



Constructionarium Scotland

Turning Theory into Practice



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Dale Lyon Introduction to Constructionarium Programme.

- Dale Lyon, Director
Constructionarium Scotland



Dale Lyon talks about the origins of Constructionarium Scotland.

- Dale Lyon, Director
Constructionarium Scotland



Academic Staff talk about the difference the Constructionarium programme makes for students.

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:



The Evaluation Methodology

The purpose of this evaluation was to further develop the evaluation that was carried out in 2015 to better understand the outcomes and impact of Constructionarium for the students, education and industry partners who take part in and support the Constructionarium programmes. Throughout the project, there has been a focus on identifying opportunities to learn, allowing Constructionarium to continually evolve and improve services and focus on delivering better outcomes for students and partners in the future.



How did we gather evidence?

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

Figure 1

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.

An independent evaluation carried out last year looking at previous programmes highlighted a number of key outcomes and differences that the programme made for the students who took part. These outcomes were mapped on the impact map below in **Figure 2**. The 2016 evaluation looked to focus in more detail on these outcomes and provide a more robust way of measuring which of the outcomes were most significant and made the biggest difference to the students.

The summary **Figure 3** below shows that across all the participating Universities and Colleges the biggest impact for students related to **Site**, **Technical** and **Design** related outcomes. A more detailed breakdown can be found in **Appendix 1**. Within the Site group of outcomes(**Figure 4**), the most significant differences for students were focused on how interdependencies work in a real environment, managing a site and co-ordinating activities and working with different materials. Within the Technical group of outcomes(**Figure 5**), the most significant differences were around creating shuttering and formwork, steel fixing and reinforcement and how to work with concrete.

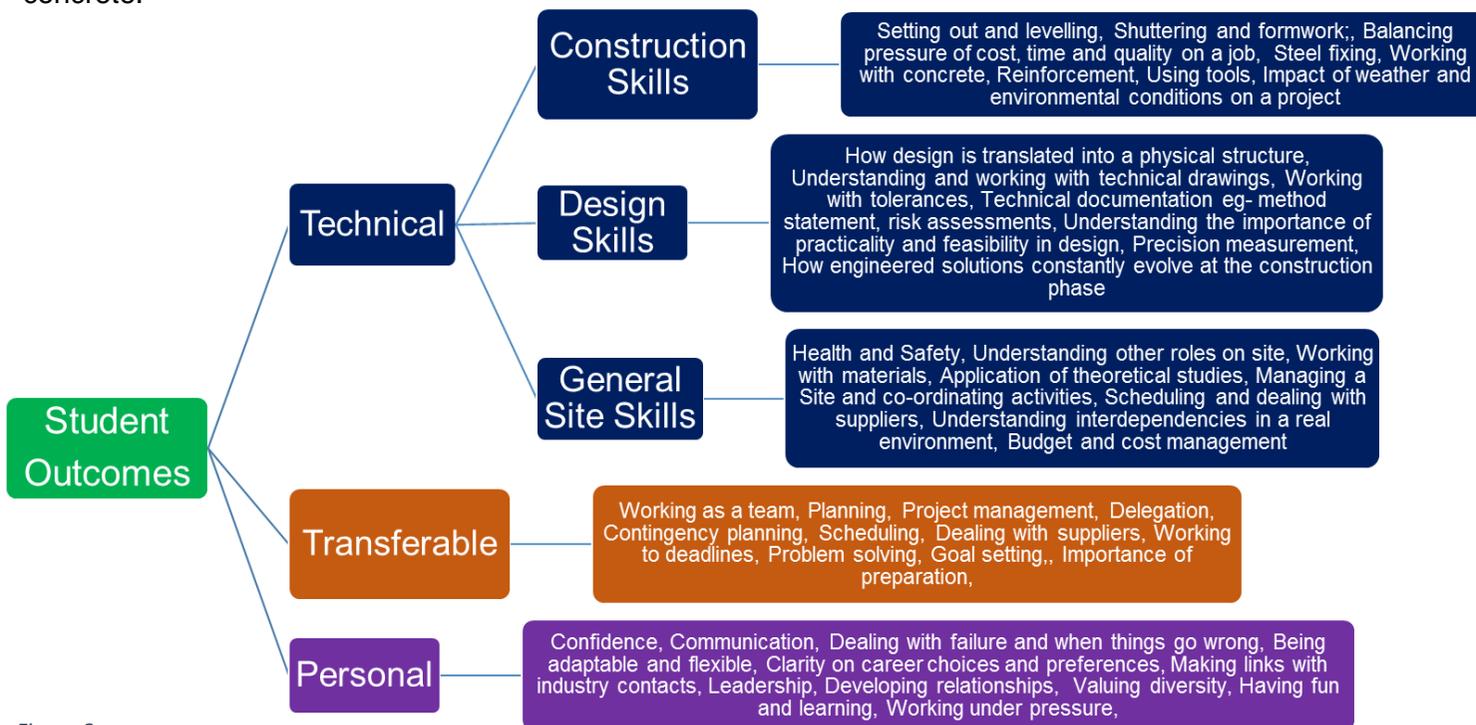


Figure 2



Students from Abertay, Dundee and Angus College and City of Glasgow College talk about the impact of taking part in the Constructionarium Programme



Contractor Partners talk about the difference taking part in Constructionarium makes to their company

Executive Summary

Within the Design Group outcomes (Figure 6), the most significant differences were an increased understanding of how engineered solutions constantly evolve during the construction phase of a project, improved understanding of technical documentation and working with tolerances. This serves to demonstrate that the Constructionarium is an effective way of upskilling students with practical skills and knowledge that has real value in the construction industry.

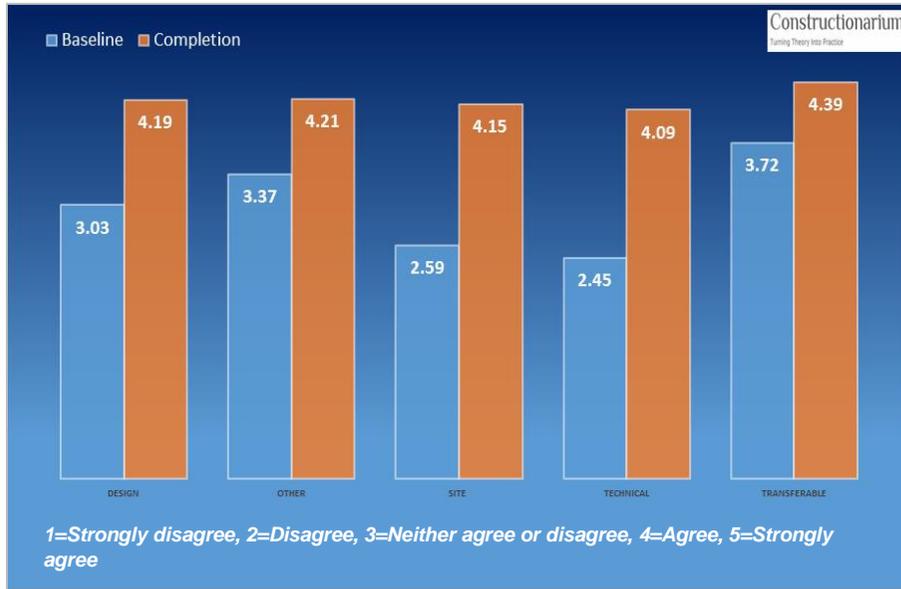


Figure 3

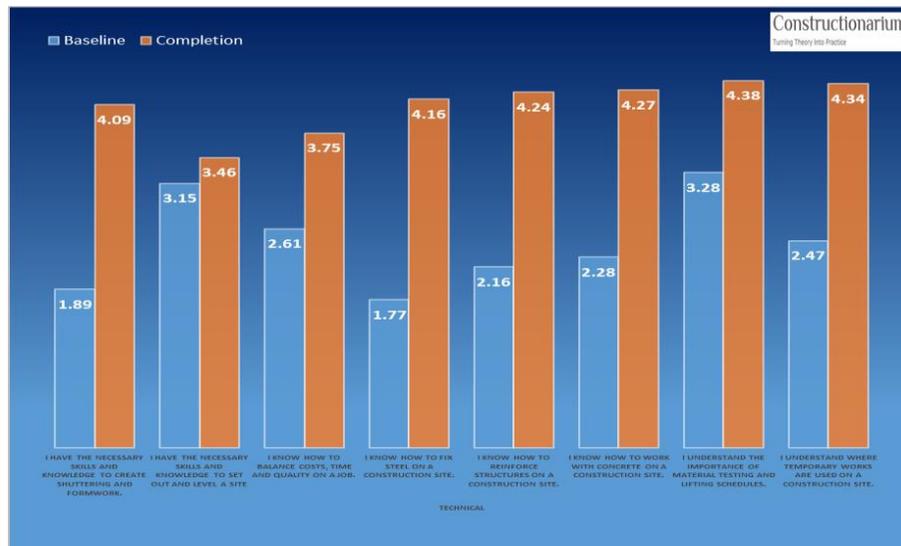


Figure 5

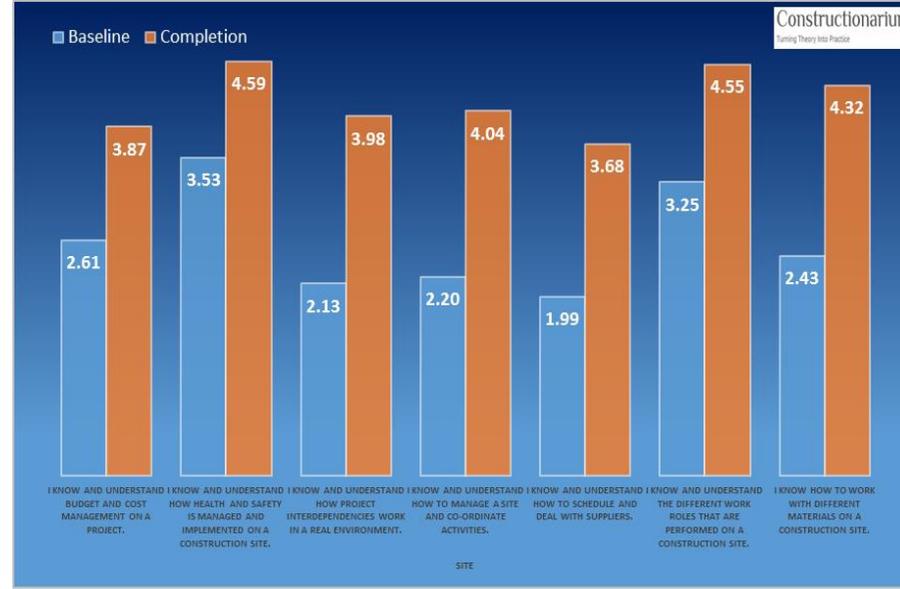


Figure 4

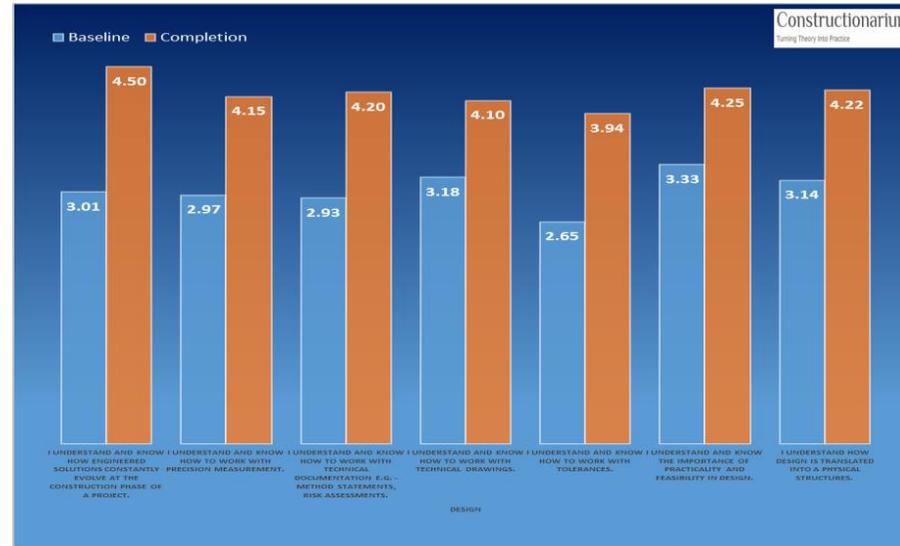


Figure 6

“I would feel much more confident working on a real-life site now following this experience”
 – Nathan Campbell, Strathclyde University

“the programme gives students an excellent practical experience of what a real site is like, allows them to put theory into practice”
 – Pdraig Gibbons, Careys CE

“experience of all tasks on-site including labouring work. Allows you to appreciate everyone’s job”
 – Jennifer Green, Glasgow University

Executive Summary

Some of the **key learning** to emerge from this evaluation that could assist in improving and enhancing the Constructionarium Programme included:

2
More information and briefing and preparation prior to the week long programme on site would improve performance

4
Could the dates of the programme be confirmed earlier in order to make practical arrangements

5
A more detailed induction to each role would allow less handholding and greater accountability

10
More woman's kit, it was very hard to do some of the fiddly tasks with large gloves, waders and welly boots

13
The number of contractor partners should be increased in order to allow the programme to grow and be offered to additional colleges and universities

14
Consider longer lead times and more interaction with students prior to going on site

20
The students may benefit from a day course prior to going on site that focuses on the drawings in order to plan more effectively

21
Consider having a co-ordination meeting with key partners to plan and agree areas for improvement each year

26
Consider looking at how to include the use of new and more varied construction materials and methods can be incorporated into the programme

27
Consider expanding the evaluation programme to incorporate more longitudinal evaluation looking at impact on post securing placement and work experience opportunities

29
The environmental aspects and implications of construction are becoming increasingly important and should be reflected in the design and delivery of future Constructionarium programmes

25
Consider expanding the evaluation programme to incorporate more longitudinal evaluation looking at short and medium term impact on academic learning and performance

Constructionarium Background



Constructionarium Background

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.

Constructionarium is a one week residential field trip suitable for students studying for a qualification in the built environment. 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 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.

At the end of the course the students will have gained a huge amount of knowledge as to what happens on a construction site and will have dealt with a number of challenges that they will face in the future.



A Strategic Context



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.

Constructionarium Supports National Outcomes

“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

Constructionarium Delivers Scottish Government Skills Strategy

“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

- ✓ High quality, efficient and effective learning
- ✓ Developed workforce – Skills and Enterprise
- ✓ Education – Industry Collaboration
- ✓ learning opportunities which contributes towards the creation of high retention, attainment and achievement.
- ✓ Deliver an integrated learning and employability experience

Constructionarium Delivers on developing Scotland's Young Workforce

“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

Constructionarium Supports Higher and Further Education Outcomes

Constructionarium Supports the Scottish Government Youth Employment Strategy

“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

Constructionarium Supports Economic 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

Constructionarium Supports the CITB National and Scottish Strategies

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:

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.

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.

Industry Engagement

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

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 10 to 18. 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 10 to 18 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"



"will actually understand how the theory applies to the real world. It has generally made me enjoy the subject more as it is more relevant and I am excited about the future jobs"

- Katherine, Herriot Watt University



"How different it is doing engineering work on site than in an office. How to manage and organise a whole project and how different plans can change."

- Ciara, Glasgow University



**160+ Students
took part**

**10 Academic
Pathways**

**Age Range
18 - 40**

**5 week long
programmes**

**500
Completed
Surveys**

**60 Females
100 Males**

**10 Summer
Placements offered
to students**

**10 Academic
Partners**

**15 Industry
Partners**

The Difference Made

“This programme has exceeded my expectations and frankly made my 2nd year. Thank You !”

- Daniel Prince, Glasgow University



Students talk about the impact of Constructionarium



Students talk about what they found most Challenging



Students talk about how Constructionarium Links to their academic studies

Student 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. Primary research conducted previously 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.

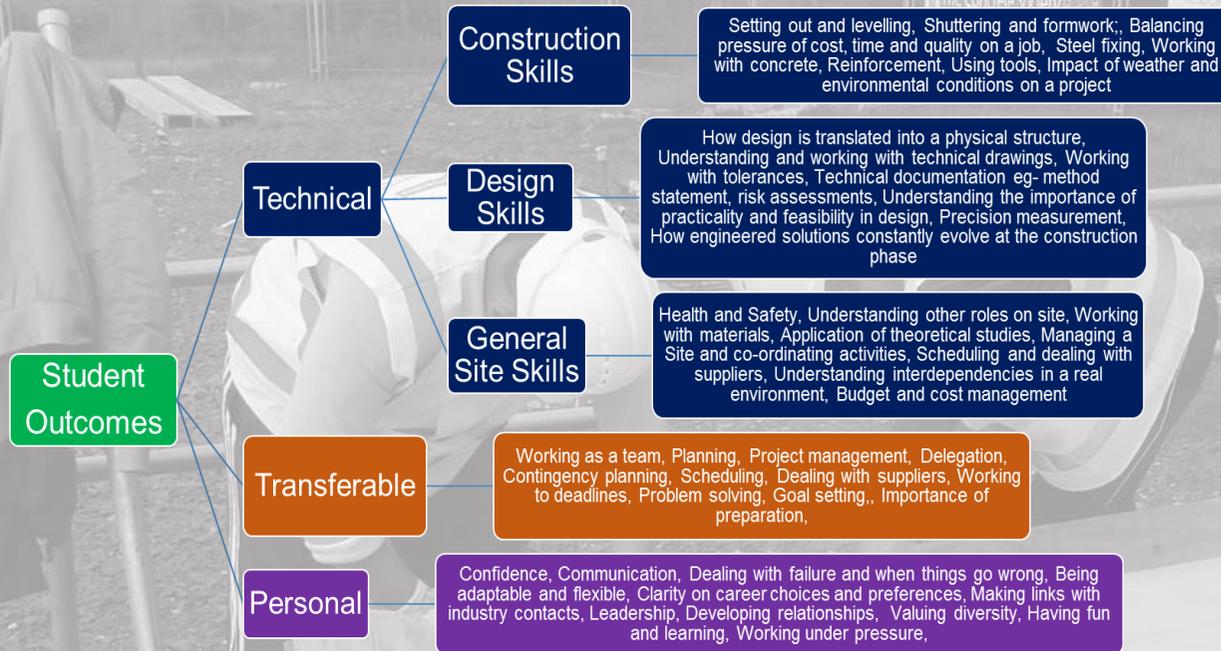


Figure 7

As part of the independent evaluation conducted on the 2016 Constructionarium Programme a more in-depth measurement was carried out to establish the difference the programme makes across these different outcomes. The primary tool used for this measurement was a student survey. This comprised of a baseline questionnaire completed by all students prior to taking part on the programme and another questionnaire which participating students completed at the end of their week long Constructionarium experience.

Figure 8 shows a baseline and completion score for each of the colleges and universities that took part in the 2016 Constructionarium Programme. In each case it is clear that the programme makes a considerable difference for each of the students within each of the colleges and universities that took part. The extent of difference for each student varies considerably based on many different factors including, prior experience, skills and knowledge. The graph below sets out below highlights the differences between across the range of broad outcome groups. A more detailed breakdown between the different colleges and universities is contained within the [appendices](#).

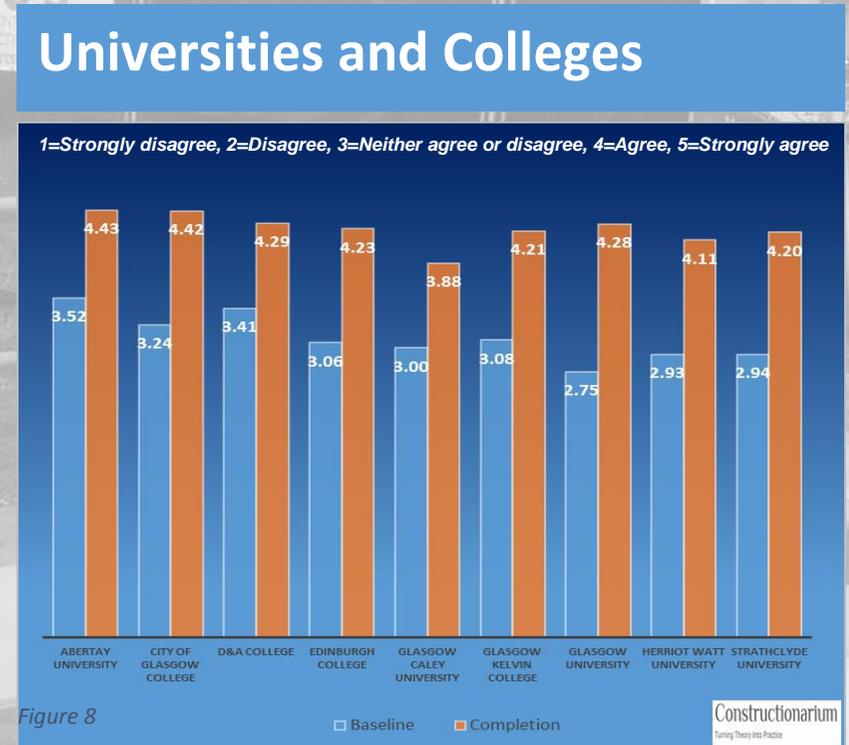


Figure 8

Outcome Groups

Figure 9 opposite shows that the differences made for students varies considerably depending on the specific outcomes and groups that are being measured.

The graph highlights that the biggest differences made for student are focused in the Site, Technical and Design related outcomes.

This positively reinforces the primary purpose of providing students with the Constructionarium experience which is to turn theory into practice by giving them real hands on experience of working within a live construction environment.

Most of the participating universities and colleges show a similar profile of results although there are some differences which are explored in more detail later in this section of the report.

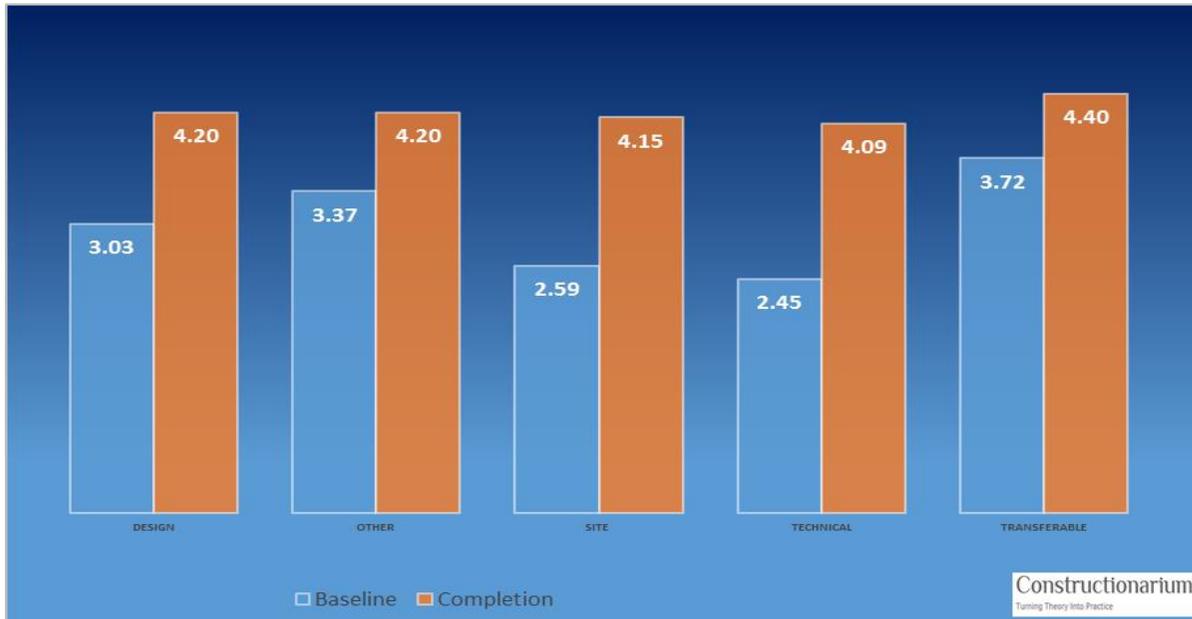


Figure 9

Outcome Groups by Gender

Figure 10 opposite shows that the differences made for students appears to vary according to gender when considering the specific outcomes and groups that are being measured.

The graph highlights that the biggest differences between genders relate to Design, site and technical outcomes.

The cause in this variation may be due to a number of different factors including chosen academic course of study, prior experiences, self-perception of existing skill levels and knowledge,

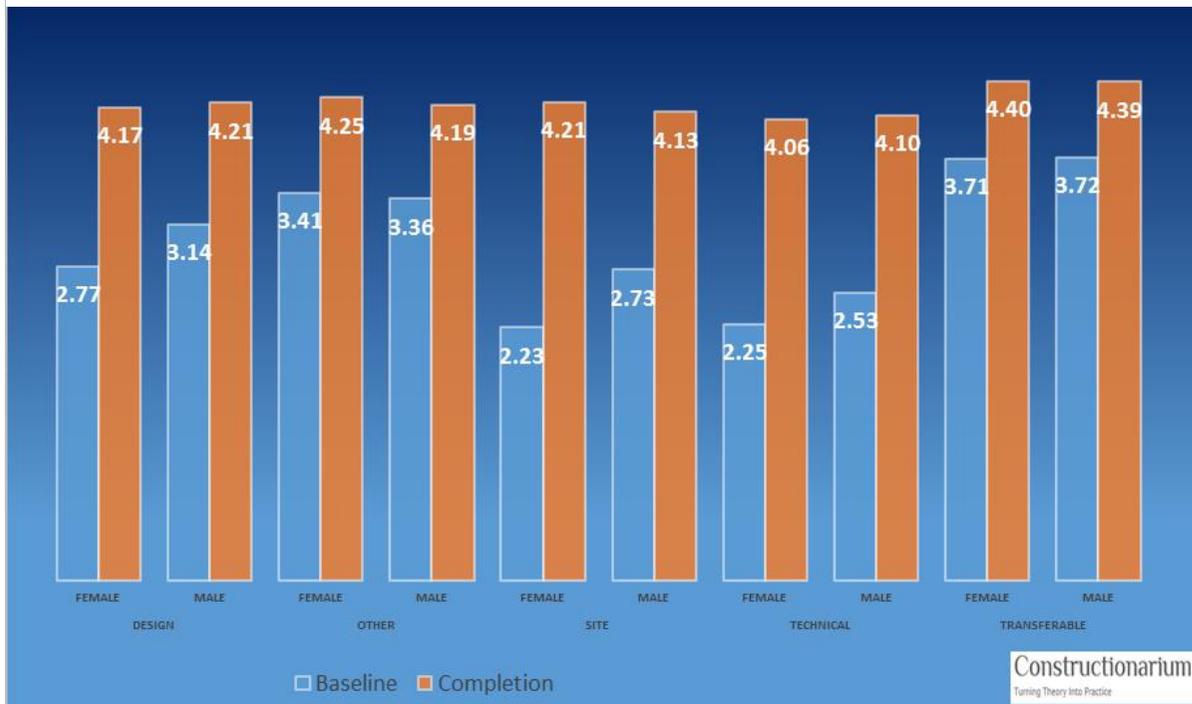


Figure 10

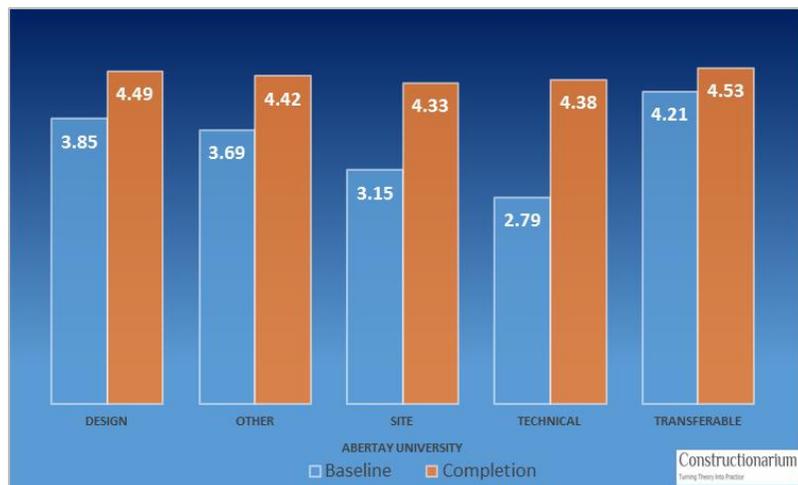


Figure 11

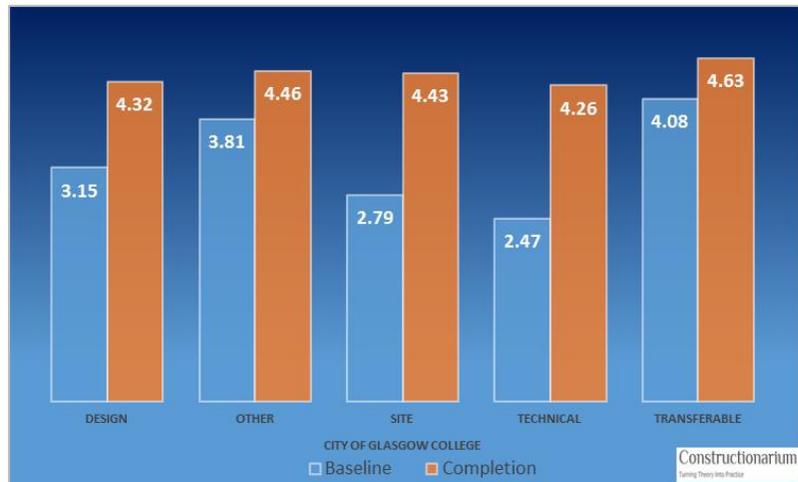


Figure 12

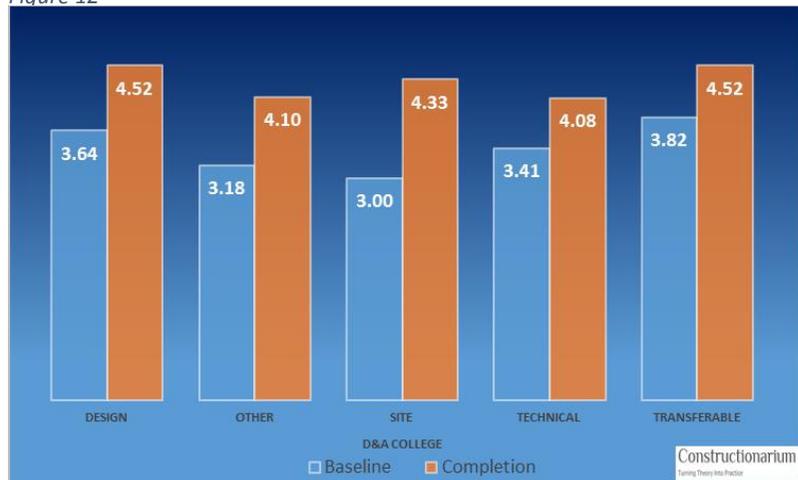


Figure 13

Figure 11. The baseline and programme completion data gathered for **Abertay University** students shows that participation in the Constructionarium made significant differences for them. The biggest impact took place in relation to Site and Technical Outcomes. **Site Outcomes** – Students felt that the biggest differences related to understanding project interdependencies, how to co-ordinate activities, scheduling of works and knowing how to work with different construction materials. **Technical Outcomes** – Students felt that the most significant differences were made in relation to developing skills and knowledge of shuttering and formwork, steel fixing, structure reinforcement, and use of temporary works. **Other Outcomes** - All students who took part in the programme found the Constructionarium experience Inspirational, felt that it would have a very beneficial impact on their academic studies and would recommend the programme to other students. The **top 3** things that students felt that they gained from the programme were focused around developing their confidence and leadership skills, getting the opportunity to have hands on experience on a real construction site and understanding the importance of health and safety on a construction site.

Figure 12. The baseline and programme completion data gathered for **City of Glasgow College** students shows that participation in the Constructionarium made significant differences for them. The biggest impact took place in relation to Site and Technical Outcomes. **Site Outcomes** – Students felt that the biggest differences related to understanding project interdependencies, how to co-ordinate activities, scheduling of works and knowing how to work with different construction materials. **Technical Outcomes** – Students felt that the most significant differences were made in relation to developing skills and knowledge of shuttering and formwork, steel fixing, structure reinforcement, and use of temporary works. **Other Outcomes** - All students who took part in the programme found the Constructionarium experience Inspirational, felt that it would have a very beneficial impact on their academic studies and would recommend the programme to other students. The **top 3** things that students felt that they gained from the programme were focused around developing their teamwork skills, getting the opportunity to have hands on experience on a real construction site and working with industry professionals.

Figure 13. The baseline and programme completion data gathered for **Dundee and Angus College** students shows that participation in the Constructionarium made significant differences across all outcome groups. The biggest impact took place in relation to Site and Other Outcomes. **Site Outcomes** – Students felt that the biggest differences related to understanding budget and cost management, project interdependencies, how to co-ordinate activities, scheduling of works and knowing how to work with different construction materials. **Other Outcomes** – Students felt that the most significant differences were made in relation to developing links with industry contacts and being given the opportunity to take part in the Constructionarium programme as part of their academic course. All students who took part in the programme found the Constructionarium experience Inspirational, felt that it would have a very beneficial impact on their academic studies and would recommend the programme to other students. The **top 3** things that students felt that they gained from the programme were focused around developing their teamwork skills, the opportunity to have hands on experience on a real construction site and Increasing confidence

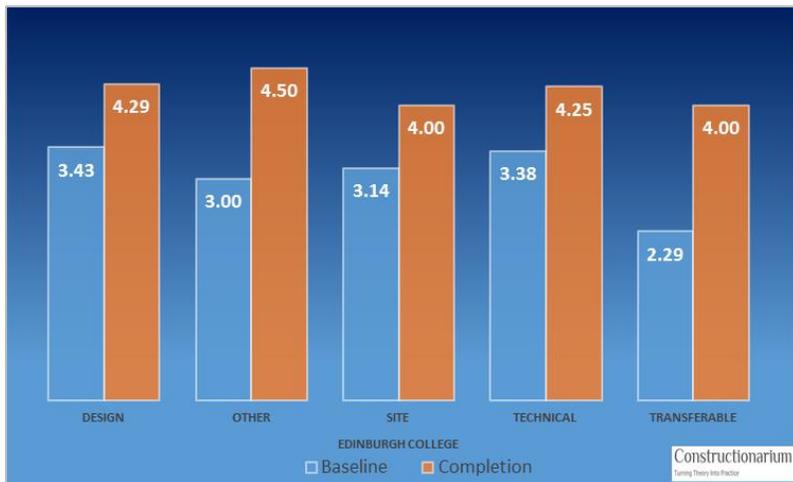


Figure 14

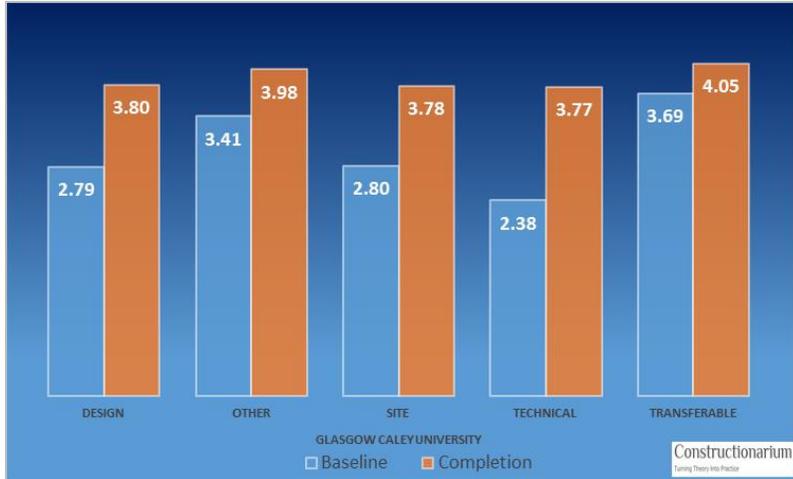


Figure 16

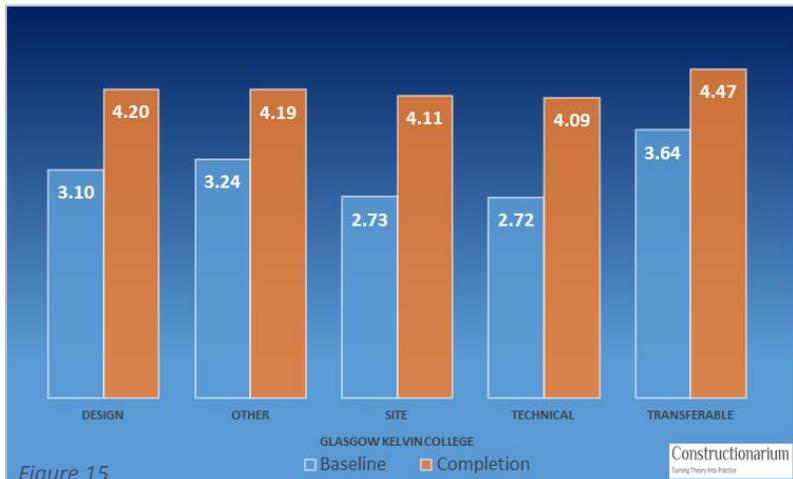


Figure 15

Figure 14. The baseline and programme completion data gathered for **Edinburgh College** students (**one student**) shows that participation in the Constructionarium made significant differences for them. The biggest impact took place in relation to Transferable and Other Outcomes. **Transferable Outcomes** – The Student felt that the biggest differences related to understanding how to delegate, managing a project, managing to deadlines, goal setting and problem solving. **Other Outcomes** – The Student felt that the most significant differences were made in relation to learning to work under pressure, applying practical experience to academic studies. The students also found the Constructionarium experience Inspirational, felt that it would have a very beneficial impact on their academic studies and would recommend the programme to other students.

The **top 3** things that the student felt that they gained from the programme were focused around developing their teamwork skills, getting the opportunity to have hands on experience on a real construction site and developing skills and knowledge in relation to reinforcement and formwork.

Figure 15. The baseline and programme completion data gathered for **Glasgow Caledonian University** students shows that participation in the Constructionarium made significant differences for them. The biggest impact took place in relation to Site, Technical and Design Outcomes. **Site Outcomes** – Students felt that the biggest differences related to understanding project interdependencies, how to co-ordinate activities, scheduling of works and knowing how to work with different construction materials. **Technical Outcomes** – Students felt that the most significant differences were made in relation to developing skills and knowledge of shuttering and formwork, steel fixing, structure reinforcement, and use of temporary works. **Design Outcomes** – Students felt that they better understood how engineered solutions evolve during construction phase, the importance of precision measurement and how design translates into physical structures. **Other Outcomes** - All students who took part in the programme found the Constructionarium experience Inspirational, felt that it would have a very beneficial impact on their academic studies and would recommend the programme to other students.

The **top 3** things that students felt that they gained from the programme were focused around developing their teamwork skills, getting the opportunity to have hands on experience on a real construction site and understanding the importance of Health and Safety.

Figure 16. The baseline and programme completion data gathered for **Glasgow Kelvin College** students shows that participation in the Constructionarium made significant differences for them. The biggest impact took place in relation to Site and Technical Outcomes. **Site Outcomes** – Students felt that the biggest differences related to understanding project interdependencies, how to co-ordinate activities, scheduling of works and knowing how to work with different construction materials. **Technical Outcomes** – Students felt that the most significant differences were made in relation to developing skills and knowledge of shuttering and formwork, steel fixing, structure reinforcement, and how to balance, time with cost and quality. **Other Outcomes** - All students who took part in the programme found the Constructionarium experience Inspirational, felt that it would have a very beneficial impact on their academic studies and would recommend the programme to other students.

The **top 3** things that students felt that they gained from the programme were focused around developing their teamwork skills, getting the opportunity to have hands on experience on a real construction site and understanding plans and technical documentation.

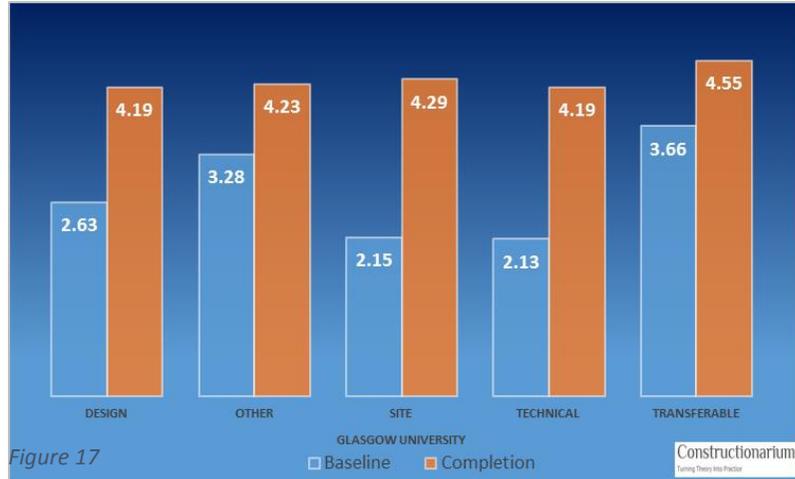


Figure 17

Figure 17. The baseline and programme completion data gathered for **Glasgow University** students shows that participation in the Constructionarium made significant differences for them. The biggest impact took place in relation to Site and Technical Outcomes. **Site Outcomes** – Students felt that the biggest differences related to understanding budgets and cost control, Site Health and Safety, site roles and responsibilities, project interdependencies, how to co-ordinate activities, scheduling of works and knowing how to work with different construction materials. **Technical Outcomes** – Students felt that the most significant differences were made in relation to developing skills and knowledge of shuttering and formwork, steel fixing, structure reinforcement, and use of temporary works on a site. **Other Outcomes** - All students who took part in the programme found the Constructionarium experience Inspirational, felt that it would have a very beneficial impact on their academic studies and would recommend the programme to other students. The **top 3** things that students felt that they gained from the programme were focused around developing their teamwork skills, getting the opportunity to have hands on experience on a real construction site understanding how to turn theory into practice.

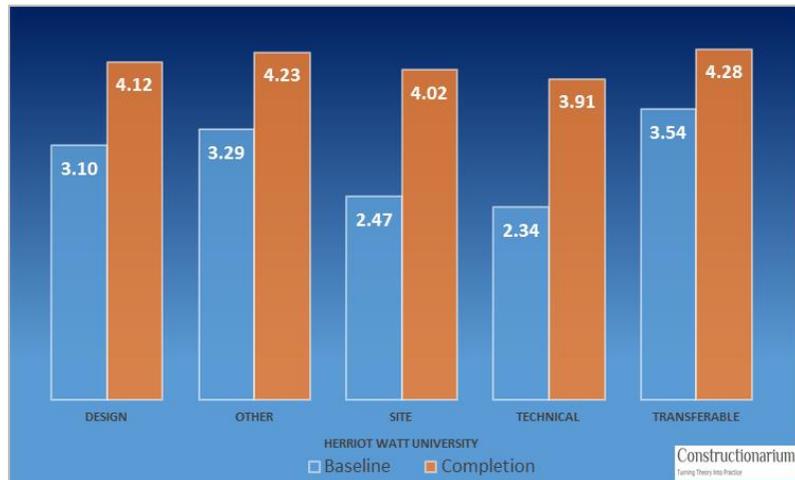


Figure 18

Figure 18. The baseline and programme completion data gathered for **Herriot Watt University** students shows that participation in the Constructionarium made significant differences for them. The biggest impact took place in relation to Site and Technical Outcomes. **Site Outcomes** – Students felt that the biggest differences related to understanding budgets and cost control, site roles and responsibilities, project interdependencies, how to co-ordinate activities, scheduling of works and knowing how to work with different construction materials. **Technical Outcomes** – Students felt that the most significant differences were made in relation to developing skills and knowledge of shuttering and formwork, steel fixing, structure reinforcement, and use of temporary works on a site. **Other Outcomes** - All students who took part in the programme found the Constructionarium experience Inspirational, felt that it would have a very beneficial impact on their academic studies and would recommend the programme to other students. The **top 3** things that students felt that they gained from the programme were focused around developing their teamwork skills, getting the opportunity to have hands on experience on a real construction site understanding how to turn theory into practice.

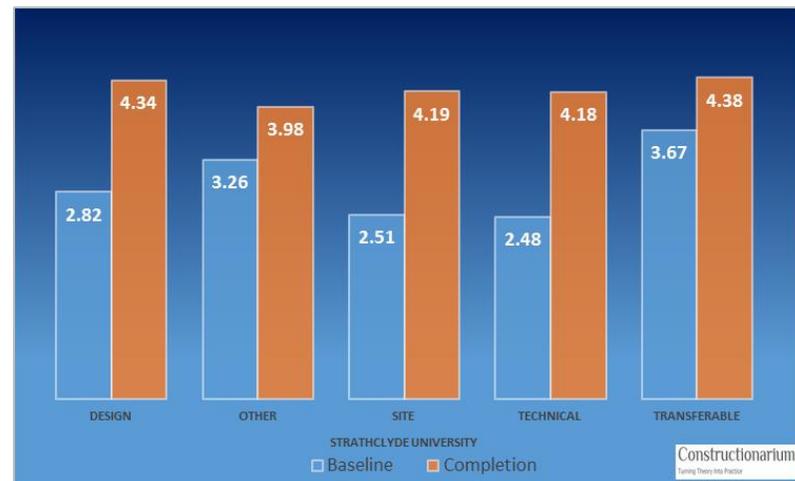


Figure 19

Figure 19. The baseline and programme completion data gathered for **Strathclyde University** students shows that participation in the Constructionarium made significant differences for them. The biggest impact took place in relation to Site, Technical and Design Outcomes. **Site Outcomes** – Students felt that the biggest differences related to understanding project interdependencies, how to co-ordinate activities, scheduling of works and knowing how to work with different construction materials. **Technical Outcomes** – Students felt that the most significant differences were made in relation to developing skills and knowledge of shuttering and formwork, steel fixing, structure reinforcement, and use of temporary works. **Design Outcomes** – Students felt that they better understood how engineered solutions evolve during construction phase, the importance of precision measurement and understanding technical documents. **Other Outcomes** - All students who took part in the programme found the Constructionarium experience Inspirational, felt that it would have a very beneficial impact on their academic studies and would recommend the programme to other students. The **top 3** things that students felt that they gained from the programme were focused around developing their teamwork skills, getting the opportunity to have hands on experience on a real construction site and understanding the importance of Health and Safety.

The Difference Made – What the Students said

The Most Important Lessons

“pre-preparation for all tests, measure twice cut once”

– Adam Thomson, Herriot Watt University

“That planning is the most important stage of construction”

– Daniel Winnie, Herriot Watt University

“Managing a team and delegating tasks to people, How to stay on a budget and deliver within time, construction problems can be solved on-site in different ways”

– Amr Aboulela, Strathclyde University

“Things usually take longer than expected on-site”

– Cameron Hastie, Herriot Watt University

“How different it is doing engineering work on site than in an office. How to manage and organise a whole project and how different plans can change..”

– Ciara Dunlop, Glasgow University

“Planning and its importance, Simple design mistakes results in large extra costs and time.”

– Thabit Albiyani, Glasgow University

The Biggest Benefits

“Reality check about how much goes into a project”

– Michaela Silver-Woods, Strathclyde University

“A better understanding of a real construction site and how it operates, also dealing with real life setbacks and problem solving”

– Sobran Arif, Glasgow Kelvin College

“understanding site-specific jargon and experiencing the real life pressure and struggles of working on a live site”

– Katherine Montgomery, Herriot Watt University

“I would feel much more confident working on a real-life site now following this experience”

– Nathan Campbell, Strathclyde University

“experience of all tasks on-site including labouring work. Allows you to appreciate everyone’s job”

– Jennifer Green, Glasgow University

“A job aspiration, aspiration to find a summer placement and get a role on-site. The confidence to walk on to a construction site and not be intimidated.”

– Alice Butler, Glasgow University

The Biggest Challenges

“solving problems on-site, trying to find a solution within budget and time that pleases the client and the designer.”

– Amr Aboulela, Strathclyde University

“time constraints and working under pressure, adapting all paperwork before carrying out any adapted procedure not just rushing into it.”

– Laura Halliday, Strathclyde University

“having to always have a risk assessment before you carry out a task”

– Deborah Mutamba, City of Glasgow College

“working and thinking as a whole team”

– Meshal Najeh Alfurayji, Glasgow Caledonian University

“Managing a team and ensuring that everyone was contributing and also at times having too many workers on tasks”

– Gregor Stewart, City of Glasgow College

“Managing Health and Safety correctly”

– Marcus Jensen, Abertay University

The Most Enjoyable

“the experience of working on a live site with real workers.”

– Craig Hamilton, Abertay University

“the teamwork and bonding with other students and the lovely personalities of the engineers and supervisors.”

– Mohamed Ahmed Al Maadhead, Abertay

“seeing first-hand how building processes work.”

– Lee Dickson, Glasgow Caledonian

“I enjoyed working with my team and being given responsibilities as a manager on-site.”

– George Stanforth, Herriot Watt University

“Getting to work as a team , solving real-life problems and working on-site.”

– Matthew Burton, Glasgow University

“Learning trades as well as managing, seeing a project go from nothing to a complete structure..”

– Laura Halliday, Strathclyde University

The Benefit to academic studies

“It helps widen my choice for different career paths and also it’s a platform for me to network with those currently in the industry.”

– Deborah Mutamba, City of Glasgow

“when I go back and learn further about construction, and the lecturers refer to materials, sizing, processes etc. I will be able to visualise it and participate confidently in the discussions. I will also have a better understanding for my designing as I will know what works and what doesn’t ”

– Hannah Steele-Milne, City of Glasgow College

“I will now ask the questions about the real life situations and how they're applied.”

– Connor Ralph, Herriot Watt University

“will actually understand how the theory applies to the real world. It has generally made me enjoy the subject more as it is more relevant and I am excited about the future jobs.”

– Katherine Montgomery, Herriot Watt University

“Helps to understand how a project is built and how time consuming it can be, got to see how reinforcement fits within the formwork for the concrete. Generally much more experience gained in the construction industry..”

– Jane Middlemiss, Glasgow University

“I can now visualise what I learn..”

– Holly-Mo Vhy, Glasgow University

Partner Outcomes

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 as part of the 2015 programme evaluation. The outcomes identified by Academic Partners are detailed on the impact map below in figure 20. The same survey was completed as part of the 2016 evaluation to validate previous findings and to see whether other outcomes were emerged that did not feature in the 2015 study.

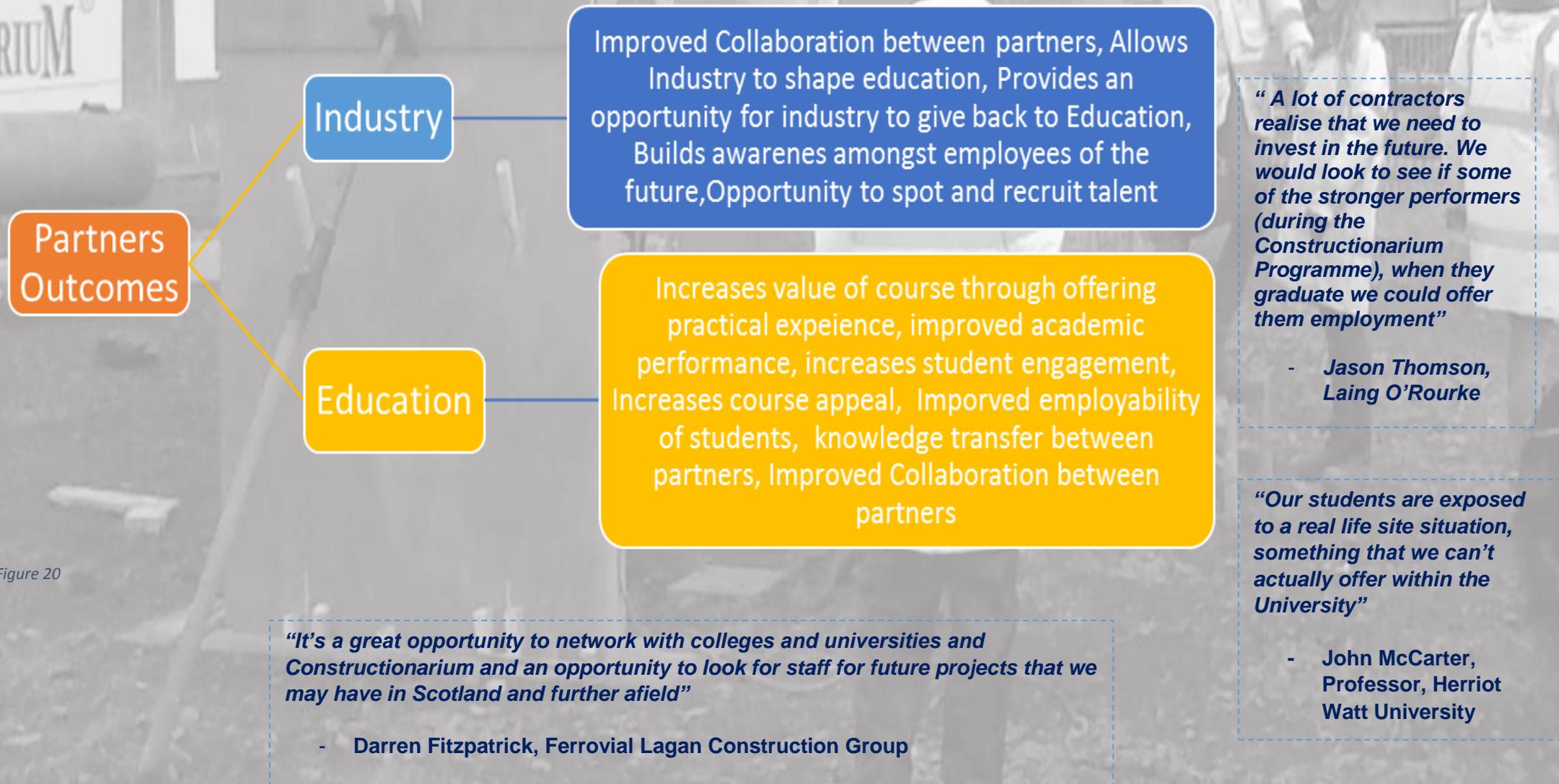


Figure 20

The Difference Made – What the Contractors said



The Need for Constructionarium

“I don’t feel students have enough exposure on a practical level that can complement their studies”

- Adam Glover, Expanded

“The link to practical learning and industry = turning theory into practice..”

- Brian Currie, Expanded

“Provides valuable experience for studies. Students get practical experience of the theoretical.”

- Stuart Hilson, Expanded

“Constructionarium is crucial to equip students with appropriate practical skills that they will require when employed as site engineers for any contractor..”

- Peter Bowles, Expanded

Why get involved in Constructionarium

“promotes company to next generation..”

- Paul Dabrera, McLaughlin & Harvey Ltd

“our company has an ongoing relationship with university and graduates..”

- Alistair Logan, McLaughlin & Harvey Ltd

“Constructionarium allows us as a business to give something back to the industry by supporting events like this. On a personal level I have got involved in and tried to pass on some of the experience I have had in the industry for the past 30 years. It is important for the students studying civil engineering to have some form of practical exposure to what actually happens on a construction site on a daily basis and to be able to apply some of the learning to real life scenarios...”

- Peter Bowles, Expanded

“to help develop and source company trainees..”

- Jim Harkness, McLaughlin & Harvey Ltd

The Outcomes for Students

“learning how to deal with contractors and consultants on-site, how to plan tasks, how to foresee/predict potential problems occurring on-site, etc...”

- Cristan Alexandru Paun, Woolgar Hunter

“primarily a very lifelike scenario where students can gain practical experience + take valuable lessons learned into study...”

- Adam Glover, Expanded

“The Students gained site experience including safety and quality procedures. Increased confidence.”

- Darren Fitzpatrick, Ferroviol Lagan

“a real good understanding of what happens over the course of a real project, working as a team”.

- Alistair Logan, McLaughlin & Harvey Ltd

“real sense of achievement, teamwork, organisation and they got a taste of real-life sites.”

- Padraig Gibbons, Careys CE

The Outcomes for the Contractors

“having the opportunity to share some knowledge and see/ work alongside some of our future construction managers + engineers.”

- Adam Glover, Expanded

“A chance to showcase our business and also provide career guidance providing an opportunity to provide employment opportunities..”

- Brian Currie, Expanded

“As a business supporting Constructionarium it gives us an opportunity to review the talent pool coming from a number of different universities and potentially to offer some individuals placements...”

- Peter Bowles, Expanded

The impact on student learning

“allows them to think about finished project.”

- Paul Dabrera, McLaughlin & Harvey Ltd

“they realise that real life projects may need redesigned.”

- James Reid, McLaughlin & Harvey Ltd

“Understanding of how to build things they're studying.”

- Stuart Hilson, Expanded

The impact on employment prospects

“Students who are able to demonstrate any practical experience of the site environment must be more employable than students who have complete all their learning in a classroom environment..”

Peter Bowles, Expanded

“I believe that all employers would look favourably on this involvement..”

- Thomas Brannan, Expanded

“I think this programme can impact in a very positive manner with students as they can say they've had practical on-site participation + experience of all aspects of construction.”

- Adam Glover, Expanded

“Employers look for graduates that are exposed to both the theoretical and practical side of the industry. Through the participation to this unique project, the student obtains the basic on-site experience that would bring invaluable benefits to a future career...”

- Cristan Alexandru Paun, Woolgar Hunter

“It provides a valid topic of discussion in an interview and provides an edge over others that have no experience.”

- Darren Fitzpatrick, Ferroviai Lagan



The Difference Made – What the Universities and Colleges Said

The Need for Constructionarium

“It is critical that students learn the practical aspects of structural design and this is an opportunity to learn about the practical aspects of civil engineering..”

- Fiona Bradley, Glasgow University

“To show real life construction industry to students planning in joining it..”

- Kevin Gallagher, Glasgow Kelvin College

“gives students a fantastic opportunity to engage with the industry they want to work in and at the same time get some real life work experience..”

- Nicola Callaghan, Glasgow Caledonian University

“It is essential to bridge the skill, knowledge and understanding gap between academic and classroom based learning and what happens in the real world of construction. Constructionarium provides the ideal platform from which to do this ..”

- Dale Lyon, Constructionarium Scotland

Why get involved in Constructionarium

“it’s a great way to stimulate experience and interest in engineering..”

- Zhiwei Gao, Glasgow University

“it’s a great way to stimulate experience and interest in engineering..”

- Zhiwei Gao, Glasgow University

“it’s a great educational and social experience for the student.”

- Fiona Bradley, Glasgow University

“It offers a unique selling point our courses and helps to attract new students..”

- Daniel Gilmour, Abertay University

“it does what is says on the can... it turns theory into practice...the students are subjected to many more problems and challenges that we can’t subject them to in the classroom.”

- John McCarter, Herriot Watt University

The Outcomes for Students

“the students learn about risk assessment, method statements, budgetary control and teamwork”

- John McCarter, Herriot Watt University

“the practical hands on learning experience the students take into 2nd year HND is invaluable to them in lectures”

- Kevin Gallagher, Glasgow Kelvin College

“greater understanding, personal development and networking with professionals”

- Jill Sutcliffe, Glasgow Caledonian University

The impact on student learning

“improves commitment and classroom participation, and overflows to other students”

- Jill Sutcliffe, Glasgow Caledonian University

“better understanding of planning, process and dealing with pressure and time management..”

- Nicola Callaghan, Glasgow Caledonian University

“what’s really good is that the students get to work with the skilled operatives tradesmen and the students always comment on how much they have learned from them and that puts a new light on their learning ..”

- David Blackwood, Abertay University

“the students recognise why we are teaching them certain things, they are able to relate their studies much more closely to work on site. They are a bit more mature and a bit more willing to apply that knowledge and put more effort in ..”

- Bob Gilmour, Glasgow Caledonian University

The impact on employment prospects

“very favourably- helps make their CV stand out..”

- John McCarter, Herriot Watt University

“Greatly increase employability and improves self-confidence.”

- Fiona Bradley, Glasgow University

“our experience has taught us that Constructionarium has been a talking point during interview situations”

- Mike McNal, Glasgow Kelvin College

“I think it will benefit them greatly as Constructionarium is being more recognised more in the industry”

- Kevin Gallagher, Glasgow Kelvin College

“Feedback from graduates has suggested positive outcomes.”

- Mike Murray, Strathclyde University

“very positively, increased confidence and team players”

- Jill Sutcliffe, Glasgow Caledonian University

Learning for the future



The Students



Students talk about what could be done to improve the Constructionarium Experience



1
Could more time be allowed onsite to improve the quality of the finished product

2
More information and briefing and preparation prior to the week long programme on site would improve performance

3
Better outline of ways to communicate with the client and consultants during the week

4
Could the dates of the programme be confirmed earlier in order to make practical arrangements

5
A more detailed induction to each role would allow less handholding and greater accountability

6
Add a demolition element to the programme

8
Consider the provision of individual student assessment to ensure maximum individual learning from the experience

9
make students aware before they sign up that there is a lot of prep to be done before the actual week as it may impact upon exam revision

10
More woman's kit, it was very hard to do some of the fiddly tasks with large gloves, waders and welly boots

7
Could the programme reflect more environmental aspects of engineering

11
Consider extending the Constructionarium Programme to include an element of demolition to deconstruct the physical structures

The Contractors

Contractor Partners talk about what could be done to improve the Constructionarium Experience



12

Consider developing the contractor role as an opportunity to enhance the management skills, and experience of contractor staff.

13

The number of contractor partners should be increased in order to allow the programme to grow and be offered to additional colleges and universities

14

Consider longer lead times and more interaction with students prior to going on site

15

Provision of welfare facilities would make a difference for both students and industry partners

16

It may be beneficial to provide some apprentice joiners to the contractor team to support and supplement the work of the students

18

Consider the introduction of daily toolbox talks on-site

17

Consider a change to the initial days activities, this would involve setting out of the two foundations by the students, but also include the building of the bases with C20 concrete. This would then allow students to set out the corner points of the foundation shuttering the following day and also place levels on the form work, thus exposing them to level control.

20

The students may benefit from a day course prior to going on site that focuses on the drawings in order to plan more effectively

19

Consider the layout of site offices and kit out better- maybe include drawings on walls etc.

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The Colleges and Universities

21

Consider having a co-ordination meeting with key partners to plan and agree areas for improvement each year

22

Students need to be exposed to the design as early as possible to ensure the final quality of the product is up to standard

23

Consider whether or not the timing of the programme could be improved in order to reduce the clash with exam timetable. This would ensure that students could give more time to preparation prior to going on site



Academic Partners and Constructionarium Scotland talk about what could be done to improve the Constructionarium Experience

Other Learning

24

Consider expanding the evaluation programme to incorporate more longitudinal evaluation looking at impact on post university employment

25

Consider expanding the evaluation programme to incorporate more longitudinal evaluation looking at short and medium term impact on academic learning and performance

26

Consider looking at how to include the use of new and more varied construction materials and methods can be incorporated into the programme

27

Consider expanding the evaluation programme to incorporate more longitudinal evaluation looking at impact on post securing placement and work experience opportunities

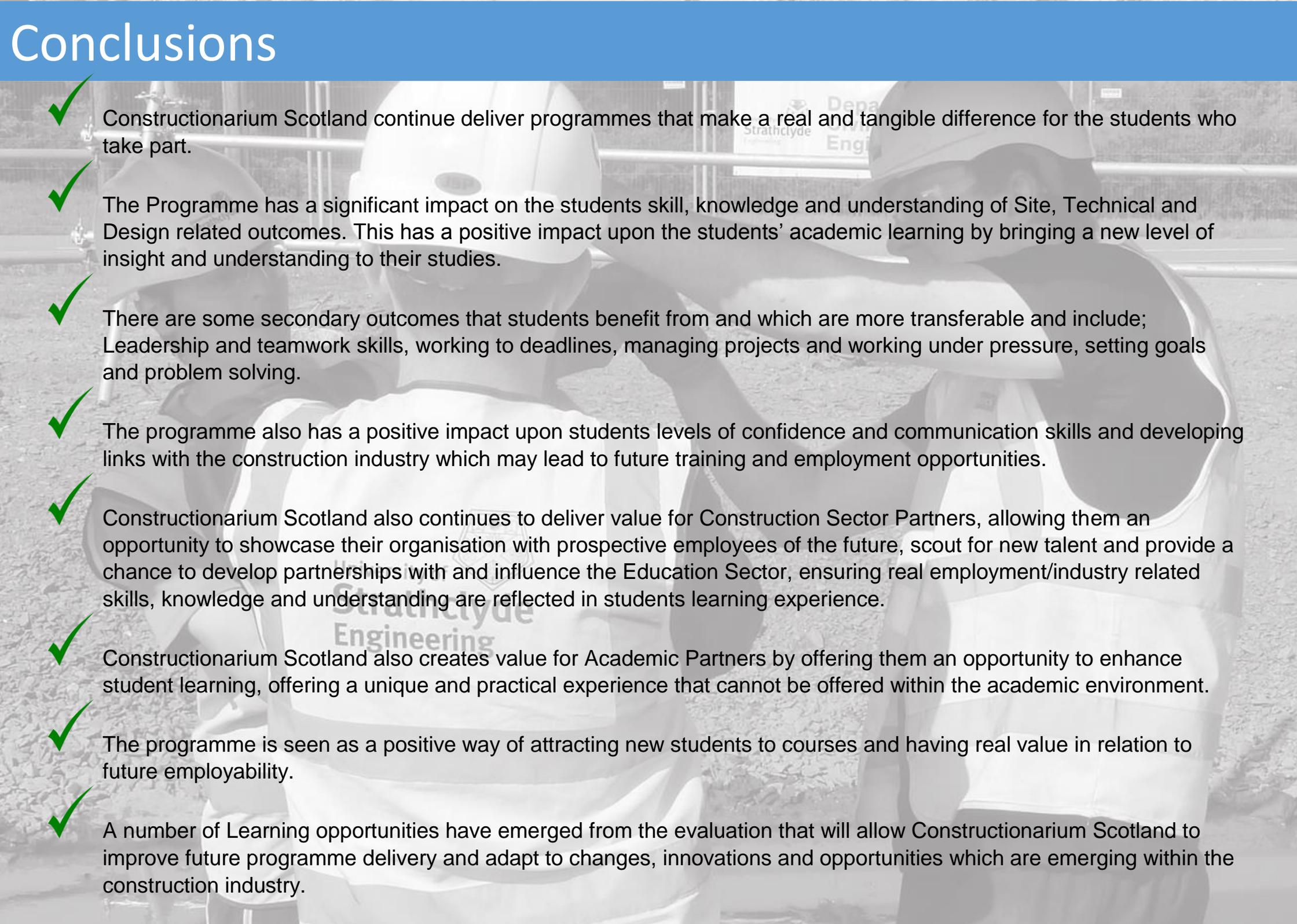
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Consider adding a deconstruction phase to the programme looking at the full lifecycle of a structure

29

The environmental aspects and implications of construction are becoming increasingly important and should be reflected in the design and delivery of future Constructionarium programmes

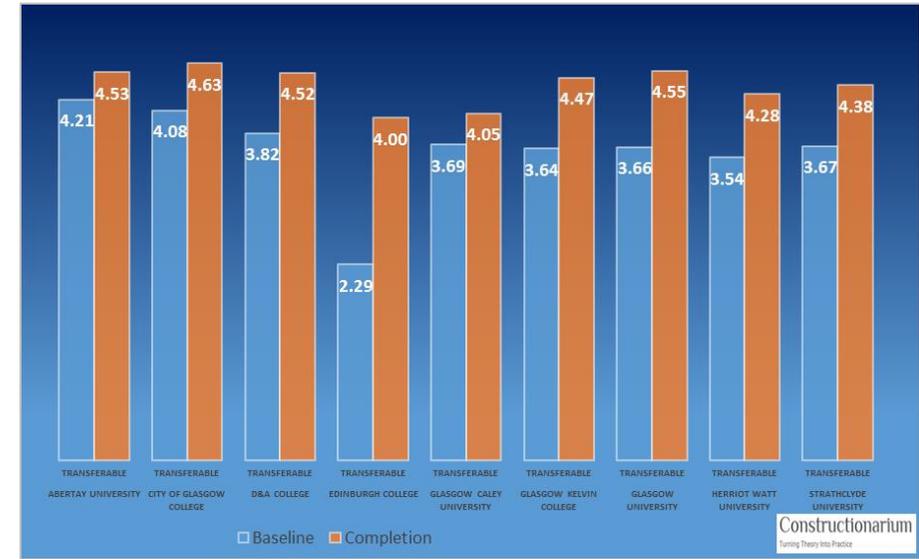
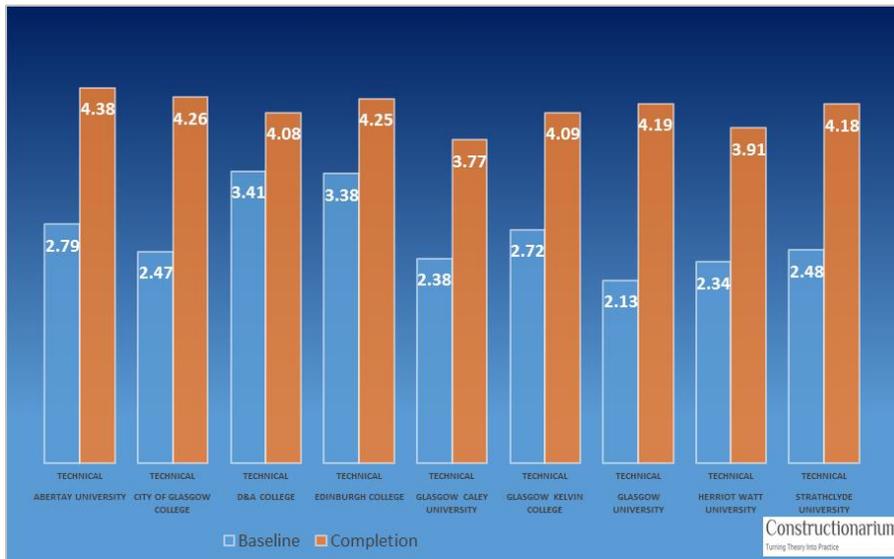
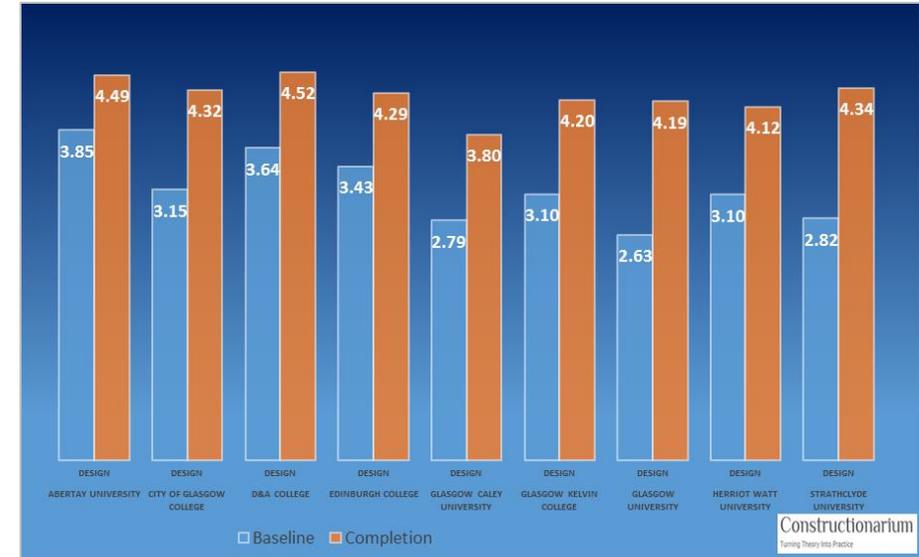
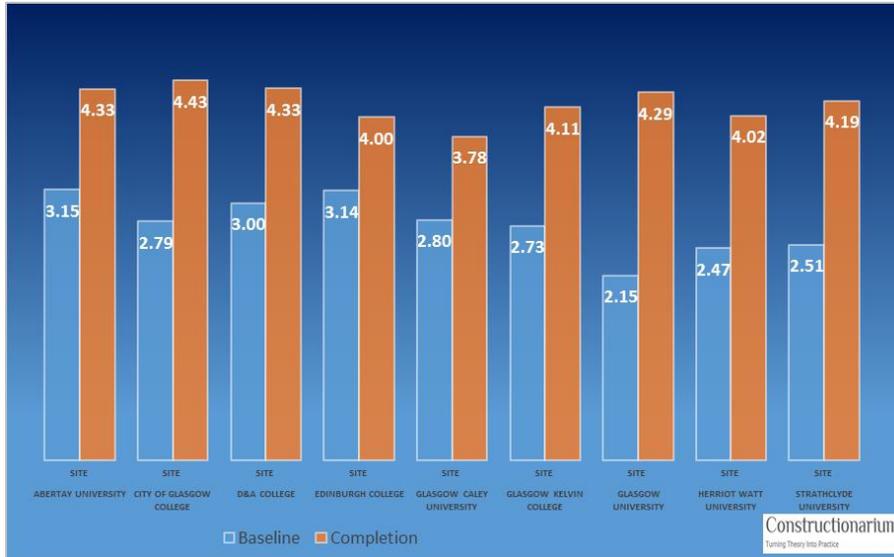
Conclusions

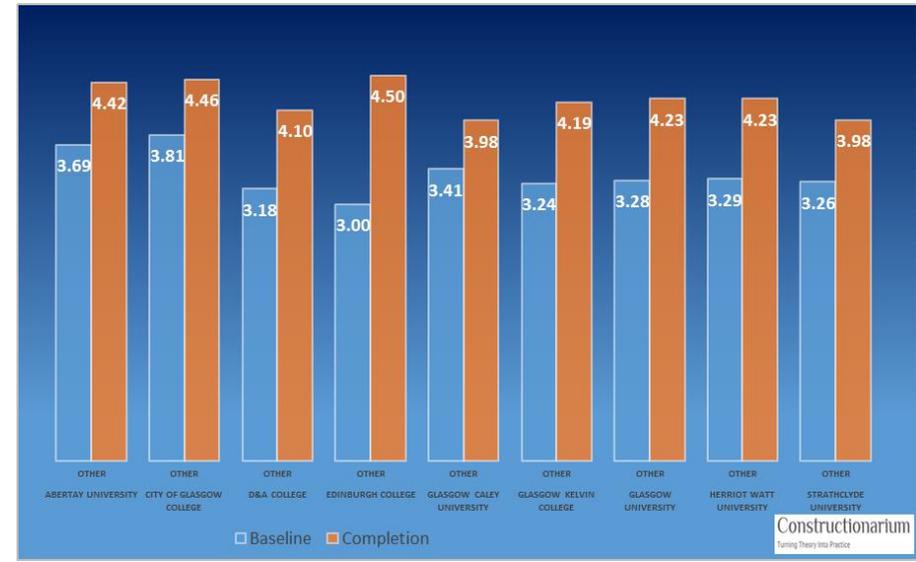
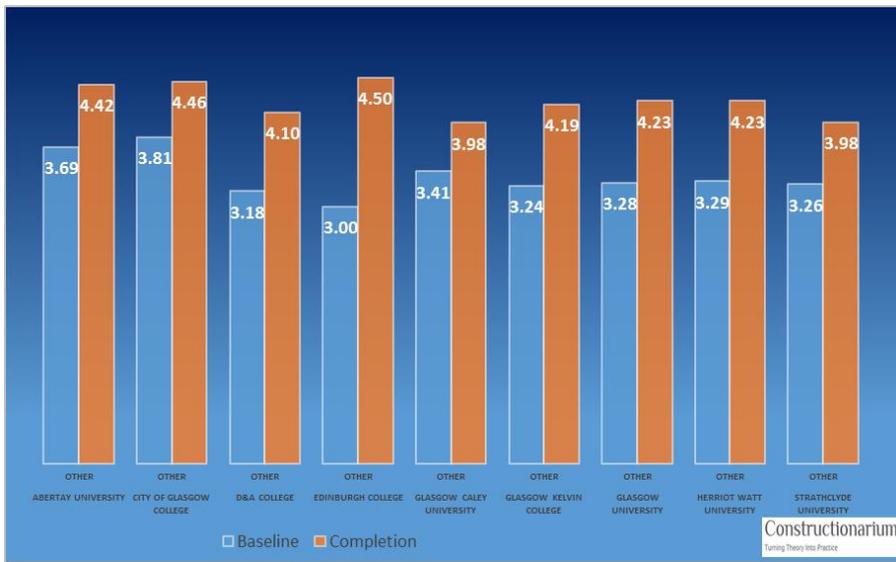
- 
- ✓ Constructionarium Scotland continue deliver programmes that make a real and tangible difference for the students who take part.
 - ✓ The Programme has a significant impact on the students skill, knowledge and understanding of Site, Technical and Design related outcomes. This has a positive impact upon the students' academic learning by bringing a new level of insight and understanding to their studies.
 - ✓ There are some secondary outcomes that students benefit from and which are more transferable and include; Leadership and teamwork skills, working to deadlines, managing projects and working under pressure, setting goals and problem solving.
 - ✓ The programme also has a positive impact upon students levels of confidence and communication skills and developing links with the construction industry which may lead to future training and employment opportunities.
 - ✓ Constructionarium Scotland also continues to deliver value for Construction Sector Partners, allowing them an opportunity to showcase their organisation with prospective employees of the future, scout for new talent and provide a chance to develop partnerships with and influence the Education Sector, ensuring real employment/industry related skills, knowledge and understanding are reflected in students learning experience.
 - ✓ Constructionarium Scotland also creates value for Academic Partners by offering them an opportunity to enhance student learning, offering a unique and practical experience that cannot be offered within the academic environment.
 - ✓ The programme is seen as a positive way of attracting new students to courses and having real value in relation to future employability.
 - ✓ A number of Learning opportunities have emerged from the evaluation that will allow Constructionarium Scotland to improve future programme delivery and adapt to changes, innovations and opportunities which are emerging within the construction industry.

Appendix

Appendix 1A

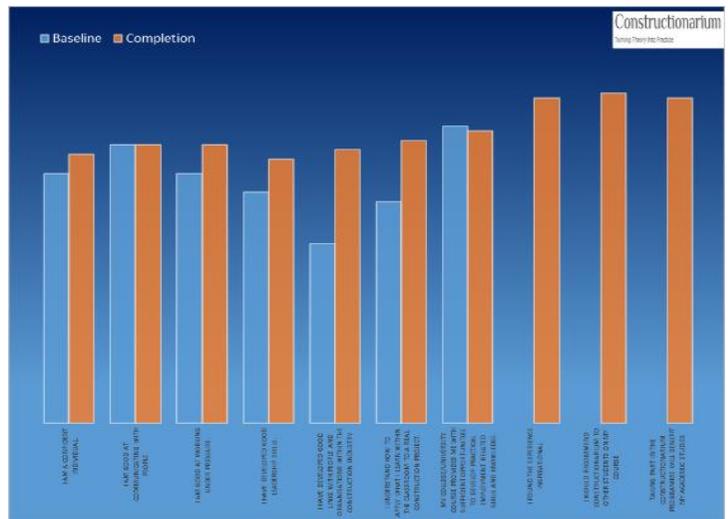
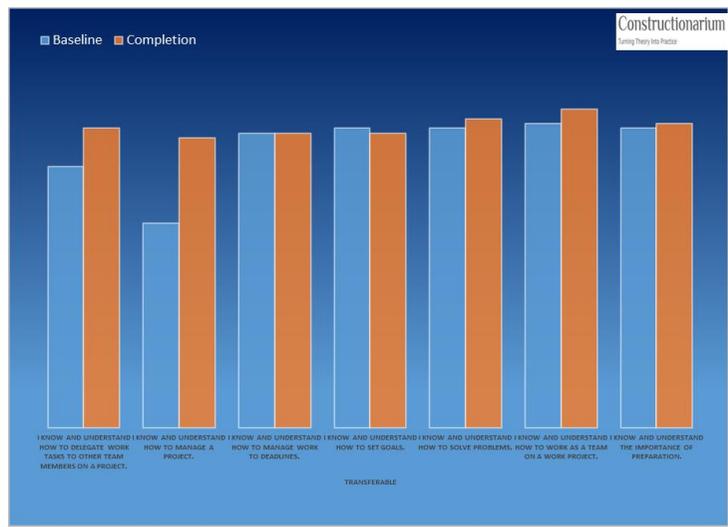
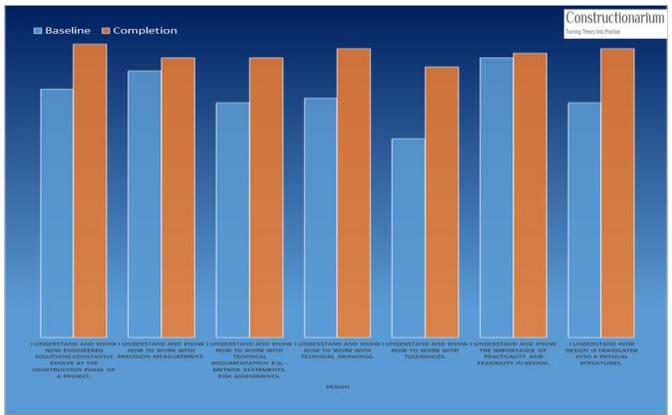
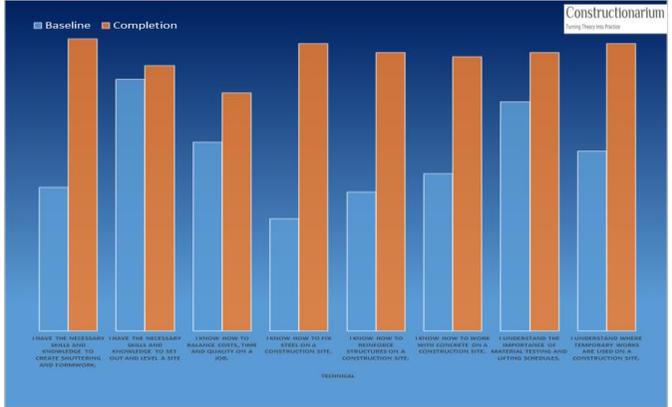
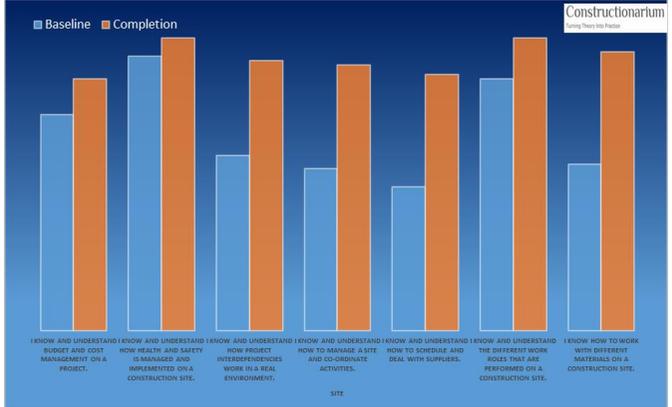
Shows the comparison between the different Universities and Colleges across the different Outcome Groups



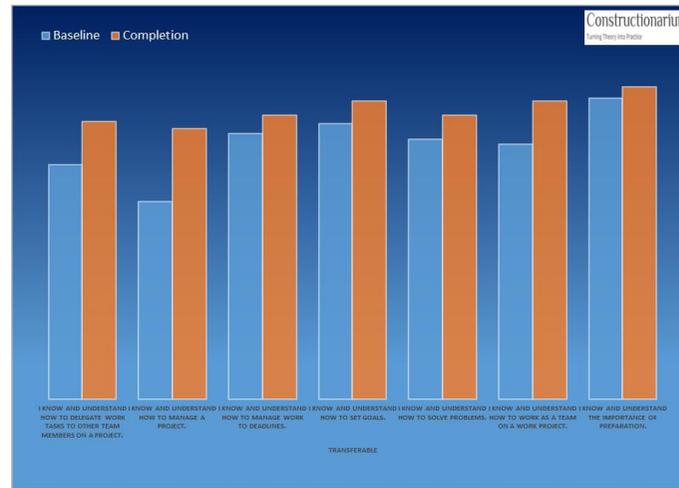
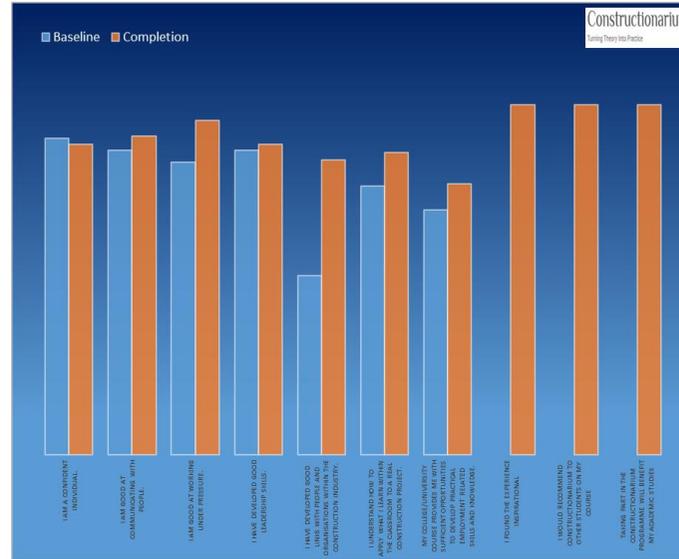
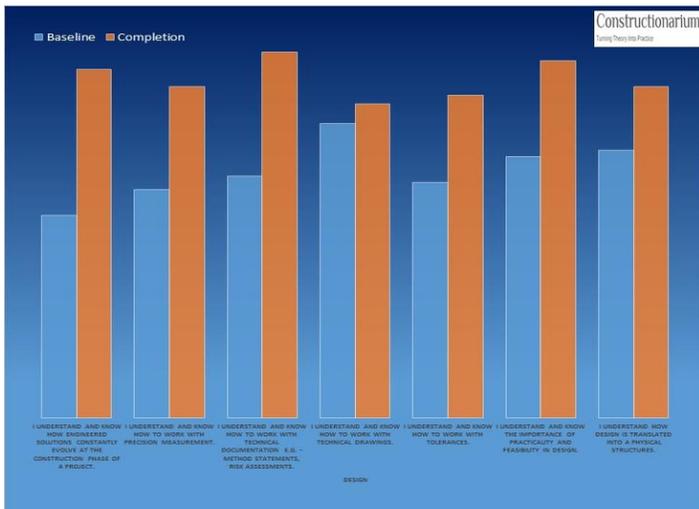
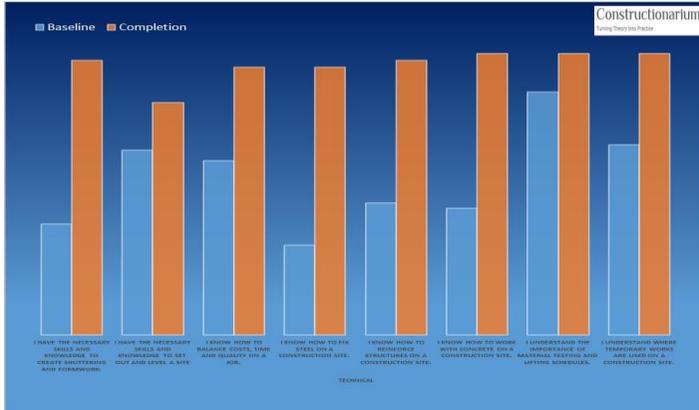
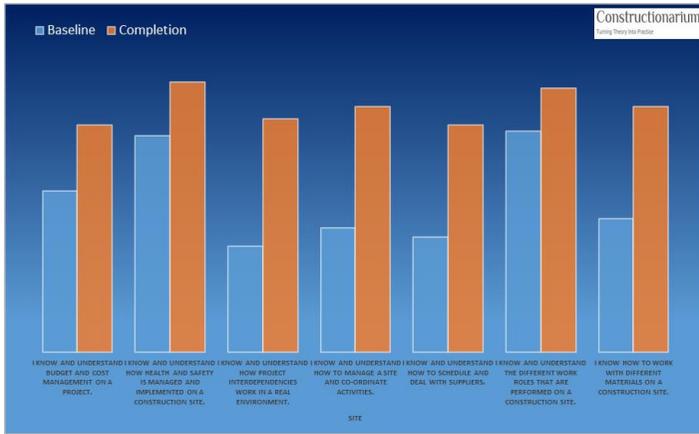


Shows the detailed outcome scores for each of the different Universities and Colleges across the different Outcome Groups

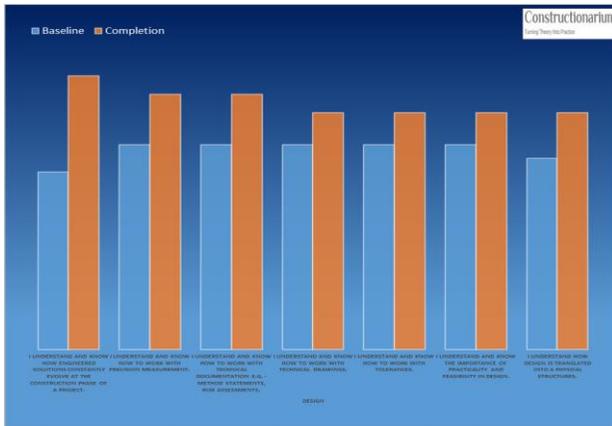
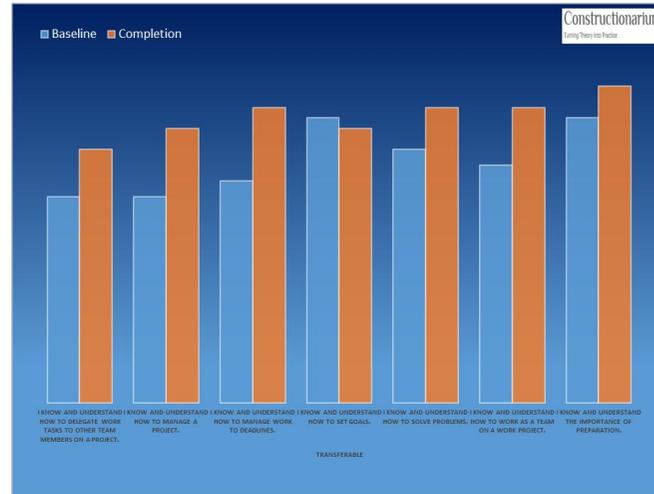
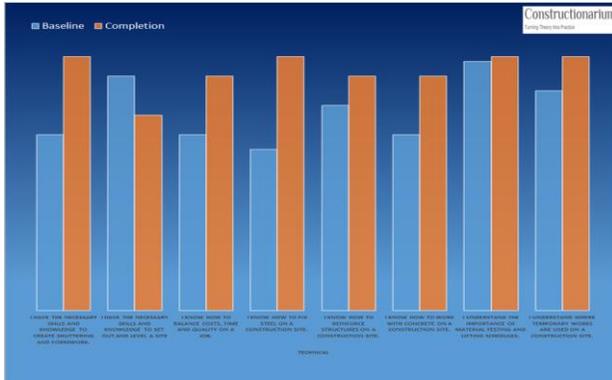
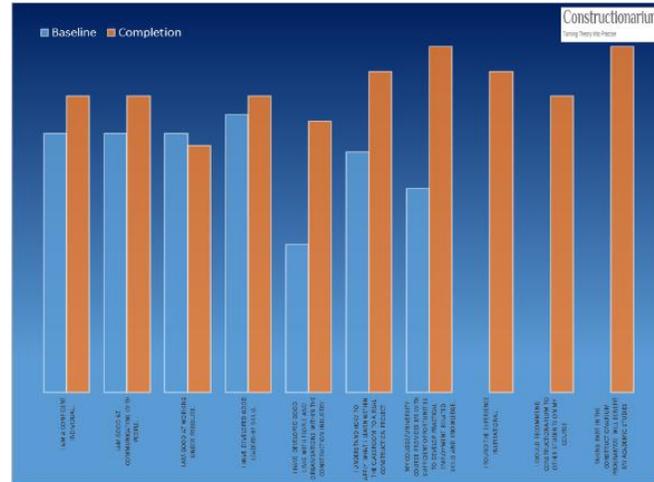
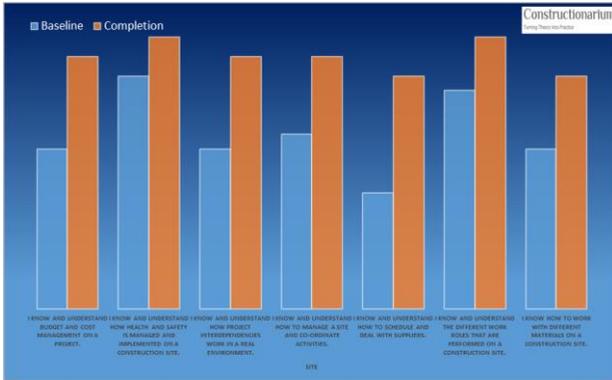
Abertay University



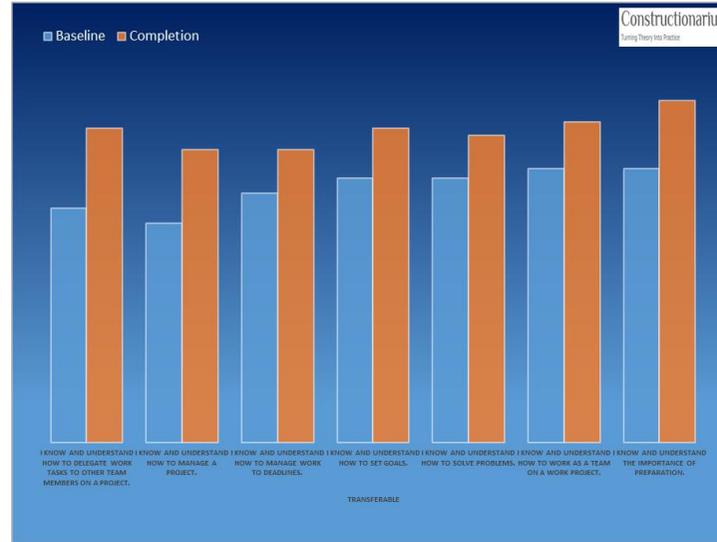
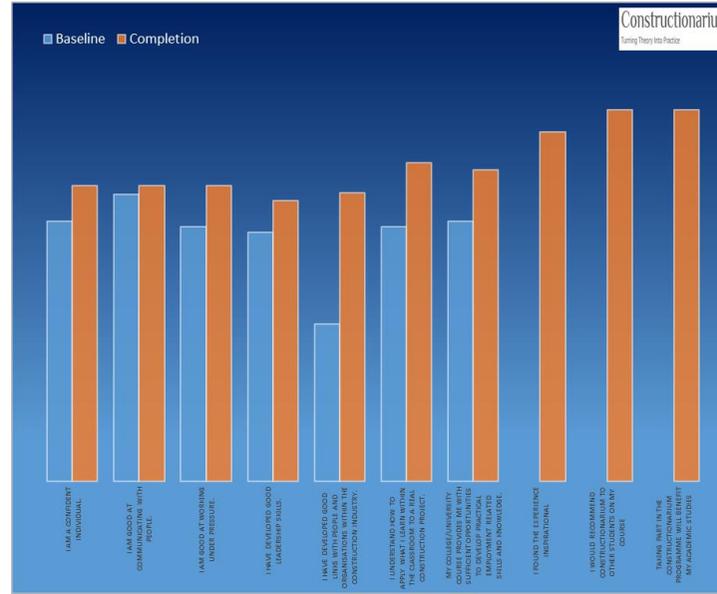
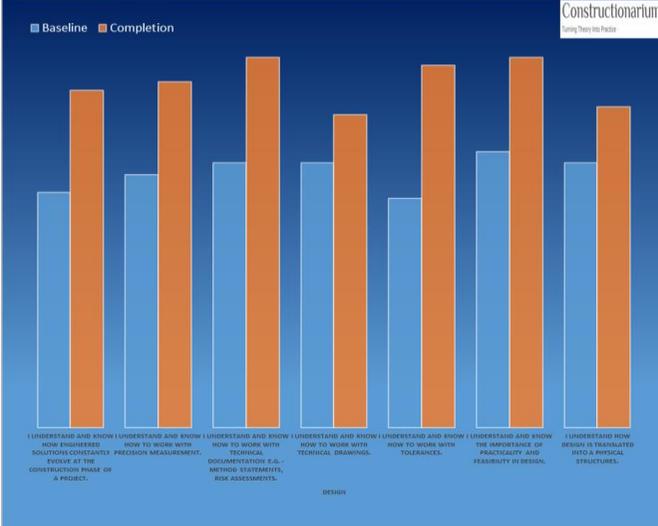
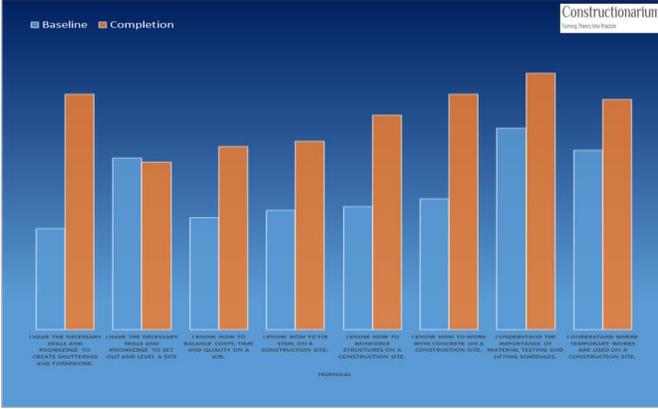
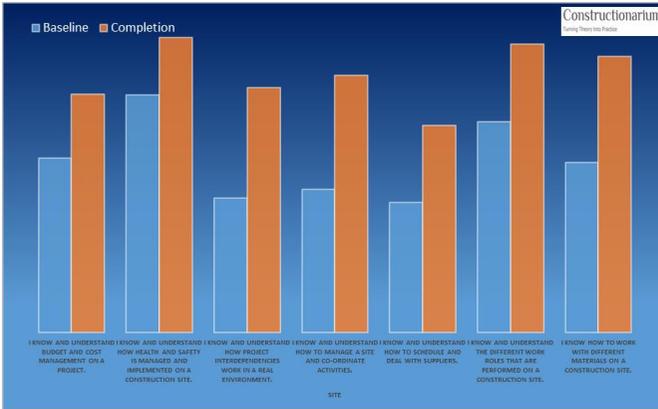
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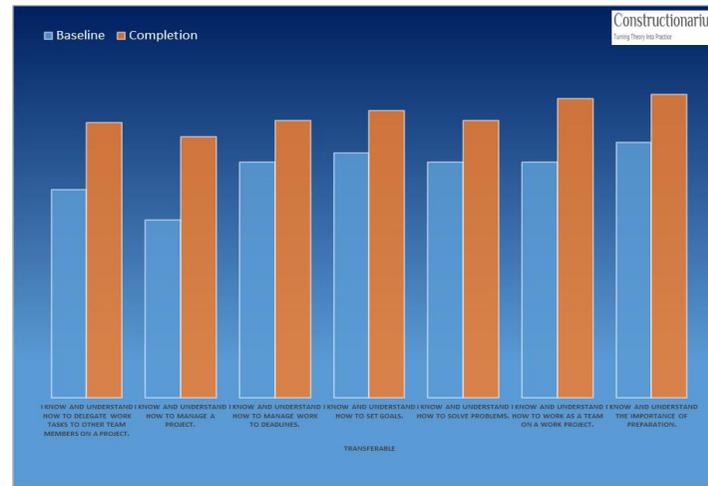
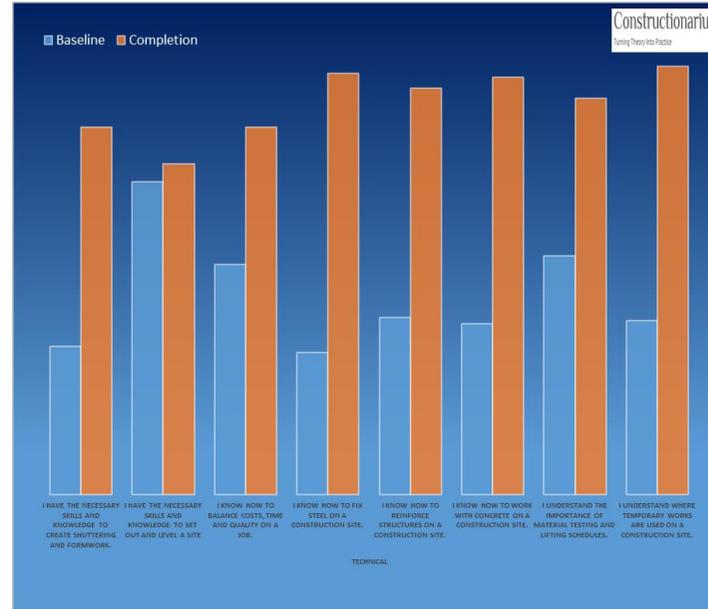
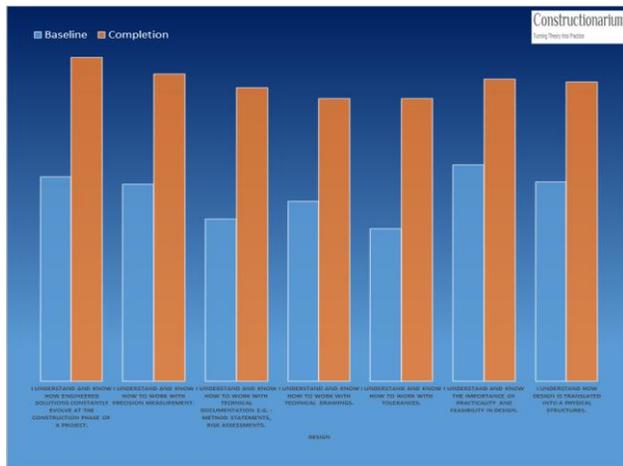
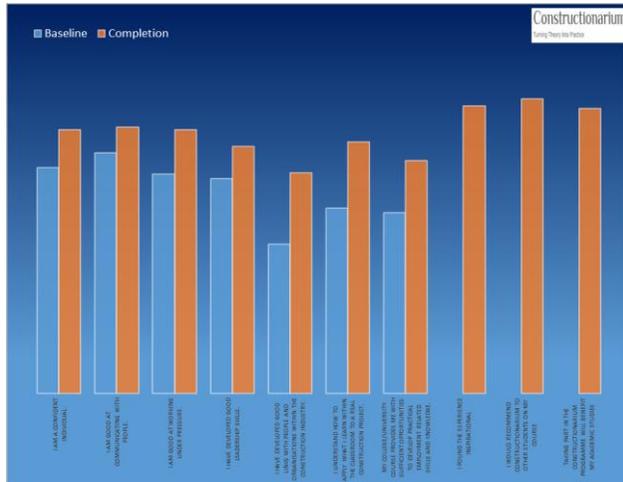
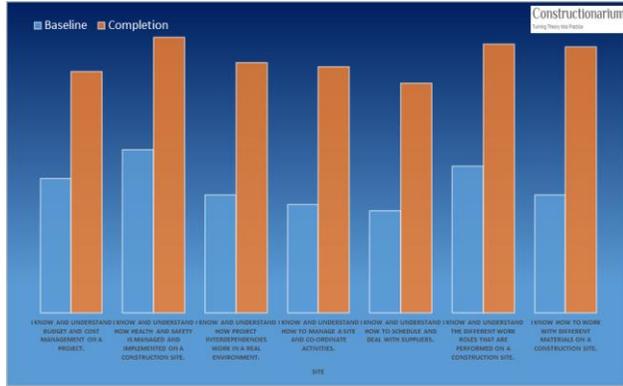


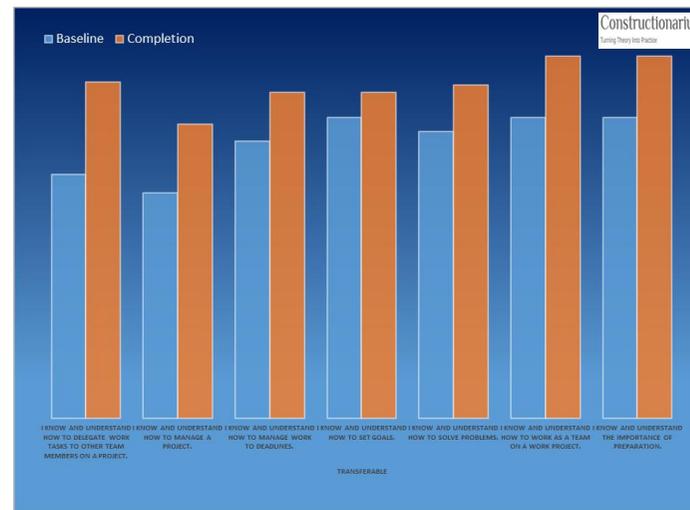
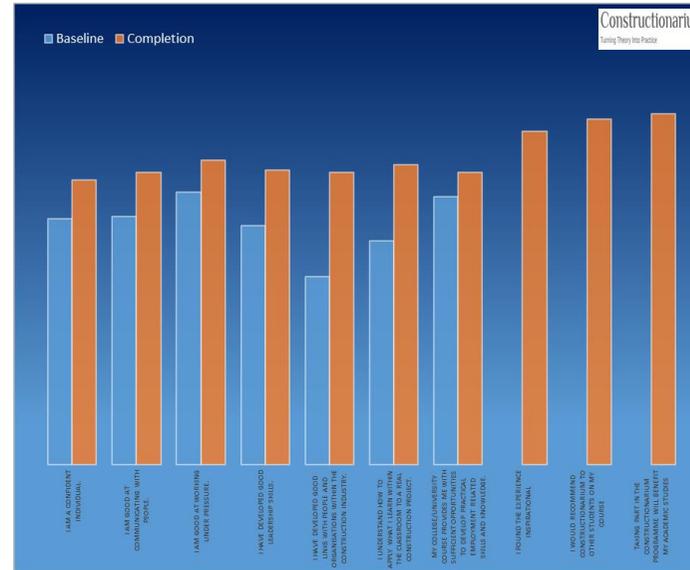
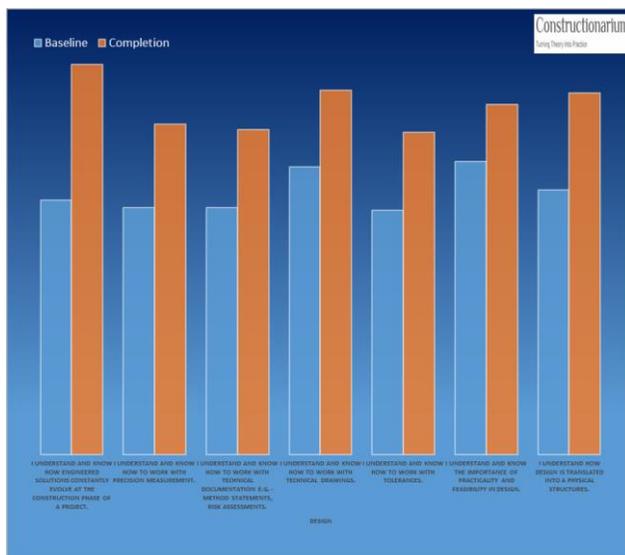
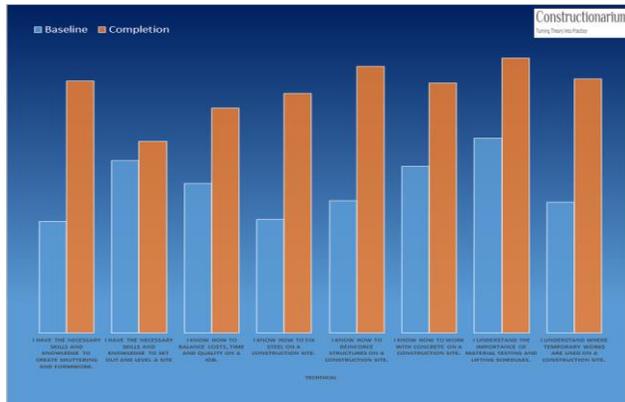
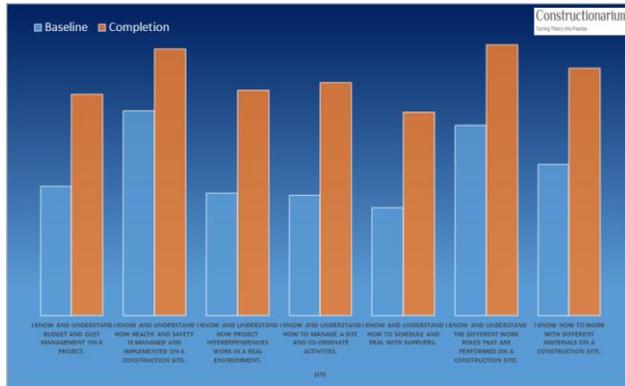
Dundee and Angus College

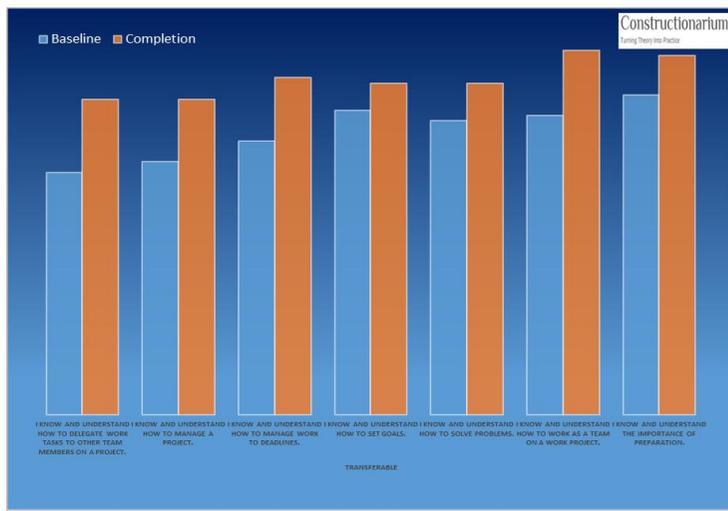
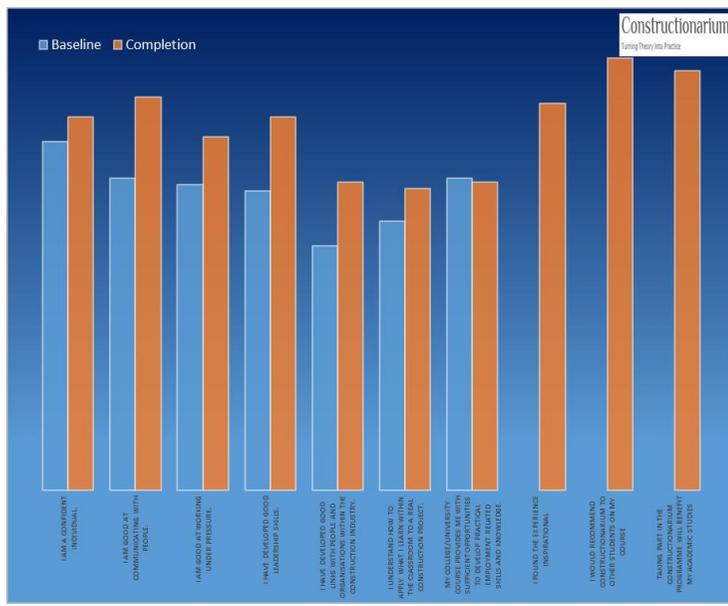
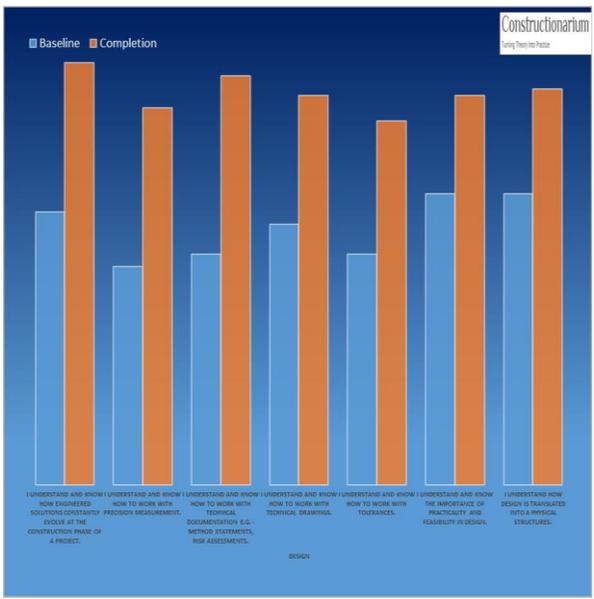
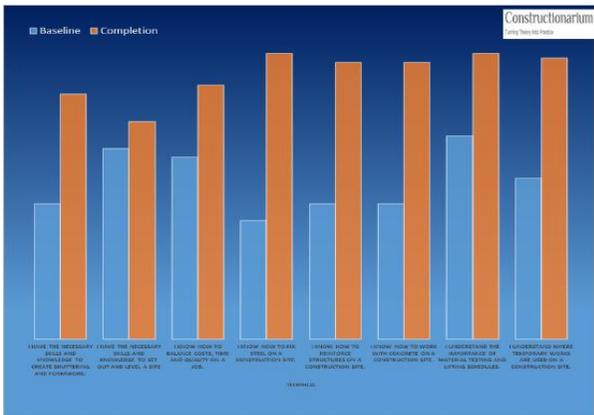
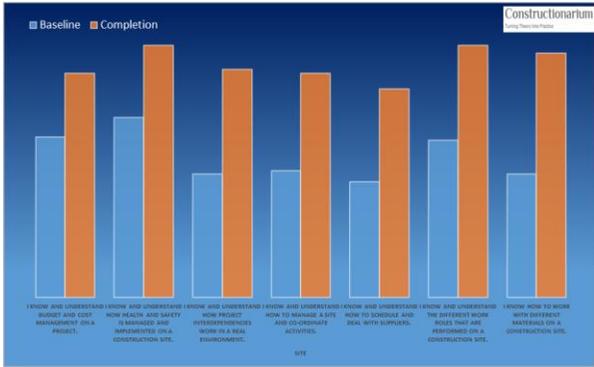


Glasgow Kelvin College









About 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.

For Further Information Contact Neil Ross, neil@integratisconsulting.com or call 07541853021