Constructionarium 2017

Evaluation Report

Neil Ross – Integratis Consulting 11/28/17

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1. Acknowledgements

Established over eleven 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 can 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 includes:

2. Executive Summary

2017 saw Constructionarium Scotland increase its participating numbers to over 200 students whilst again introducing new participating universities and contractors.

Constructionarium Scotland Parliament Launch 2017

From its Parliamentary Launch, sponsored by Fiona Hyslop MSP, it was evident that the year ahead was going to be unlike any other year. Over 100 guests attended the event where Depute First Minister, John Swinney MSP, delivered the key note speech and Constructionarium Scotland announced their Memorandum of Understanding with CITB where they confirmed their intention to develop and deliver a wider experiential learning proposition in line with CITB's Education and Training aspirations.

Lloyd Walker Part 1 - Jacobs UK

Through partnering with Concrete Scotland, Constructionarium Scotland, was able to impact on the education of a further 300+ young adults through various different programs including "Concrete in the Classroom" and the award winning "Octavian Program" which was awarded the Scottish Training Federations Innovation in Training Award 2017 for connecting with and reengaging young learners with the education process. It was also possible through this collaboration to ensure a new SQA Qualification was available "An Introduction to Concrete Technology"

The core delivery of Constructionarium Scotland was further enhanced through the partnership with the PEETS project, an Erasmus+ funded project, Promoting Excellence in Employability and Transversal Skills. This project brought Constructionarium Scotland together with Glasgow Caledonian University, The Hague University, from Netherlands and Lahti University, Finland. Hosting the 39 students on site for three days to deliver a scaled down version of the new Westrigg Windfarm Project. This project has now been introduced to the project bank and has been delivered successfully on several other full project weeks.

One of the new Construction Industry Partners, Robertson Construction, was so impressed with the process that Constructionarium Scotland delivered that they have committed to creating a new project to be piloted in early 2018. This project will involve key themes to the industry relating to the interface between brick wall construction and the use of cladding materials in Construction. The project will aim to bring the theory alive through practical application to ensure the students can experience real problem solving in a controlled environment.

"As we enter 2018, we also enter yet another round of funding bids, however we are confident that through our commitment to independent evaluation, peer review and addressing the needs and wants of both academia and the Construction industry that we will be well positioned to secure funding for several years ahead.

As Directors of Constructionarium Scotland we would like to thank all the companies that continue to support us through donations, discounts, participation or patronage as without that support it would not be possible to make the difference to so many young adults as they set out on their journey into the Construction Industry."

The Constructionarium Scotland Board of Directors.

3. Introduction

The main focus of the 2017 evaluation report is on the new students who participated in the 2017 Constructionarium Programmes, looking at what differences occurred through participation on the programme across a range of outcomes that were identified through previous evaluations. The report also identifies what lessons can be learned and how this learning can impact upon the design and delivery of future programmes.

Herriot Watt University 2017

The evaluation also looks back in more detail at students who took part in the 2016 programme (and prior to this) to better understand the impact that participation in the programme has had on their learning and academic studies within their college or university course and their employment prospects.

City of Glasgow College 2017

The report also touches briefly on the "Concrete in the Classroom" (CitC) Programme which has been delivered across a range of schools throughout the year and the Octavian Programme which was similar to the CitC programme in terms of design and delivery but drew school pupils from across a number of schools in West Lothian, connecting and reengaging young learners with the education process.

4. The Need for Constructionarium

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 construction 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.

> *Skills shortages are already being identified and, over the next five years, the priority will be to stem the shortfall. In Scotland, forecasts show that more than 28,000 jobs will need to be filled in the next five years and with 44,000 construction workers aged within 10 years of retirement, the need to recruit the next generation of talent has never been so pressing.*
>
> [1]

The remainder of this section sets out the strategic context for Constructionarium describing how the programmes outcomes are aligned to the wider national and sector priorities.

Abertay University and Dundee and Angus College 2017

[1] Building Partnerships in Scotland – CITB Strategic Plan 2015-17

4.1 National Outcomes

The Sixteen National Outcomes describe what the Scottish Government wants to achieve over the next ten years, articulating more fully the Government's Purpose. One of the key National Outcomes is:

"We are better educated, more skilled and more successful, renowned for our research and innovation"[2]

Constructionarium is a National Programme incorporating industry/academic partners and students from across the country and beyond. The outcomes for students and partners are closely aligned to the National Performance Framework and becoming recognised as being a leader within its field.

4.2 Higher/Further Education Institutions Single Outcome Agreements

"Scotland's higher education institutions (HEIs) make a direct and significant contribution to the Scottish Government's purpose of sustainable economic growth and have an impact across the National Performance Framework. The sector's contribution is central to Scotland's economy; to public policy; to enhancing public services and to cultural and civic life."[3]

Outcome agreements between the Scottish Funding Council (SFC) and individual HE/FE Institutions have been introduced as a key process in delivering and demonstrating universities' impact from Scotland's public investment in the sector. They do this through delivering on a range of outcomes which include:

- High quality, efficient and effective learning experience.
- Developed workforce – Skills and Enterprise.
- Higher/Further Education – Industry Collaboration.

[2] http://www.gov.scot/About/Performance/scotPerforms/outcome

[3] Delivering for Scotland: University Outcome Agreements

- Governance and Management, Environmental Sustainability, Equality and Diversity.
- Delivering 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 contribute 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.

The Constructionarium programme is an established collaboration between Higher Education, Further Education and Industry. It creates a benchmark for how the different sectors can come together and create a unique learning experience for students and young people that ensures skills, knowledge, experience and expectations are aligned. Participation on the programme not only enhances the employability of the student, it also positively impacts upon academic performance. It also offers the Education Sectors the opportunity to learn from industry to help shape and improve the design of academic courses to reflect the real world of construction.

4.3 Skills for Scotland

The Scottish Government set out in its 2010 strategy, the need to increase individual's opportunity to develop skills in support of economic growth and performance. The strategy has a clear vision where:

"creative, innovative, enterprising people: • are aware of the skills they possess and can use them effectively; and • are engaged in competitive

public and private sector organisations with ambitious, progressive and innovative leadership and management.

high skill, high productivity, healthy workplaces enable people to perform at their best.

a cohesive and efficient learning and careers system centred on the individual that anticipates and responds to employers' needs: • supports the lifelong development and use of skills; • provides high quality learning opportunities and continually improves; and • recognises and credits the learning individuals have undertaken and enables them to progress through the learning system seamlessly.

national and local government policies for investment, enterprise, skills, innovation and competition support the development and best use of skills in the workplace.

the nation is a model of best practice in tackling climate change with businesses capitalising on the opportunities that a low carbon economy will bring, creating new employment for a skilled workforce and driving the adaptation of existing jobs".[4]

The Strategy has 4 key themes

- empowering people,
- supporting employers,
- simplifying the skills system and
- strengthening partnerships.

[4] Skills for Scotland: Accelerating the Recovery and Increasing Sustainable Economic Growth

The Constructionarium Project is a unique partnership between industry, education.
Constructionarium empowers individuals to take ownership for their own learning and development outside of their core academic course work. It develops real life experience and valuable links to future employers. It provides a source of qualified and experienced students for industry partners whose skills are shaped around industry needs and priorities.

4.4 The Construction Industry Training Body (CITB)

The CITB is the industry training board and a partner in the Sector Skills Council for the construction industry in England, Scotland and Wales. Their job is to work with industry to encourage training, which helps build a safe, professional and fully qualified workforce.

"Construction is a major contributor to our economy, employing 2.1m people in its supply chain and contributing 8% to GDP. It's a powerful driver for growth, delivering £2.84 to the economy for every £1 invested".[5]

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.

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.

[5] CITB Strategic Plan 2015-17

- programmes, and
- engage with careers influencers.

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.

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.

5. Constructionarium Inputs and 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 must deliver their projects to time and budget within the five days 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”

6. Constructionarium 2017 Evaluation

6.1 Monitoring and Evaluation

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Monitoring and Evaluation is when information/evidence is collected in a systematic way to inform decision making and enhance organisational learning. Evaluation of participation, therefore, is a process of assessing the way in which a participation project is undertaken (process) and assessing the results of that activity (outcomes), to ensure we continue to improve how we involve students, Industry Partners, Universities, Colleges and other Stakeholders and learn from what they say.

A comprehensive and methodical approach to M & E of participation will improve understanding of where, when, why, and how participation works and does not work. M & E will help stakeholders and practitioners understand what type of participation, under what circumstances, creates what results.

M & E involves using information from monitoring and other evaluation activities to make judgments on performance, and to use the findings to inform decision-making and enhance organisational learning.

There are several compelling reasons to measure outcomes:

- Putting the needs of Stakeholders are the heart of programme development
- Measuring the effectiveness of a programme or intervention.
- Identifying effective practices.
- Identifying practices that need improvement.
- Proving your value to existing and potential funders.
- Getting clarity and consensus around the purpose of your programme or activity.
- Evaluate how well the organisation is performing

- Motivate people to deliver advocacy that has impact

The purpose of the M & E report is to provide an ongoing and robust base of evidence in support of the key outcomes that Constructionarium delivers for the students, industry, academic institutions and CITB. The Evaluation report also underlines our commitment to proving the impact that our programmes make and continually learning how services can be improved to increase effectiveness.

6.2 Evaluation Methods

The approach taken to the 2017 evaluation was similar to the one taken in previous years and involved a range of methods and tools **(Figure 1)** which included:

- 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 the 2017 programme but also with students who had participated in previous years.

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

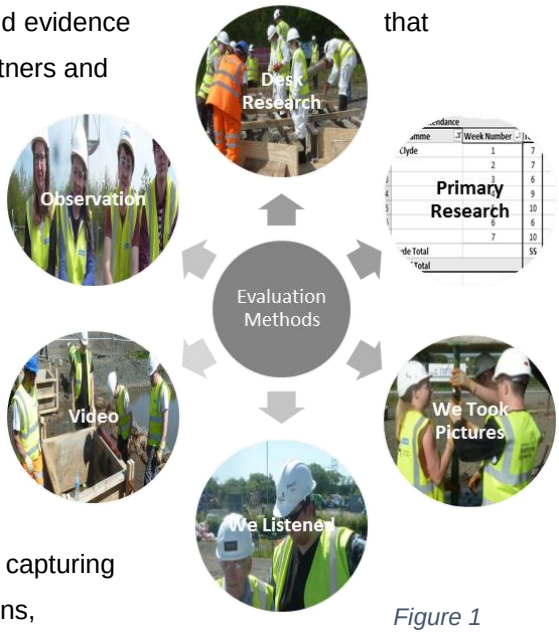


Figure 1

- 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
  In depth interviews were filed with students who had participated in previous years programmes.

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

6.3 Who Were the participants?

Students came from a number of educational institutions. Several students from Lahti University in Finland took part in the 2017 programme.

Strathclyde University 2017

- Glasgow University
- Strathclyde University
- Edinburgh College
- Dundee and Angus College
- Glasgow Kelvin College
- City of Glasgow College
- Glasgow Caledonian University
- Abertay University
- Herriot Watt University
- Other – Lahti University, Finland
- The Hague University, Netherlands

6.4 Where do students come from.

Students taking part in the programme come from a wide range of places and countries. The majority come from locations across Scotland as can be seen from **Figure 2 below.**

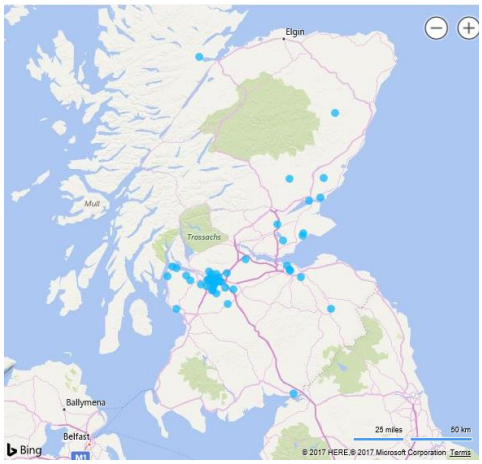


Figure 2

However, students come from several other countries including Myanmar, Finland, Belgium, Pakistan, Romania, Greece, USA, Bulgaria, Kuwait, Uganda and Ireland.

Scottish Index of Multiple Deprivation

From the 130 students who completed the Completion Survey, 12% came from areas that fall within the 20% most deprived areas in Scotland. **See Figure 3**. These areas were:

- Glasgow City - Pollokshields West
- Letham
- Motherwell South
- Shettleston North
- Calton, Galllowgate and Bridgeton
- Nitshill
- Springburn East and Cowlairs
- Glasgow City - Toryglen and Oatlands
- Govan and Linthouse
- Govan and Linthouse
- Springburn East and Cowlairs
- Drumoyne and Shieldhall
- Calton, Galllowgate and Bridgeton
- Bingham, Magdalene and the Christians
- Greenock Town Centre and East Central

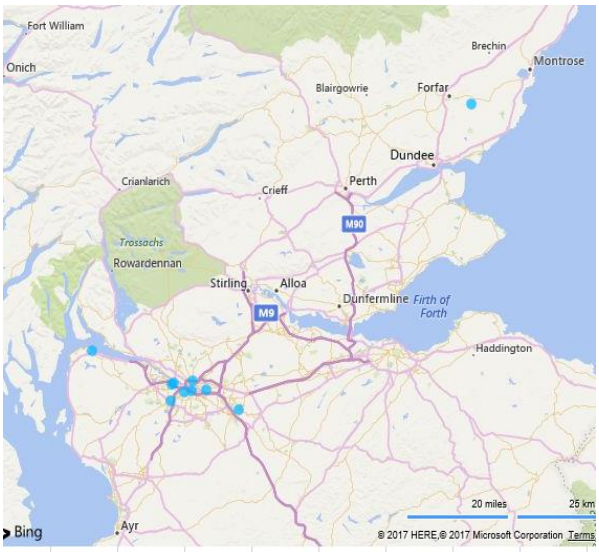


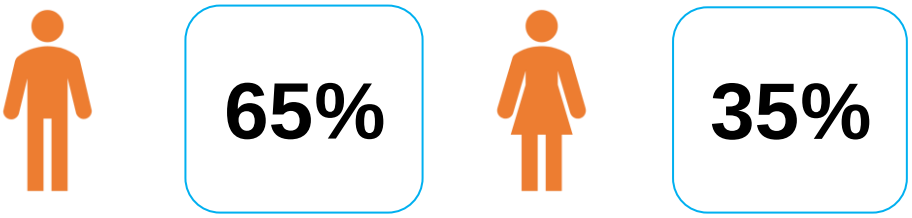
Figure 3

6.5 Student Study Paths.

The students taking part in the programme come from a range of different disciplines and are undertaking a number of different degree and HND level academic courses.

6.6 Gender.

200 students took part in the 2017 programme. The gender split of students was:



This compares favourably with national statistics where only 9% of the engineering workforce is female and 16% of engineering and technology undergraduates are female.[6]

6.7 Career Path.

Students were surveyed prior to taking part in the programme and once they had completed the programme. **Figure 4** below shows that there is almost an equal split between those students who see themselves following a career in the contracting sector versus those wishing to pursue a career in the contracting sector. This split

[6] Women's Engineering Society

did not vary significantly following participation in the programme.

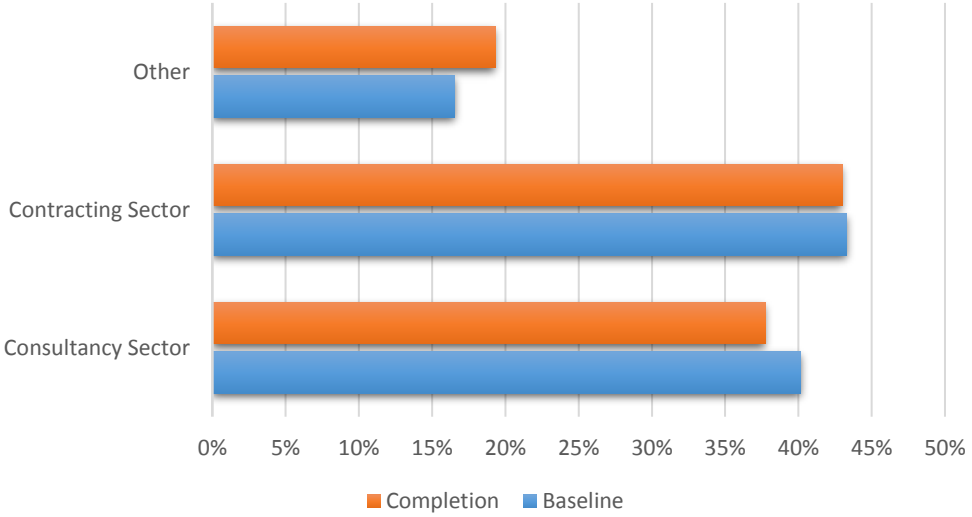


Figure 4

Some students identified other career interests which included:

- University Lecturing
- Marketing and Sales
- Environmental Engineering
- Data marketing
- Conservation
- Business and Accounting
- Teaching/ Research

6.8 What did students hope to gain from the programme?

The Baseline survey completed by the students prior to taking part in the programme asked them to identify the top 3 things that they hoped to gain from participation in the programme. The most significant were developing practical hands on experience; acquiring construction skills, understanding the construction process, becoming more confident and working as a team.

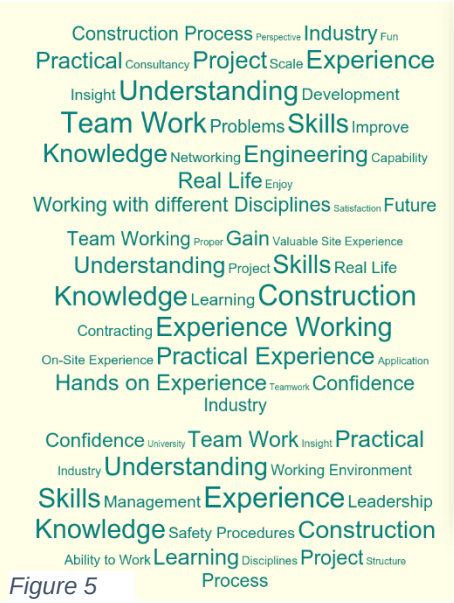


Figure 5

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6.9 What did students actually gain from the programme?

After completing the programme, students were asked to identify the top 3 things that they had gained from the programme, see **Figure 6**. The most significant were developing experience, understanding the importance and application of health and safety in a construction environment, understanding how to use drawings; planning and project management and the importance of working as a team.

When comparing the students actual experience to what their hopes had been prior to taking part, it is clear that the programme has been successful in meeting student expectations.

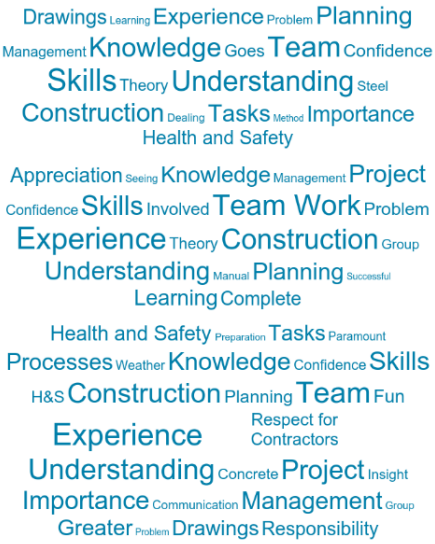

Figure 6

6.10 Outcomes

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. Previous evaluations of the Constructionarium programme, identified a number of key outcomes for students participating. These were grouped into 4 themes;

- Technical Outcomes
- Site Outcomes
- Design Outcomes and
- Transferable Outcomes

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Figure 7 below shows that the most significant impact for students were in the areas of Technical, Site and Design related Outcomes.

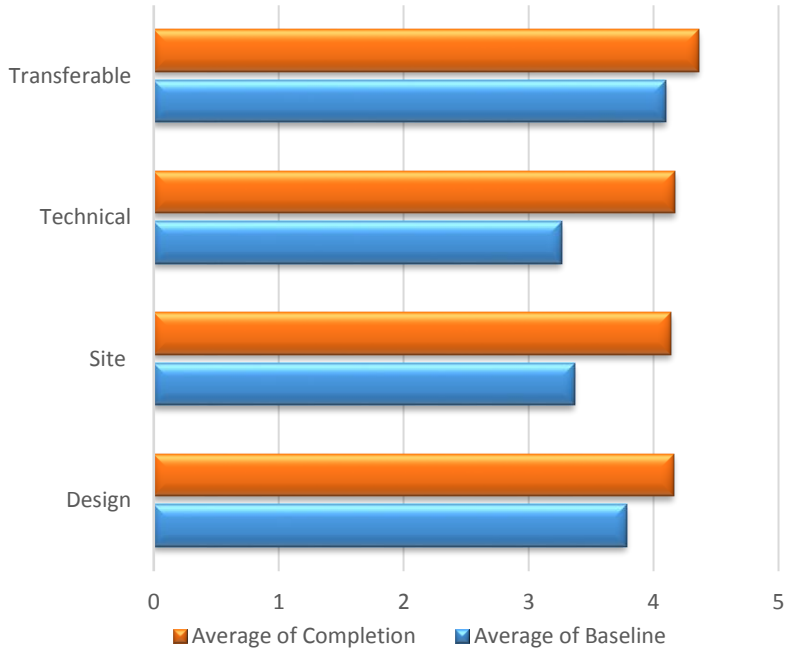

Figure 7

6.10.1 Technical Outcomes

These outcomes relate to the acquisition of hands on construction skills, knowledge and understanding through experiential learning on the programme. **Figure 8** below shows that students felt the programme had made a significant difference in a number of important areas which included; shuttering and formwork; Setting out and Levelling a site; balancing costs; time and quality on a job; fixing steel on a construction site; reinforcing structures on a

Glasgow University 2017

construction site; working with concrete on a construction site; material testing and lifting schedules and temporary works are used on a construction site.

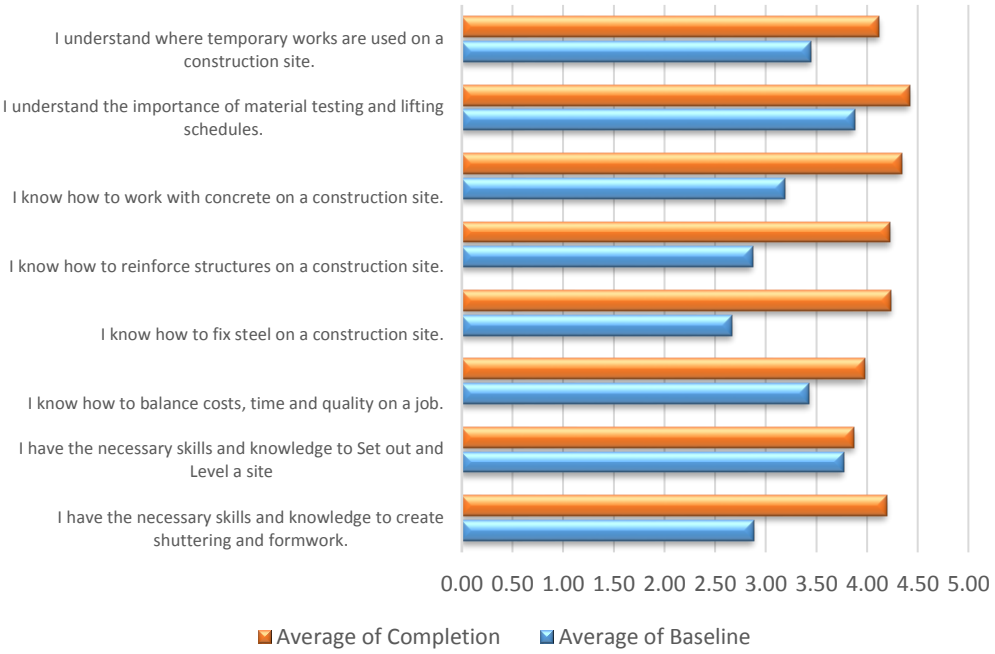

Figure 8

6.10.2 Site Outcomes

These outcomes relate to the acquisition of site management skills, knowledge and understanding through experiential learning on the programme. **Figure 9** below shows that students felt that the programme had made a significant difference in a number of important areas which included; budget and cost management; Health and Safety, how project interdependencies work, understanding how to manage a site and co-ordinate activities and how to schedule and deal with suppliers.

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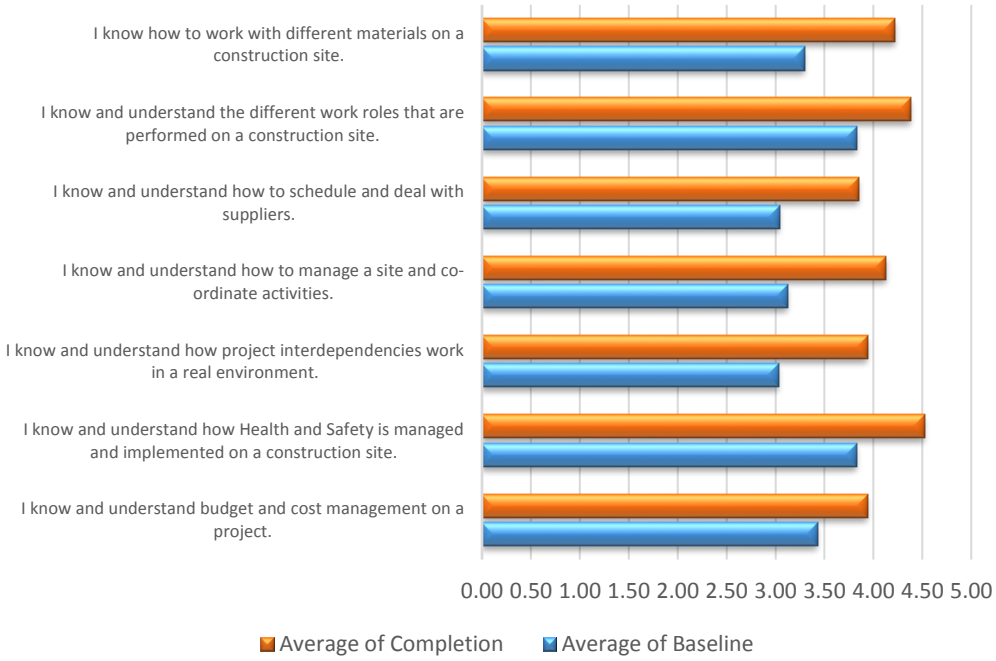


Figure 9

6.10.3 Design Outcomes

These outcomes relate to the acquisition of design skills, knowledge and understanding through experiential learning on the programme. **Figure 10** below shows that students felt that the programme had made a significant difference in a number of important areas which included; how design is translated into physical structures; how to work with precision measurement and how engineered solutions constantly evolve at the construction phase of a project.

Strathclyde University 2017

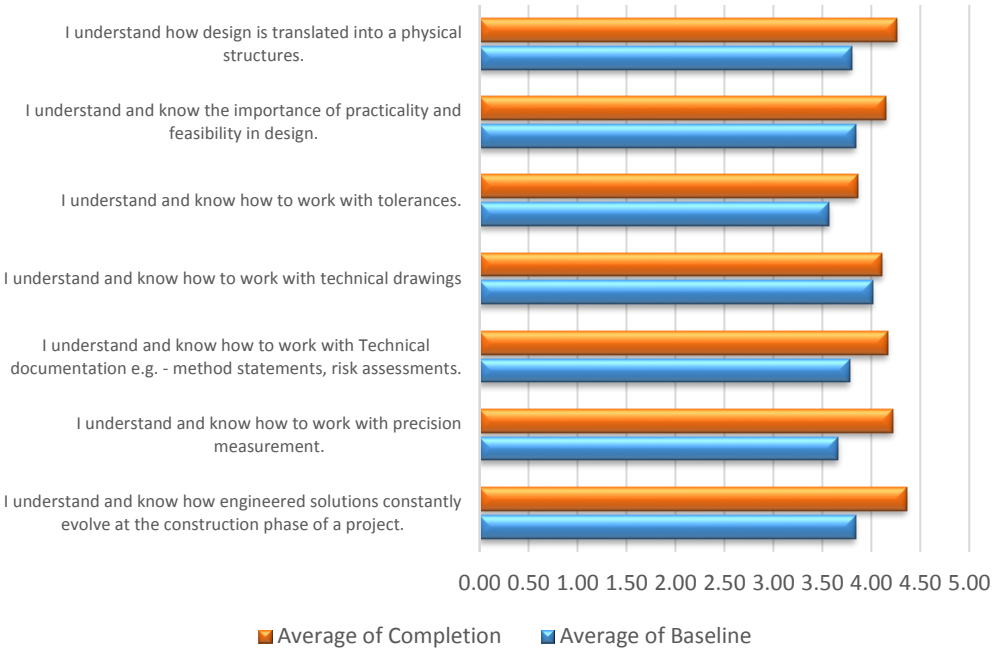


Figure 10

6.10.4 Transferable Outcomes

These outcomes relate to the acquisition of transferable skills, knowledge and understanding through experiential learning on the programme. **Figure 11** below shows that students felt that the programme had made a significant difference in a number of important areas which included; how to delegate work tasks to other team members on a project; how to manage a project and understand how to work

As team on a work project.

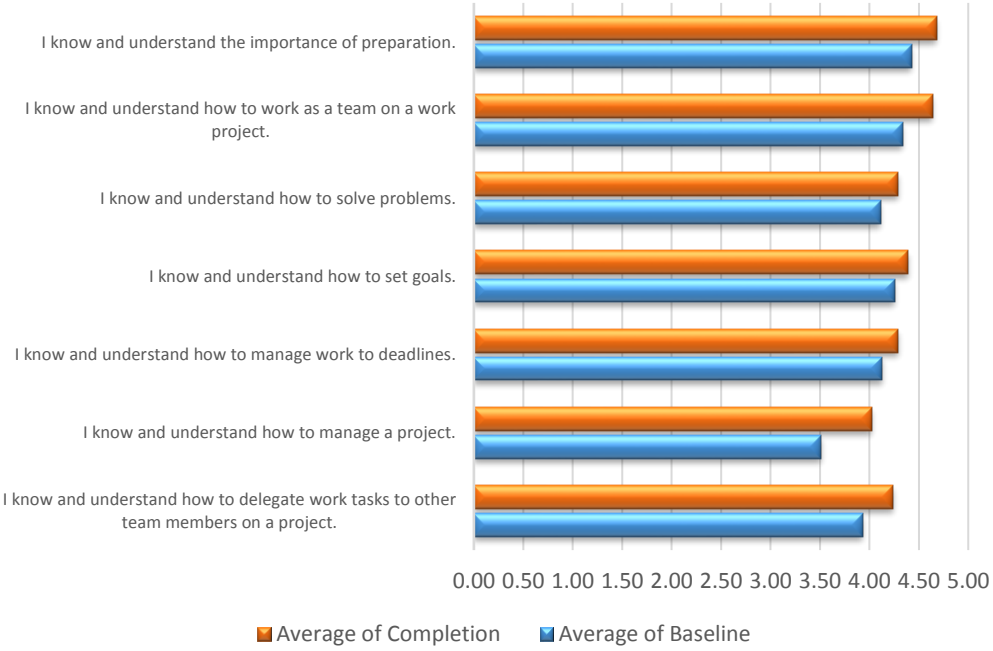


Figure 11

6.10.5 Other Outcomes

Students also experienced improvements across a range of other outcomes. These included working under pressure, improved communication and leadership, developing confidence and application of learning. See **Figure 12** below.

Figure 12

6.11 The most important Lessons.

Students who participated in the programme were asked, what were the most important lessons that they have taken away from their Constructionarium experience. The main lessons that emerged were:

"planning works prior to starting is key as it gives you a wider scope of what is required for the task. "

"In different teams, there is always different people working together and you have to get along. "

- the importance of planning and preparation in advance of any work commencing and
- between stages of work and the need to work as a team at all stages of the project.

6.12 Biggest Challenges

Students also experienced a range of challenges whilst participating in the programme. **See Figure 13** below. These challenges reflect those that would be expected as part of any construction programme. The key ones to emerge were, weather, working with people, planning and working to tight deadlines

> **"Planning the week and then trying to re-plan things when deadlines started to slip. Trying to keep site of everything that was happening on site when I was trying to accomplish my own tasks at the same time. "**

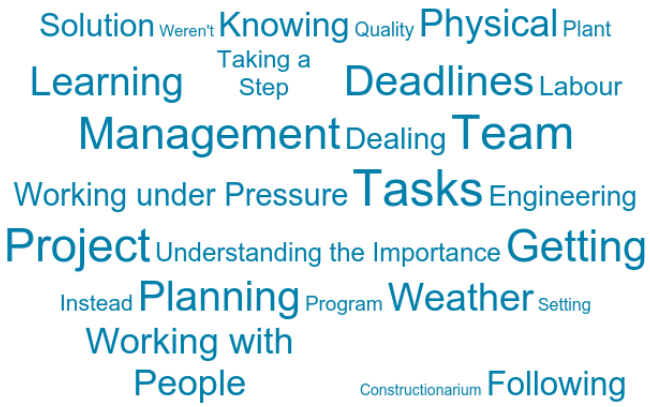


Figure 13

6.13 Most Enjoyable aspects of the programme.

Whilst participants found the programme challenging, all students found it an enjoyable experience. The opportunity to get real hands on experience, meeting and working with new people and gaining a real sense of achievement were common to many of the participants.

> **"The satisfaction of knowing this is where I want my future to be. Having already had a lot of experience on a building sites I wanting to challenge myself with the task of project manager which I feel I coped with very well "**

> **"Planning the week and then trying to re-plan things when deadlines started to slip. Trying to keep site of everything that was happening on site when I was trying to accomplish my own tasks at the same time. "**

6.14 Benefit to Academic Studies

All students who completed the programme completion survey felt that their Constructionarium experience would benefit their studies. A more in-depth analysis of impact on academic studies is detailed in section 7.

"Simply put, it adds meaning and paints a clearer picture to what we see in our lectures "

6.15 Improvements/Lessons Learned

Students were also asked for feedback in terms of what could be done to make improvements to the programme in the future. The most frequent comments are detailed below.

- More time to be allowed prior to participating in the programme to look at plans etc.
- There should have more support during the project because some of the questions that we asked were unanswered.
- The wind farm project was a bit less demanding than the bridge project. I would have like to have been challenged more in terms of making more shuttering and working with concrete more.

Abertay University and Dundee and Angus College 2017

- More Joiners, More Plant Drivers, more "pre-training" before even getting to the site, rather than telling people "I can't tell you that" have the experienced staff explain the answer to the question and trust that staff member will listen and learn rather than letting them make every mistake possible, and then in hindsight saying, "you should have done this" as that is extremely unhelpful and frustrating, which then affects concentration on site, which is a health and safety issue.

- If possible, a practical induction would be useful. Most participants didn't really have any practical skills. A few us in my team specifically spent time having to teach people how to saw and hammer nails etc. However, it could just as easily have been a team with no experience at all. Therefore, if for an hour everyone could be shown how to use hammers, saws, drills etc properly and safely participants might be less nervous about getting stuck in with the practical aspect of the project.

> "More time before the project to spend planning. Although we had more than a month, the first meeting and last meeting all fell within my exam period which made it hard to dedicate time to plan as much of the project as I would have liked to. "

- Better co-ordination with exam timetable.

7. Constructionarium 2016 – Retrospective Evaluation

A more detailed analysis was carried out in relation to students who took part in the 2016 programme to better understand what difference participation made to them when they returned to their academic studies in terms of learning, performance and employability. This was done through distributing a survey to all participants of the 2016 programme. A response rate of 15% was achieved.

Lucas Sielacz - City of Glasgow College

The gender split of students that responded was:

Responses were received from students from Glasgow University, Strathclyde University, Herriot Watt University, City of Glasgow College and Glasgow Kelvin College. The age range of respondents to the survey is detailed below in **Figure 14.** Almost half of those coming from the 18 to 20 age group.

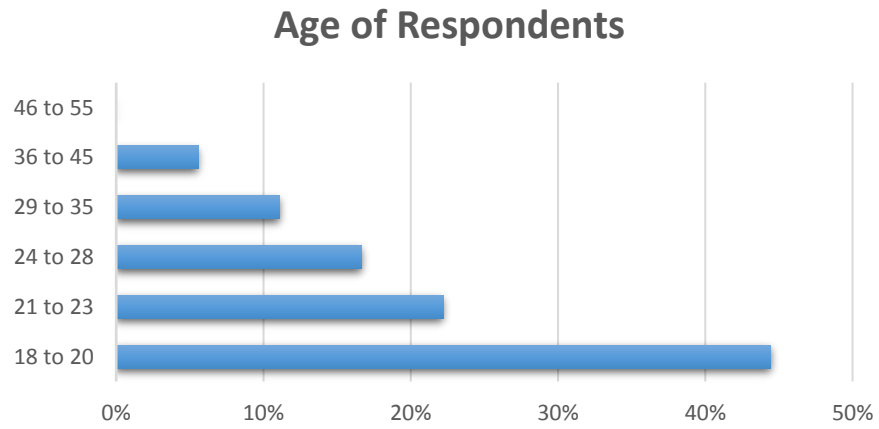


Figure 14

Respondents were involved in a range of academic courses ranging from Civil Engineering with Architecture, Architectural Engineering, Structural Engineering, HND Construction Management, HND Architecture, Architectural Technology HND, Quantity Surveying. The majority of respondents saw their career path in the Concultancy sector. **See Figure 15 above.**

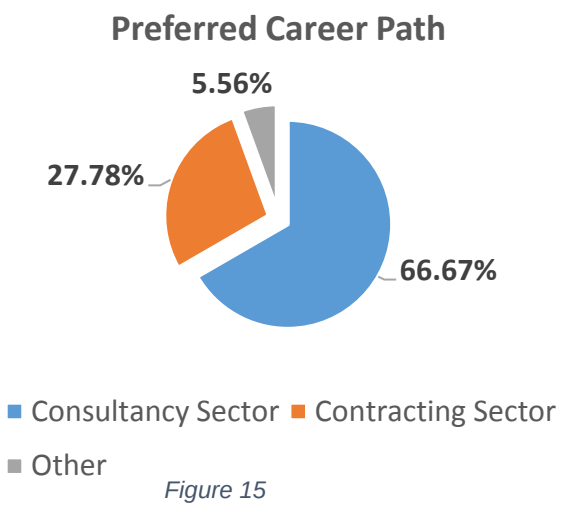


Figure 15

7.1 Benefit to Academic Studies

An overwhelming 95% of respondents felt that participation in the Constructionarium programme had benefited their academic studies.

Students felt that having such a practical hands on experience improved understanding and brought to life theoretical principles taught in a classroom setting. This real-life experience was then reflected in their written work enriching it with insight and practical examples.

The benefits experienced by students were felt in the context of Exams, Assignments, Project work but also in relation to participation in lectures and group discussion where concepts relating to work carried out on Constructionarium were better visualised.

> *"The main benefit that Constructionarium has provided was introducing construction processes in an interactive, physical setting much earlier than many students would otherwise have access to. (Where this may only be done in summer placements or after graduation).*
>
> *With this, the processes we learned in lectures or in other areas of the course were reinforced when experienced 'live' during Constructionarium. Whether through Method Statements and Health and Safety Procedures for the site (Construction Management), steel reinforcement detailing for construction of the bridge foundations and main deck (Structural Design) or even testing the concrete itself (Civil Engineering Skills). Experiencing these in the Constructionarium setting gives a deeper understanding, for example, when designing steel reinforcement for a concrete element in class it is not until you have tied the steel bars yourself physically by hand to you have an appreciation of the implications and the full understanding of say the number of bars required or the dimensions specified of the piece that you have designed. This knowledge then gives weight to your further studies when the real-world aspects of the information you are learning and applying are at the forefront of your thinking.*
>
> *But overall Constructionarium has, in my mind, focused the ambition that this is the industry that I wish to pursue my career in. Giving a first experience in producing a successful project, an achievement made through effort and team-working and one that will be remembered as a key part of my early career."*
>
> ***Daniel Prinn, Glasgow University***

7.2 Other benefits from participation

All students felt that there were other non-academic benefits from participating in the programme. These included opportunities for holiday placements, internships and employment. **See Figure 16 below**.

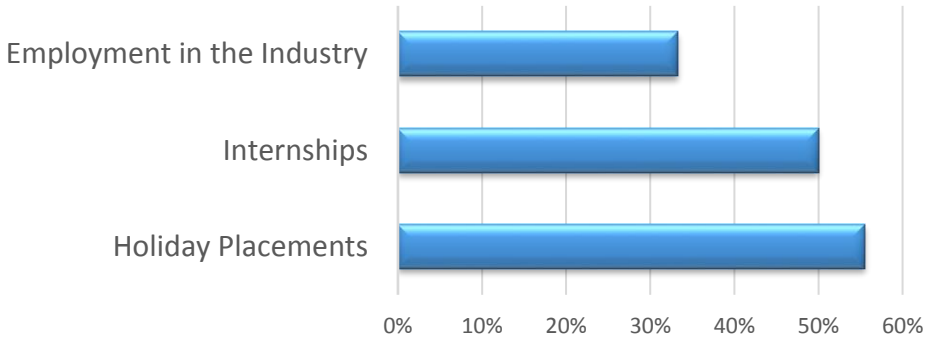
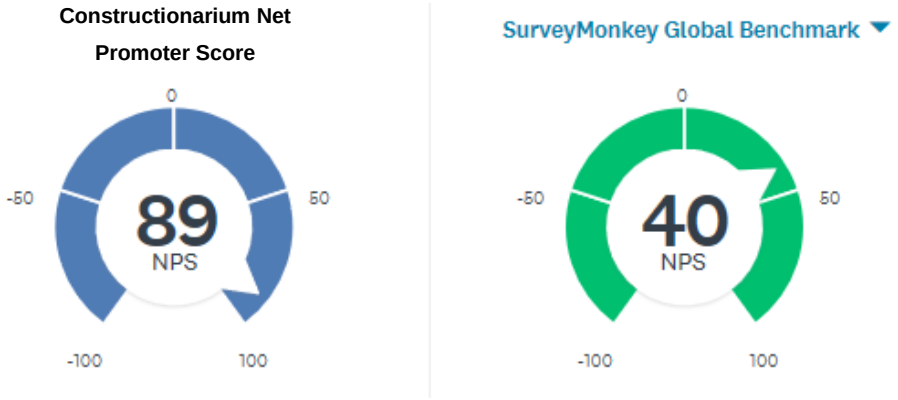


Figure 16

7.3 Net Promoter Score

Net Promoter Score (NPS) measures the loyalty that exists between a provider and a consumer. The provider can be a company, employer or any other entity. As part of the 2016 Student Survey, students were asked how likely is it that they would recommend Constructionarium to a friend or colleague. The response to this question was overwhelmingly positive with score of 89.



8. Concrete in the Classroom

8.1 Background

Concrete in the Classroom is a programme that brings together a range of partners from Education and Business working together to improve academic performance, skills and employability outcomes for young people. It is a Curriculum for Excellence resource which delivers cross curriculum learning through five construction related lessons and culminating in a site visit to a concrete factory or similar construction facility.

Dunbar Academy 2017

Concrete in The Classroom completed its second full year of successful delivery.

The Programme set out with clear objectives for the wider pilot:

- Create a learning experience which shows employability within the Construction Industry and explore the part that the Concrete Sector plays in this Industry.
- Create lifelong learning skills and show how these materialise in future work opportunities.
- Create new meaningful links between Secondary Education, Industry and Further / Higher Education.
- Help to create confident individuals who are successful learners and become an effective contributor and responsible citizen.
- Develop an awareness of career opportunities that may not have been referenced prior to the program.
- Create an opportunity through CPD for schools to up skill their staff to repeat the program whilst being supported and ultimately self-deliver the program going forward as other schools join the program.

The program is delivered in 5 x 50 minute lessons and culminating in a final half day site visit to either a concrete factory, construction site or related construction location.

Kilsyth Academy 2017

The five lessons are structured to give a broad technical and scientific understanding of Concrete as a construction product and an insight to the related career opportunities within this sector.

The lesson plans are titled:

- Lesson 1. ""What, Why and When"" - An introduction to the history of cement bound materials. An overview of what materials make concrete. The way in which these products are collected and combined and how they are used in the modern world.
- Lesson 2. ""What is Concrete"" - Understand how the different particle sizes are combined to form concrete. How the particles are bound together. Gain the ability to sieve materials and weigh materials. Combining materials in proportions and conversions from mass to volumes.
- Lesson 3. ""Health and Safety in the Workplace - Understand the importance of and responsibility towards Health and Safety. Both in respect of cementitious materials and the wider construction industry.


Kilsyth Academy 2017

- Lesson 4. ""Hydration, Practical Concrete"" - Understand how each of the constituent materials that make up concrete combine to create a fluid

material. Gain the ability to weigh and measure materials in correct proportions and get an understanding for the relationship between water and cement.

- Lesson 5. ""Concrete in a Hardened State"" - Understand the physical properties of hardened concrete. Understand that hardened concrete is the result of an exothermic reaction and not of a drying out. Introduction to curing and its importance. Environmental consideration relative to concrete usage
- Industry Visit - The culmination of the five lesson plans is an industry supported visit to a construction related work environment to bring the class learning to life, increase awareness of employment opportunities and forge stronger links between Education and Industry Partners.

8.2 The Numbers

11 High Schools, 1 College

260 Participants

The gender split of participants was:

60%

40%

80%

Would Recommend the programme to others

75%

Would like to take part in more programmes like Concrete in the Classroom

Most of the 2017 programme participants came from class S3.

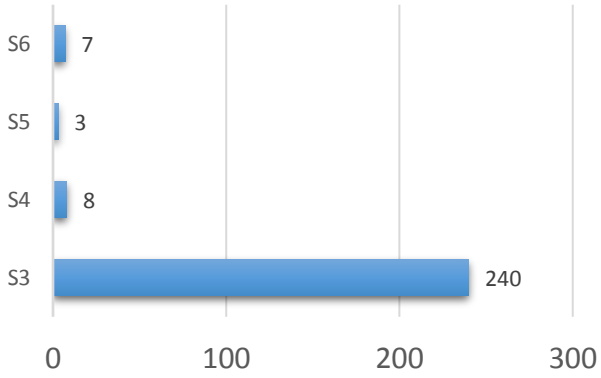


Figure 17

8.3 The Difference Made

Programme Outcomes

The Concrete in the Classroom Programme intended to deliver a range of outcomes.

- Course participants increase their understanding of the history of concrete and how it is used in the modern world.
- Course participants increase their understanding of how concrete is formed and are able to sieve and weigh materials.
- Course participants increase their understanding of how concrete becomes a hardened material.
- Course Participants increase their understanding of health and safety in the work environment.
- Course participants are able to make concrete using the correct materials and quantities.
- Course participants increase their awareness of employment opportunities within Construction Industry and concrete sector
- Course participants are confident and positive contributors and express their thoughts and ideas in the class environment and take part in activities.

Each pupil who took part in the programme completed a baseline survey before the programme began. They also completed one at the end of the programme. **Table 1** below summarises the responses from all pupils who took part in the programme. It shows that considerable impact was made across all Outcomes.

	Measure	
Outcome	**Baseline**	**Week 5**
I know about the history of concrete.	1.40	3.52
I know how concrete is made.	2.03	4.45
I know about how concrete is used	3.14	4.43
I know how to make concrete.	1.69	4.36
I know and understand about health and safety in a work environment.	3.12	4.43
I am aware of the broad range of career opportunities in the construction industry.	2.43	3.75
I am considering a career within the construction industry	2.29	2.76
I am confident at communicating my thoughts and ideas in class	2.96	3.47

Table 1

1 = Strongly Disagree, 2 = Disagree, 3 = Not Sure, 4 = Agree, 5 = Strongly Agree

9. Octavian Programme

9.1 Background

The Octavian Concrete program was developed in partnership with West Lothian Council who were looking for the delivery of an 8-week program for a group of 12 disengaged senior phase students across their district. The bespoke programme showed both an insight into the world of work and a relevance to the young adults current learning and future opportunities. It was developed along the same lines as Concrete in the Classroom to incorporate a mixture of hands-on activities, design and manufacture activities, experiential learning and industry site visits centred around employability within construction.

By challenging the students out with their normal school's environment in a setting more akin to a working environment it allowed the students to develop many of the "softer" skills that are often referred to as being lacking in many candidates by prospective employers: Diligence, team work, leadership, the ability to assimilate instructions and deliver upon them.

The program, although had a common thread of concrete construction running through out, the innovative nature of the program was the way in which the industry visits were not only focused on manual careers but a fusion of all roles available within those organisations visited whilst the experiential learning activities delivered actual manufactured structures that the students could actively use, having taken

them from 2-dimensional drawings to 3-dimensional structures.

The Octavian Programme was awarded Winner: STF (*Scottish Training Federation) *Innovation in Training Award 2017

9.2 Who Took Part in the programme

12 Pupils who took part in the programme came from a number of high schools. The ages ranged from 15 to 17 with 2/3rds aged 15. **See Figure 18.**

- St Kentigerns
- Linlithgow Academy
- Inveralmond High School
- James Young High School
- Bathgate Academy

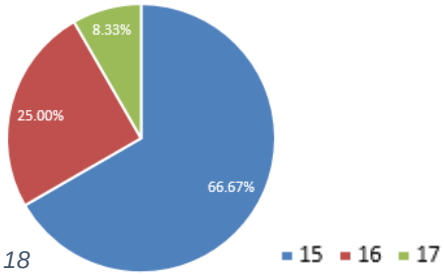


Figure 18

All participants were male from S3 to S6 classes with the majority (66%) coming from S4.

9.3 What Difference did we make?

Each pupil who took part in the programme completed a baseline survey before the programme began. They also completed one at the end of the programme. **Table 2** below summarises the responses from all pupils who took part in the programme. It shows that considerable impact was made across all Outcomes with most average scores between 4 and 5.

	Measure	
Outcome	**Baseline**	**Week 8**
I understand Surveying	3.00	4.73
I have experience on a construction site	1.58	4.73
I am aware of a wide range of careers within construction	3.08	4.64
I am considering a career within construction	3.58	4.82
I enjoy my current classes in school	3.00	3.45
I wish to learn more about the wider construction industry	4.25	4.91
I am interested in a construction related Modern Apprenticeship	4.08	4.73
I know how concrete is made.	2.50	4.91

I know about how concrete is used	3.42	4.82
I know and understand about health and safety in the workplace	3.33	4.73
I know how formwork is used	2.00	4.45
I know how to set up a construction site	1.67	4.27

Table 2

1 = Strongly Disagree, 2 = Disagree, 3 = Not Sure, 4 = Agree, 5 = Strongly Agree

100%

Would Recommend the programme to others

100%

Would be interested in Modern Apprenticeships

60% of the participants have achieved positive destinations either in College, Apprenticeships or work which can be directly attributed to their re-engagement with the education process through their involvement with the Octavian program.

Integratis Consulting

Integratis Consulting is a leading independent consultancy practice and was established to provide innovative and tailored solutions to clients operating across public, private and 3rd Sectors. The company specialises in: ***Strategy/Business Planning, Corporate Governance, Business Intelligence and Research, Community Engagement, Independent Programme Evaluation, and Project Assurance; Social Impact and Social Return on Investment; Feasibility Studies/Project Management.***

- **Independent Programme Evaluation and Project Assurance –** Our objective, dispassionate and rigorous approach to identifying the real difference and impact that organisations programmes and activities make ensures maximum value in terms of evidencing outcomes and identifying opportunities to learn and improve practice and delivery. Our Project Assurance service ensures project design, approach, delivery and evaluation are robust and geared towards optimising benefits realisation for our clients and their key stakeholders.
- **Strategy and Business Planning –** Our strategy and business planning services support organisations to bring their ideas to life, maximising opportunities whilst identifying, understanding and minimising any risks. Our approach is pragmatic and grounded in 25 years of hard earned experience.
- **Programme Evaluation, Impact and Social Return** – This forms part of our core work and focuses on helping organisations to *"prove and improve"* the health, social, economic and educational, outcomes that their activities and services provide for communities, participants, service users and their families.
- **Feasibility Studies/Project Management –** Adopting a robust, rigorous and methodical approach we help organisations to bring their ideas, hopes and ambitions to life in a way that is sustainable, positively engages communities and other key stakeholders and deliver the key outcomes. This work encompasses feasibility studies, options appraisal, business planning and project management and implementation.

- **Corporate Governance –** Good governance is the foundation of any organisation whether it operates within the public, private or charitable sectors. One of only a handful of organisations with CIPFA Governance Qualified staff we help organisations build strong foundations based on the most appropriate governance standards and practices. Allowing the organisation to flourish and grow focusing on making a difference.
- **Business Intelligence, Research and Community Engagement –** All our projects start with developing a robust evidence base utilising the latest intelligence and information appropriate to the specific project. This frequently involves engaging with the key project communities and stakeholders, understanding their priorities and needs whilst building positive relationships and wherever possible co-producing. Our community engagement processes are innovative and tailored to meet the needs of specific target groups and audiences.