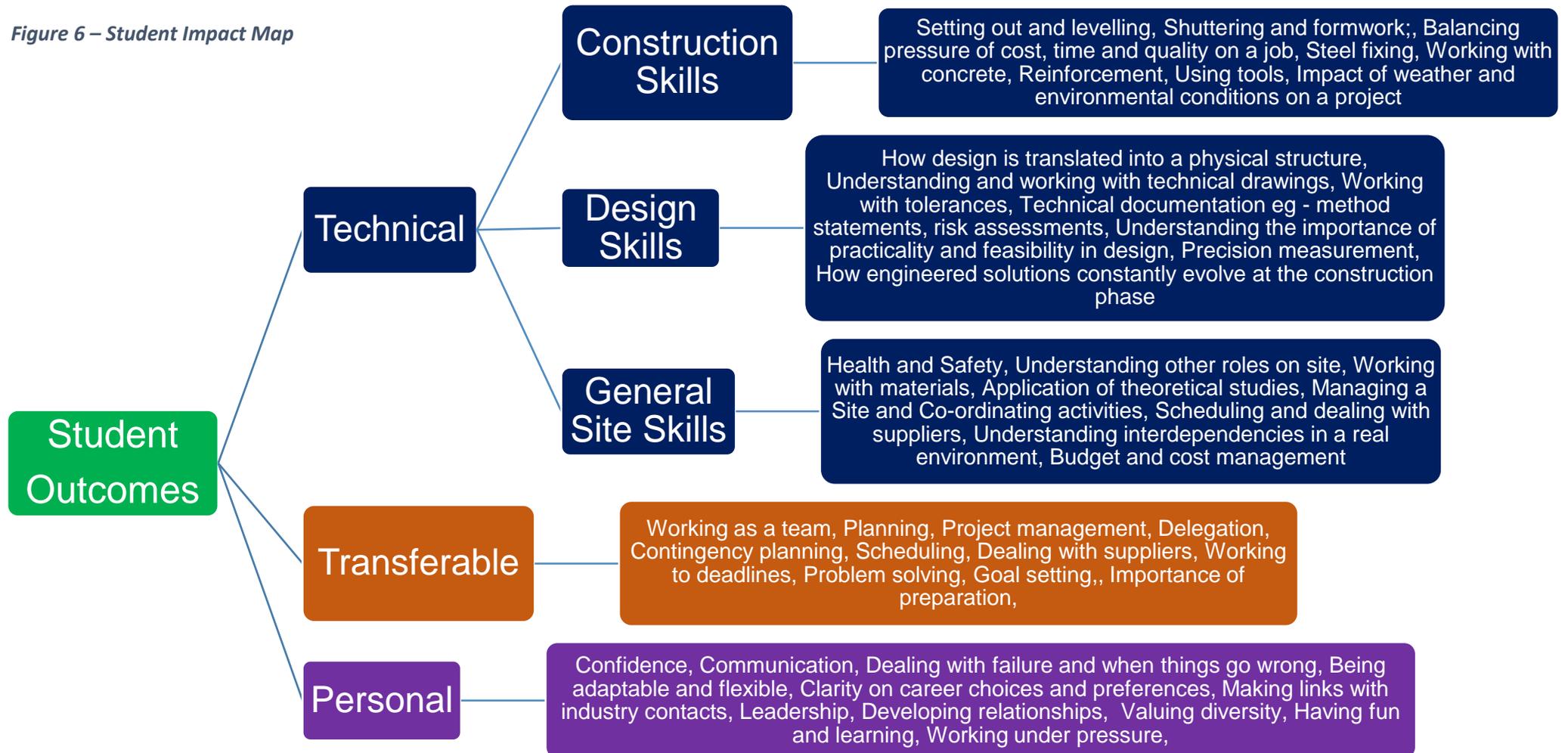
Figure 5. Student Case Study

# ... and the difference we make.

Outcomes are about the things that matter most, the change or difference the activities or services make for those that are involved or take part. Outcomes can be both positive and negative and can often be subtle and very personal to the individual.

The Constructionarium (Scotland) project aims to make a difference for key stakeholders which include, the student participants, academic institutions and industry partners. Primary research conducted by the University of Strathclyde and Kelvinside College over the last 4 years and a more recent survey of students who have completed their academic studies highlight some of the differences the Constructionarium programme is making for participants.

Figure 6 – Student Impact Map

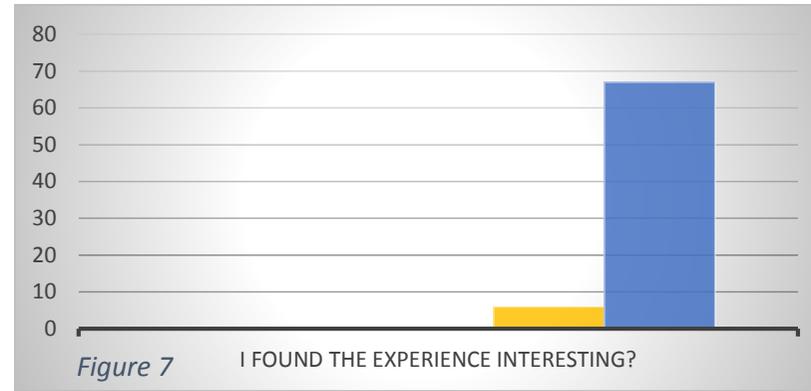


# .... and the difference we make.

Primary Research Carried out by the University of Strathclyde provides an insight as to how the Construction (Scotland) Programme has impacted upon the learning experience of students.

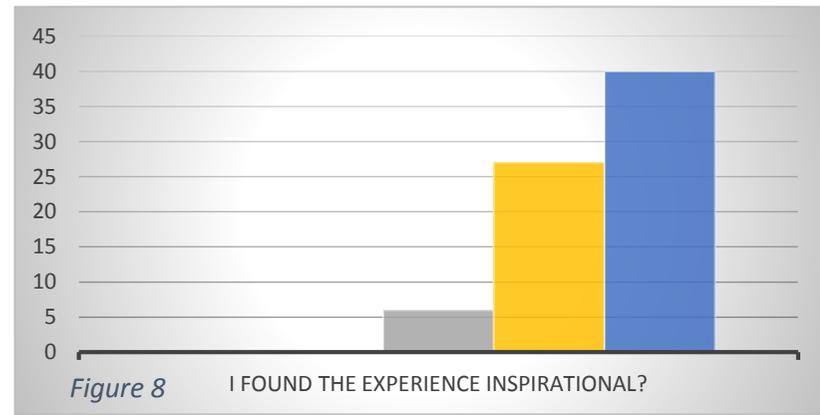
Of the 73 Students who were surveyed, 100% found the experience interesting with 92% finding the experience **Inspirational** (Fig.7 and Fig.8)

|                   |            |
|-------------------|------------|
| Strongly Disagree | Light Blue |
| Disagree          | Orange     |
| Neutral           | Grey       |
| Agree             | Yellow     |
| Strongly Agree    | Dark Blue  |



*"I think projects like this should become compulsory in degrees like ours! The lessons I learned during this experience are ones which I couldn't have been taught in class"*

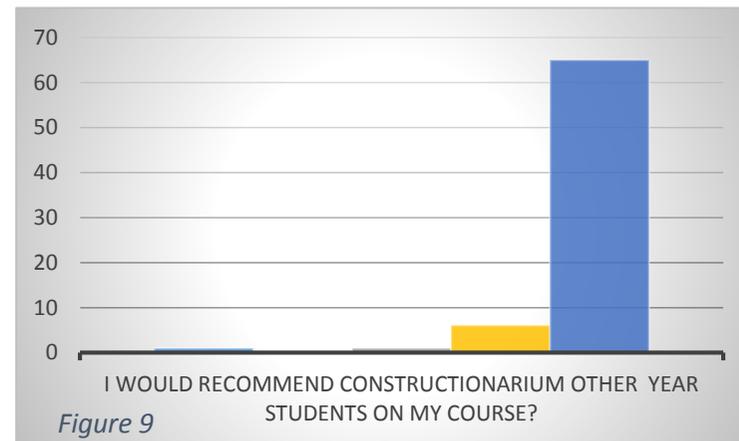
*"It was an unforgettable learning experience and a good reflection of an actual civil engineering project, unexpected problems included. I would recommend it to anyone studying civil engineering; it is important to get site experience as early as possible and is really beneficial in terms of understanding the theory learnt in class".*



*"I think Constructionarium could be more widely advertised for students who may participate next year. I didn't fully understand what I was going to be doing and I think that if this is advertised more there would be much more interest as it is invaluable experience"*

100% of those students that were surveyed would recommend the Constructionarium Programme (Scotland) to their fellow students with many of them suggesting that the programme should become a compulsory part of the curriculum.

The students who were surveyed and who had completed their academic studies all felt that Constructionarium had played a major part in them securing employment within the industry. (Fig.1 and Fig.19)



*"I loved the week here at Constructionarium. Working with the 3<sup>rd</sup> years, joiners and other experienced workers was fantastic experience – putting the theory into practice by managing our own construction project was very useful experience, especially as the week was set up to give us experience of what a 'real' construction project would be like."*

# .... and the difference we make.

|                   |            |
|-------------------|------------|
| Strongly Disagree | Light Blue |
| Disagree          | Orange     |
| Neutral           | Grey       |
| Agree             | Yellow     |
| Strongly Agree    | Dark Blue  |

The practical hands on experience of working on a real project also appears to have benefited the students in terms of influencing their thoughts on future career options. 94% of students surveyed agreed that the experience on the Constructionarium Programme had helped to confirm their intentions to become a civil or architectural engineer (Fig.10) with 72% indicating that they would seek employment in the contracting sector (Fig.11). Only 26% of students surveyed agreed that the experience would encourage them to seek employment in the consultancy sector.

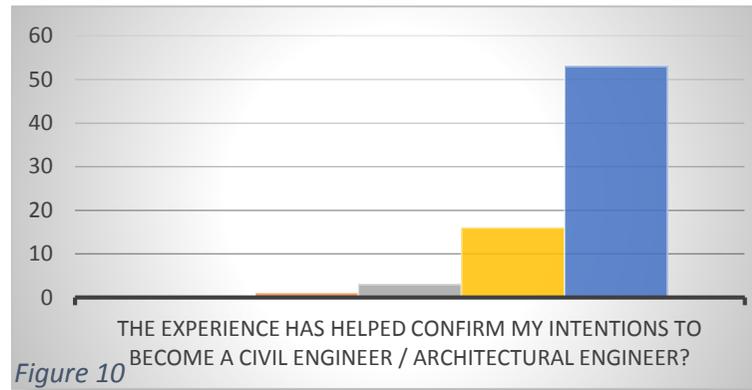


Figure 10

*"Was very enjoyable and helpful. So useful it should be a mandatory part of the curriculum as it lets student get a feel for different areas of the business (i.e. Quantity surveyors, project management, design, land surveying) and how they impact a project as a whole. This is important to learn before you leave uni as it lets you have a better idea of what sector you want to move into."*

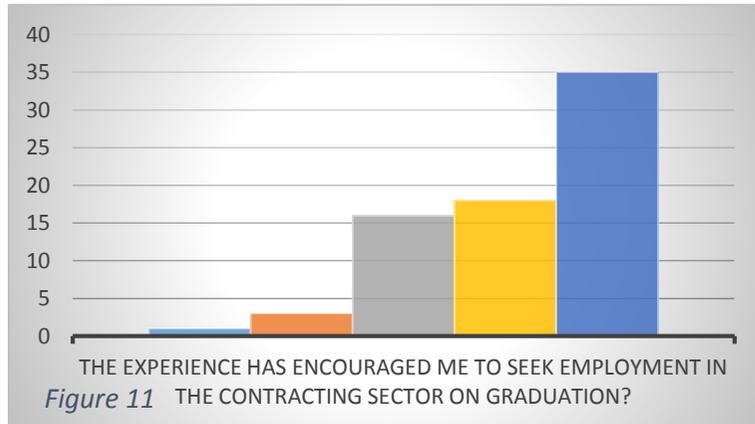


Figure 11

*"Before attending Constructionarium I was almost certain that consultancy was the career path I would like to follow after graduation as I really did not think that contracting was for me, but I am now thrilled to be able to strongly consider contracting as another option for me!"*

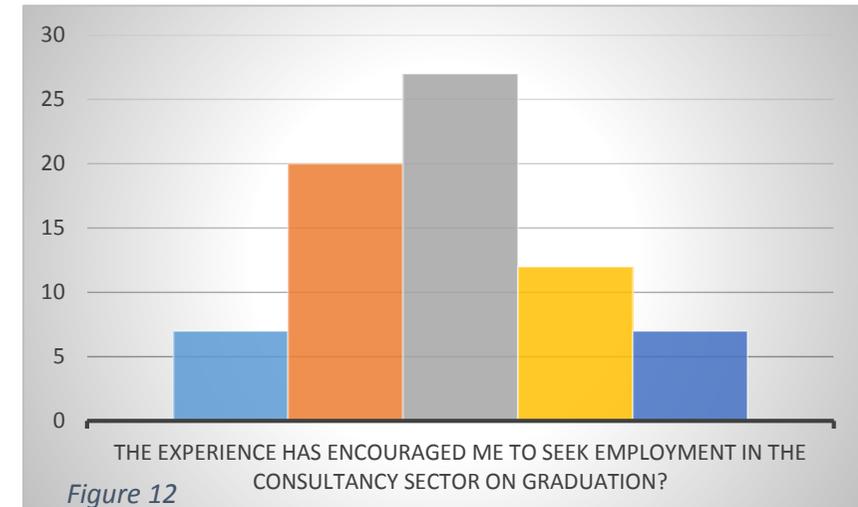


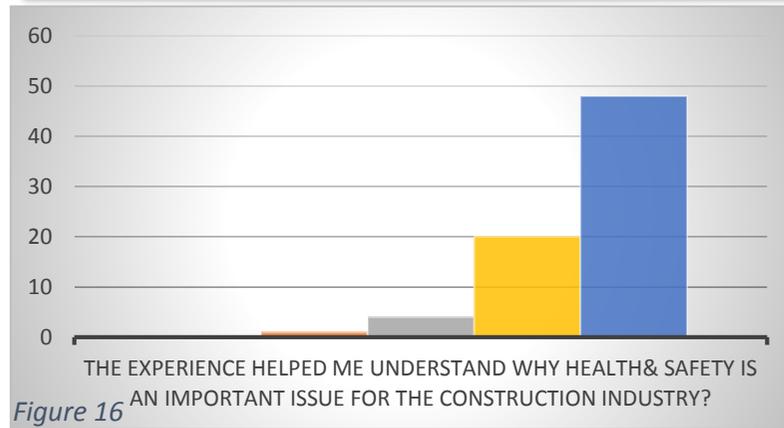
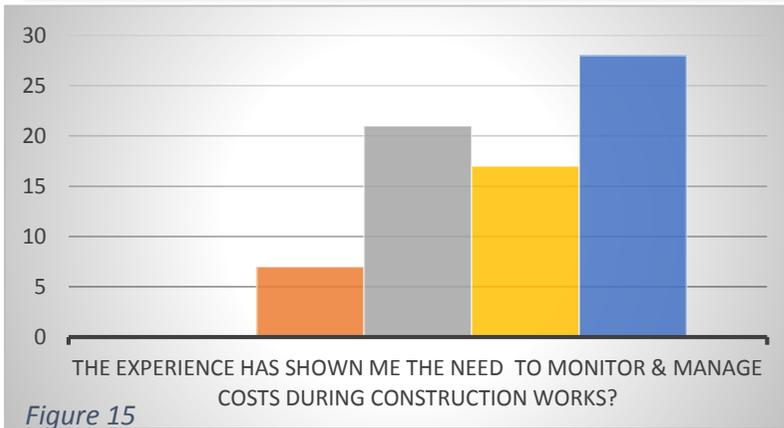
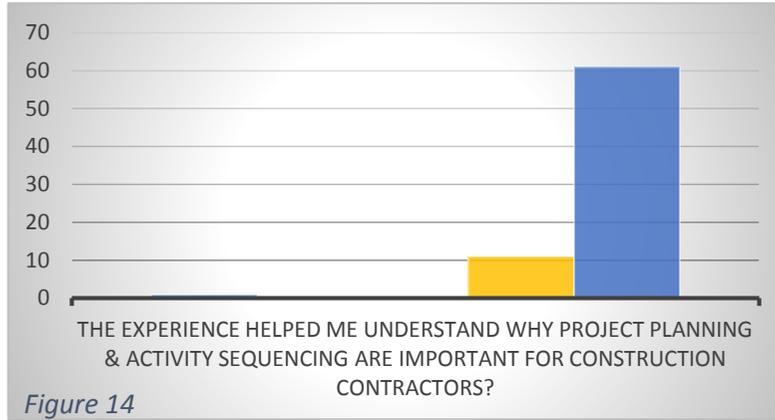
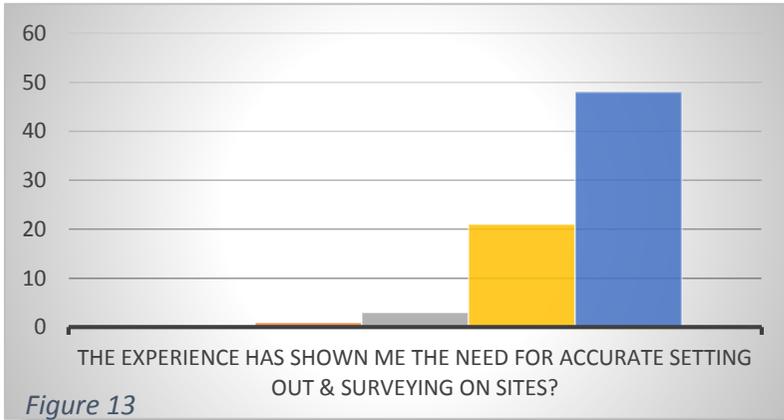
Figure 12

*"I knew I wanted to go into contracting after graduating and this experience is a great opportunity to actually get your hands dirty and do some of the specialist works (such as steel fixing) that one day as a Civil Engineer I will hopefully be overseeing. I learned so much from this experience and the skills and confidence gained are invaluable!"*

The impact of participating in the Constructionarium (Scotland) programme has a real and tangible effect on the levels of technical skills, knowledge and experience attained by the students. 94% of Students surveyed agreed that the experience had shown them the need for accurate setting out and surveying (Fig.13). All participants felt that participating on the programme had helped them to understand the importance of planning and sequencing of work when onsite and the crucial part that Health and Safety plays in managing a live site (Fig.14, Fig.16). Feedback from students revealed many other technical outcomes from participating in Constructionarium which are summarised in Fig.6 Impact Map, Fig.13-17.

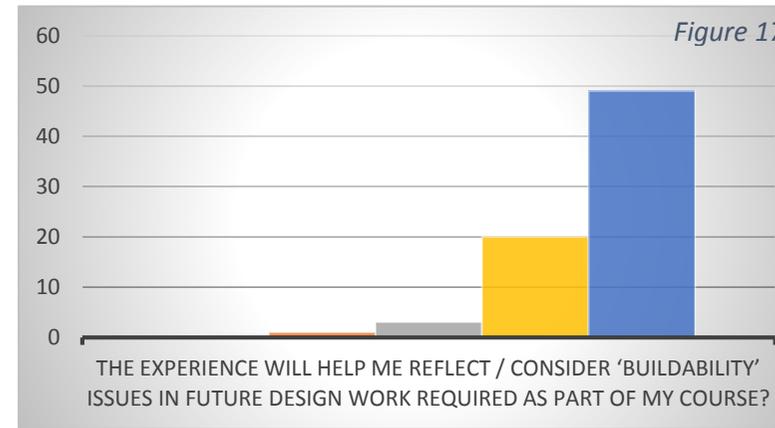
# .... and the difference we make.

|                   |            |
|-------------------|------------|
| Strongly Disagree | Light Blue |
| Disagree          | Orange     |
| Neutral           | Grey       |
| Agree             | Yellow     |
| Strongly Agree    | Dark Blue  |



*“As part of the setting out team I was required to accurately set out the tower foundations and level the excavation according to the plan drawings. The experience improved my understanding of how points are set out and levelled using surveying equipment, which put into practice and increased my understanding of what I had learnt in the land surveying class this year”*

*“Another key aspect of the experience was site health and safety. Actually working onsite gave me a greater awareness of the hazards and risks involved in the construction and the measures that are taken to eliminate reduce or isolate the risk. The risks were identified prior to the start of the project and the project manager briefed us on potential hazards for the work each day to ensure everyone was aware of their personal safety and those around them.”*



*“Buildability – I hadn’t previously appreciated the complexity and manual labour involved in certain elements such as steel fixing and constructing formwork and it took a lot longer than I was expecting.”*

# .... and the difference we make

Some of the outcomes that were identified by the students were more generic and transferable out with the construction sector and included:



## Working as a team

*"It was also very useful to see the teamwork and communication that is needed for construction projects, and this was a lesson we were always learning and improving upon throughout the week"*

*"Being able to work in a team and handle everyone's suggestions and constructively collaborating them is also something that I have learned- often people have different ideas on how something should be done and it is very important to find the happy medium that will ultimately lead to a safe and successful construction of a structure.."*

*"I think the primary lesson I took from my participation was that pre planning really is vital. We fell behind in the first day due to a lack of understanding of how much we had to do prior to the first day. This is a lesson I think can be applied in many aspects of my academics."*

## Importance of Preparation

*"Taking a step back from everything going on to get a better idea of what is going to be needed next allows you to prepare and delegate more efficiently.."*

## Project Management

*"I enjoyed actually learning of how a bridge is built. In class I feel we don't understand how projects are actually constructed and the stages involved in this. I feel I have gained a lot in that aspect, actually able to understand how a project is put together"*

## Planning

*"I think Pre planning of a project and sticking to time plans is absolutely essential."*

## Working to Deadlines

*"there were stressful points where deadlines were tight or mistakes had been made and had to be corrected, but these were also the times when the biggest lessons were learned."*

## Delegation

*"I enjoyed the problem solving and team working aspects of the project. We worked together as a group to complete tasks according to the programme however some tasks took longer than anticipated as problems arose. The team successfully overcame challenges, solving the problem collectively and correcting the mistake"*

## Problem Solving

*"You can plan and timetable as much as you like but as long as you are relying on outside contractors and deliveries to make deadlines you are at risk."*

*"The project illustrated the importance of timing, activity sequencing and allowance in program to account for unexpected, unforeseeable problems.."*

*"I enjoyed the combination of physical labour and engineering problem solving."*



# .... and the difference we make

The student outcomes delivered by the Constructionarium (Scotland) Programme were not restricted to those specific to the Construction Industry. A number of outcomes identified were personal and related to the development of the individual. These included:

## Confidence

*"I learned so much from this experience and the skills and confidence gained are invaluable!"*

*"Although being thrown in at the deep end with it has definitely increased my confidence in reading them for the future."*

*"The communication within the group between project managers and other managers also being hugely important. Especially in overcoming the inevitable problems that would arise throughout the project"*

## Dealing with failure and when things go wrong,

*"The main lesson I have learned is the importance of checking. Although at the time you may feel that checking every detail slows the project down, in the long run it can actually help speed up the project as doing it wrong the first time means you need to do it again which will require more time and money.."*

## Being adaptable and flexible

*"Unpredictable things happen on site. You need to be adaptable to changing events and circumstances without losing sight of the end goal"*

*"Another important lesson I have learned at Constructionarium is that when working on a site you have to work well together as a team and therefore you need to be a good team player, you can only get so far by working on your own..."*

## Communication

*"I was able to find out what was good about the leadership and what aspects I would try to do differently myself and I feel that will help me in the future.."*

## Making links with industry

## Leadership

*"Being involved or at least aware of every aspect of a project is essential for effective leadership. Taking a step back from everything going on to get a better idea of what is going to be needed next allows you to prepare and delegate more efficiently..."*

## Valuing Diversity

*"I understand the importance of each of the different trades and how they contribute to a successful project"*

*"the contractor staff were very helpful and were a great source of info re employment opportunities"*

*"It was great to work with so many skilled people and to make contacts for the future."*

# .... and the difference we make

The Constructionarium (Scotland) Programme also delivers a number of positive outcomes for Academic and industry Partners. These were identified through a small survey conducted with a range of partners. Some of the outcomes identified by Academic Partners included:

The University or College is able to offer its student real hands on training and experience



This Compliments and improves academic course participation and achievement by students



and increases student engagement and motivation

It allows the University or College to increase course appeal to potential students



and improves employability of students

The Programme provides an opportunity to enhance the student learning experience

and transfers practical knowledge and skills to academic staff & students

improving Academic and Industry collaboration



## Case Study – Catriona (Civil and Environmental Engineering Student)

Whilst at school, Catriona didn't have any interest in pursuing a career in engineering or construction and actually spent 10 years working in the Equestrian Industry.

She had always had an interest in how things were made and put together so when she decided upon a career change, she felt that engineering and construction might be a good fit.

In her 3<sup>rd</sup> year of study, she had the opportunity to take part in a Constructionarium (Scotland) Project which she hoped would provide first-hand experience of an actual building project. She also felt that it would be good to have this on her CV as she had no previous site experience.

*“Constructionarium gave me a greater understanding of actual site work and putting design drawings into a real life object. I also appreciated my role as project manager and working as part of a team. We had daily talks both in the morning to plan out the day as well as in the evening to discuss the next day's plans. As a team we discussed everybody's strengths and weaknesses and assigned tasks based on that as well as each individuals particular interests. Constructionarium gave me a greater understanding of the information that is required in construction drawings as well as the challenges that can be faced on site due to unknown ground conditions, the weather and how important communication is”*

Taking part in Constructionarium gave Catriona a more practical view of design work. It enabled her to complete the design of certain aspects of work within university while keeping the buildability aspects in her mind. Although she didn't actually build anything in University it has stayed with her into her working life and enabled her to consider buildability in her design work.

*“Constructionarium is an excellent opportunity to learn about the challenges that face real life construction projects. This is something you can take forward into the rest of your university life and through into your working life.”*

Figure 18. Student Case Study

# .... and the difference we make

## Case Study – Finn (Civil and Environmental Engineering Student)

Whilst at school, Finn had an interest in engineering but was more interested in the finished product rather than the construction process. The opportunities to develop any practical engineering or construction related skills were limited to some basic “application of forces” in higher physics.

From school he went on to the University of Strathclyde to study Civil and Environmental Engineering. Whilst studying, opportunities to get practical hands on experience were restricted to some very basic labs showing mixing and testing of concrete and properties of steel. One surveying course he completed, included fieldwork and he also attended various site visits organised by the department to see construction projects.

Finn first came across Constructionarium (Scotland) when looking for a summer job. His initial thoughts were that it would make a good addition to his CV and provide an opportunity to:

***“learn about the nuts and bolts of building things in an environment where there was no pressure to get things right first time and the emphasis was on learning”***

Through participating in Constructionarium, Finn hoped to make himself more employable, through having a better understanding of how things are built, having a better understanding of the role of a contractor, and to improve his work at university by having a better understanding of the industry.

***“After completing Constructionarium for the first time, I was invited to an interview out the blue a few weeks later. From here I was offered a summer placement starting shortly afterwards, and was then placed on Laing O’Rourke’s scholarship scheme on which I completed a further two summer placements. I have now accepted a graduate job with the company and will be starting in September”***

Figure 19. Student Case Study

Some of the outcomes identified by Industry Partners included:

Creating a unique opportunity for the construction industry to collaborate with the Further and Higher Education Sectors to create value



and helps Industry Partners to get closer to educational institutions, serving to influence and shape the future of civil and structural engineering



It provides the opportunity to give some learning and experience back to education



and builds student awareness of potential employers and their organisational profile



It ensures potential employment candidates have developed practical hands on relevant industry experience



and allows industry partners to meet and assess the capabilities of potential future employees

# Learning for the Future.....



Students from the University of Strathclyde  
– Department of Civil Engineering &  
Environmental Engineering.

One of the results from this evaluation project is to highlight what can be learned from what has been done and the hard earned experience gained from this. This knowledge and evidence base can help to inform how Constructionarium (Scotland) is developed and delivered in the future and allow further improvements be made to enhance the learning experience and improve the outcomes for Students, Academic and Industry Partners.

From the **Students** the key learning points to emerge include:

More information could be provided to students re construction techniques prior to going on site

More detailed drawings could have been provided

Provision of additional tools to accommodate the level of activity running concurrently

Having to buy lunch and dinner every day made the experience very expensive and may put others off the experience

Any decisions to move students between groups should be made and communicated as early as possible in order to allow students to do some preparation

Much of the PPE provided did not fit well and made work uncomfortable

Students should do more of the hands on skilled work to do

It would be good to get experience of setting out site

having better knowledge on reading engineering drawings. It's something that isn't taught at University

The timing of Constructionarium planning activities prior to going on site need to be considered in relation to e.g. exam timetables to avoid conflicts for students

The course should be a compulsory element of the university course as it is invaluable

The timetable onsite revolved around when concrete would arrive (often late) Could groups be given timescales for delivery so that they could plan programme better

Courses so be advertised better within universities as the experience is so beneficial

Unplanned problems are an invaluable addition to the learning experience

A group debriefing would be useful to maximise learning across the different groups

The last day seems rushed in terms of completing project, debriefing and leaving the hotel

# Learning for the Future.....



Students from the University of Strathclyde  
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From the **Industry Partners** the key learning points to emerge include:

Focus on learning outcomes could be strengthened i.e. with regards to the actual construction process and dealing with unexpected events e.g. late deliveries as opposed to a fixed focus on completing the job at all costs. Not completing the physical elements would not necessarily result in "failure" provided that the process and learning experience of dealing with unexpected consequences is obtained.

Make the Contract Review mandatory as don't believe all companies hold this but all decisions must link to a commercial outcome to determine success/fail.

certain elements which could have been planned and implemented better. There appeared to have been some disorganisation regarding what the students could/should have been doing and much of the work appeared to have been guided by the contractor on site which resulted in a lot of down time for the students.

Industry participation in Constructionarium could facilitate and improve knowledge exchange from university research

the students were subjected to severely adverse weather on at least two of the days. Moving the timetable to a potentially warmer time of the year may avoid this.

Replicating actual onsite conditions would strengthen the lessons learnt e.g. lack of appropriate clothing would normally restrict workers from being present on site.

# Learning for the Future.....

From the Academic Partners the key learning points to emerge include:

Grow the number of Constructionarium Programmes available

Increased involvement from industry to grow the programme and increase the impact of Constructionarium Programme

Improve support for universities to co-ordinate and organise Constructionarium programmes

Improve awareness and programme advertising among students and academic institutions

Increase awareness and understanding within academic institutions about the importance of the Constructionarium experience to students and the tangible benefits of participation to both students and academic institutions

Increase financial support for students in order to take part in Constructionarium Programme

Introduce a consistent and ongoing evaluation framework for Constructionarium programme to evidence impact

Improve links between academic institutions and industry partners within the academic environment

Participation in Constructionarium by Academic Partners helps them support employers by better understanding and assessing the skills they need for future success, and ensuring that the supply of skills, training and qualifications can be responsive to this

Provide pre-programme support to students taking part on Constructionarium

Participation of Academic Staff in Constructionarium can improve the skills, knowledge and experience of staff which can then inform the academic curriculum design

Planning importance really having  
problems only all being site construction  
Constructionarium enjoyed concrete  
Reallife few Leadership before getting  
understanding group students working  
tasks any help much university people made  
Although engineer make Skills important Confidence  
involved together like most week quality joiner doing  
through day felt see bit steel during some more  
able good lesson feel hard tools better  
other each helped because real formwork drawings  
Teamwork something pour take learned another work  
Safety things actually rebar great  
plan Practical Health about future  
project stressful part lot again  
think<sup>put</sup> team time  
enjoyable know