



ST AMBROSE BARLOW
RC HIGH SCHOOL



University of
Salford
MANCHESTER

Supporting the development and delivery of the Level 3 DEC! Learning Programme:

Enhancing the pathway to Higher Education
and employment through local HEI and
School partnership

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Foreword

“The Design Engineer Construct! (DEC) Learning Programme was created to give young people a clear insight into the work of professionals in the digital built environment.

For learners to thrive, they need inspirational teachers who can bring the outside world right into the classroom. When a child asks “when will I use this?” they need a real answer.

It is no surprise then, that excellence in teaching and strong leadership has given St Ambrose Barlow RC High School in Salford the reputation as one of the top DEC schools in the UK. St Ambrose regularly opens its doors to academia, industry and indeed other schools to showcase how ‘real-world’ experiential learning can harness the interest and excitement of young people, accelerating learning and increasing soft skills, especially in team-working, problem-solving and decision-making.



The mission of Class Of Your Own, and of the Design Engineer Construct! Learning Programme is to improve the skills and knowledge of teachers in Built Environment subjects, to engage young people in the full range of built environment career pathways and to develop enhanced school-employer partnerships. ***All in all, to deliver the best built environment education in the world.***

It is critical therefore to collaborate with world class universities, and I feel proud to work alongside the University of Salford where their pioneering research in the fields of BIM and construction sector efficiency and productivity is documented worldwide. Through the BIM4Education project, and as part of the UK BIM Academic Forum and the Centre for Digital Built Britain, we are collectively exploring paths to uncover the mutual benefit of schools, universities and employers working together to create and support a digitally enabled, agile, competent, and ultimately productive workforce. This includes my recent appointment of Visiting Senior Research Fellow in the Education & Learning Built Environment (ELBE) Research Group with the School of the Built Environment at the University of Salford.”

Alison Watson MBE

Chief Executive,
'Class of Your Own' Ltd

Introduction

The construction industry has traditionally suffered from a less than favourable professional and low tech image in comparison with other sectors. Furthermore, there is currently a lack of knowledge of opportunities, career paths, and progression routes together with negative perceptions of the construction industry amongst young people and their influencers, i.e. parents, teachers, career advisors, etc. This in turn, is impacting on the industry's ability to recruit and retain the right talent. The current drive for change and the digital transformation of the UK construction industry, following the UK Government's commitment through the Government Construction Strategy in May 2011, presents an excellent opportunity to positively influence the perception of the industry and address the current 'digital' skills gap by inspiring young people into an industry that significantly affects the everyday lives of society and contributes to the nation's economic growth.

Design Engineer Construct! (DEC) is an accredited Learning Programme for secondary-school age students and has been expertly developed to create and inspire the next generation of Built Environment professionals. Alison Watson, a former Land Surveyor, established the social business Class Of Your Own (COYO) in 2009, subsequently creating the accredited DEC Programme in 2012. Since then, ever-increasing numbers of schools across the UK, and further afield in States of Jersey and Dubai, have continued to provide DEC Learning Programmes.

The authors were commissioned to contribute to the 'BIM4Education' research project in Autumn 2016 with the overarching objective for the School of the Built Environment (SOBE) at the University of Salford to support and enhance the development and delivery of elements of the Level 3 Design Engineer Construct! Learning Programme in order to better structure the linkages between Level 3 and Higher Education and employment by:

1. providing direct training for DEC teachers in terms of addressing the relevant knowledge gaps in current Digital Construction/BIM and technical/professional aspects of design, engineering, and construction practice.
2. providing opportunities for better links with current practice in industry to support the shaping of the curriculum.
3. support the development of better pathway awareness for Level 3 students through to Higher Education and employment.
4. providing access to state-of-the-art developments in terms of the application of Digital Construction/BIM application and research targeted towards Level 3.

Scope of the report

This report outlines the key findings and benefits from this BIM4Education project, and the partnership between St. Ambrose Barlow RC High School, The University of Salford, and Class Of Your Own. The purpose of the report is to document evidence of the value for all contributors to the DEC curriculum, i.e. pupils, teaching staff, schools, and HE partners.

Intended readership

This report should be of value to all of those engaged in improving STEM education at secondary school level, and in developing the ‘pipeline’ of skills for the construction industry through positively influencing the perception of the industry and inspiring young people into the industry. The report provides a practical resource and effective guidance, which will be of particular interest for those engaging with the DEC curriculum, including teachers and head teachers; career advisors; parents; industry partners; and higher and further education providers.



Executive Summary

The DEC curriculum provides a project-based learning opportunity to children, young people and adult learners via a curriculum deliverable in schools and colleges. DEC has been recognised at RQF Level 1, 2 and 3 in England and States of Jersey, and SCQF Level 4 and 6 in Scotland. The DEC curriculum framework is designed to be supported by industry and/or academic parties, external to the school, who arrange with the provider to join classes periodically to engage with the pupils' learning.

This report serves to demonstrate the value of the engagement of industry and academia in school level education. There is evidential, replicable, measurable value to all parties, indicating a sustainable relationship that will support ongoing collaboration at no additional cost.

Strategies for Mutual Benefit

The partnership of a HEI and local school in enhancing the development and delivery of the Level 3 DEC Programme in this report can be understood to benefit all parties engaged. The project indicates that:

- relevant knowledge gaps in current Digital Construction/BIM and technical/professional aspects of the capital delivery and operation of built environment assets can be addressed by providing direct training for DEC teachers from leading academics in specific fields.
- the shaping of the curriculum can be further supported through opportunities for better links with current practice in industry and by providing access to state-of-the-art developments in terms of Digital Construction/BIM application and research.
- such a partnership supports the development of better pathway awareness for Level 3 students to progress to Higher Education with their local university. This enables students to enter Higher Education with a sound foundation of knowledge and understanding, which benefits both students and university programme teams, e.g. retention and progression.
- the engagement of university students can provide effective support and training for DEC pupils in schools and the DEC Programme, and thereby develop their own skills that are essential to their self-development and future careers.
- this provides university staff with a clear justification for engaging both themselves and their students with the DEC Programme.
- such a partnership can positively influence the misperception of the industry together with addressing the current 'digital' skills gap by inspiring young people into a professional career within an industry that significantly affects the everyday lives of society and contributes to the nation's economic growth.

Delivering the Level 3 DEC curriculum

Delivering the Level 3 DEC curriculum at St. Ambrose

Guest lecturers from the University of Salford were invited into St. Ambrose Barlow RC High School over an 18 month period to deliver five 60-90 minute sessions on various aspects of Digital Construction/BIM. St. Ambrose Barlow RC High School were pioneering the new Level 3 DEC curriculum and it was important that both students and teachers were supported on their knowledge of the latest developments in Digital Construction/BIM. The topics of the lectures were identified by the staff of St. Ambrose Barlow RC High School as areas within the Level 3 DEC curriculum that required enhanced knowledge and expertise. The University allocated the five topics to academics who were experts in each of the areas of Digital Construction/BIM so that the students and teachers received the most appropriate support. The sessions were delivered to classes of between 14 and 18 students, aged between 17-18 years old, in a standard school classroom with an interactive whiteboard at the front.

A teacher's perspective ...

“It was important for our school and sixth form to develop meaningful links with local universities. We have a strong pathways programme for industry, but we felt the students would benefit, and be inspired by, exposure to academia. The delivery of a new curriculum at Level 3 meant staff at St Ambrose needed support with the depth and breadth of knowledge in BIM. The support in planning and delivering lessons, through many conversations with University of Salford academics, meant valuable CPD for staff was obtained. As a result staff felt more confident of delivering a relevant and robust curriculum, where this enhanced knowledge was able to be cascaded to students. This process was not without challenge as it was often difficult in establishing what was appropriate to deliver to Level 3 students, as this was something that (to the best of our knowledge) had never been attempted before. Over the course of 18 months, students and teachers at St Ambrose were enriched by lectures delivered by University of Salford Academics on topics including; Financial Control and Costing, BIM for Facilities Management and Building Energy Performance. As well as the enhanced knowledge and expertise that the students received, it also gave them an insight and taster into how lectures in universities are delivered. Many of the students really engaged with the challenge and style of the lectures, whereas some found the length of the lectures, as well as the depth of knowledge and discussion, challenging. This insight meant that for all students the experience was valuable in helping them to plan their appropriate next steps into work, training or Higher Education. Three of the St Ambrose Barlow students who attended the guest lectures progressed to undergraduates with the School of the Built Environment at The University of Salford.”

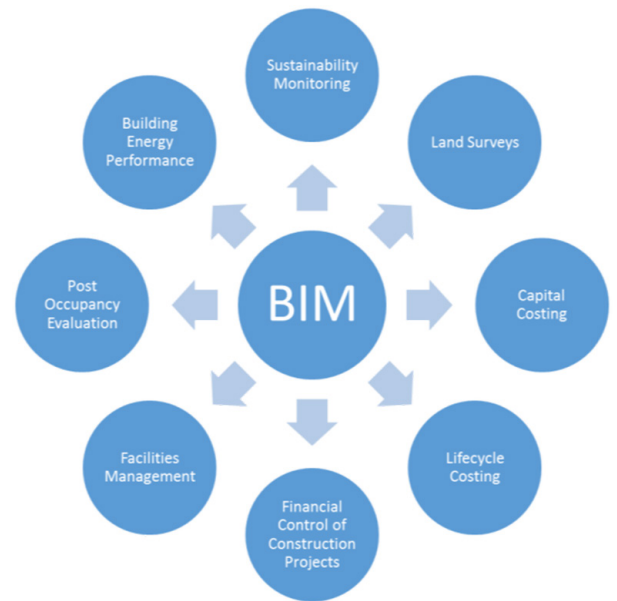
Activities undertaken

A number of teaching activities were undertaken at St. Ambrose Barlow RC High School that focused on a variety of key subject areas, whereby Digital Construction/BIM has a direct influence. Each of the sessions was developed by a leading academic from the University of Salford with expertise in the specific subject/topic area and St. Ambrose Barlow RC High School staff. The sessions were designed to be delivered initially by University of Salford academics and subsequent delivery by St. Ambrose Barlow RC High School staff; supported by co-delivery where required. Furthermore, each session was designed to be between 60 and 90 minutes following an agreed format, which was developed by both the University of Salford and St. Ambrose Barlow RC High School. The following elements, but with some flexibility, were used to develop the classes:

- /// Outline of learning objectives
- /// Short presentation of threshold concepts
- /// Activity designed around concepts
- /// Review of activity
- /// Plenary + (recap and introduction to higher level issues)

The figure above depicts the different subject areas that were addressed through the delivered sessions; aligned through the context of Digital Construction/BIM.

The table below details the learning objectives that were covered in each of these subject areas.



Subject	Learning Objectives
Sustainability Monitoring	<ul style="list-style-type: none"> ▪ Definition of sustainability – the triple bottom line ▪ Measurement of sustainability – environmental, BREEAM, Considerate Constructors, Community Measures, KPIs
Land Surveys	<ul style="list-style-type: none"> ▪ Site investigation and reporting ▪ Flood risk ▪ Water courses ▪ Ecology
Capital Costing Lifecycle Costing	<ul style="list-style-type: none"> ▪ Rates and models for building capital costs ▪ Definition of construction lifecycle ▪ Building lifecycle costs ▪ Operational costs ▪ Asset management
Financial Control of Construction Projects	<ul style="list-style-type: none"> ▪ Cost planning ▪ Cash flow ▪ Key issues of financial control
BIM for Facilities Management	<ul style="list-style-type: none"> ▪ Handover processes ▪ Definitions of Facilities Management ▪ BIM use for Facilities Management
Post Occupancy Evaluation	<ul style="list-style-type: none"> ▪ Models for Post Occupancy Evaluations ▪ Comfort and In Use Assessment Soft Landings
Models for Building Energy Performance	<ul style="list-style-type: none"> ▪ Understanding Energy Performance ▪ Building Models – SAP/SBEM/others ▪ Key elements of building models

Deliverables included a set of slide decks for each of the sessions and the supporting resources/ references, providing access to guest lectures, site visits and other events that are delivered to both undergraduate and postgraduate programmes. Academic staff were contactable for advice on material or content and the wider course material to provide validation and support.

In addition, university postgraduate research students were engaged in providing support and hands-on training to students in developing their project and competition work, i.e. BIM tools and technologies, and also in wider DEC workshops.



Students' reflection

Level 3 students' perspective ...

“Firstly the lectures that we had delivered to us in college were extremely useful, as it gave us a taster of what university life would be like if that was our chosen option. The things that the tutors went over in the lectures influenced our work in class, as they taught us things in more depth than we would usually get taught in college. I enjoyed each of these lectures delivered by Salford Uni as it broke it up from having normal lessons all of the time and broadened our knowledge of the built environment and other aspects.”

“In terms of the DEC course in college, I loved every minute of it! It’s a course like no other and there are so many career opportunities which stem from it. Throughout my 4 years of studying Design Engineer Construct I was involved in many different activities outside of school. I got into a work placement at Laing O’Rourke, I was involved in the Manchester airport Terminal 3 renovation project, I shadowed civil engineers for a week at TfGM Metrolink, and I even got to travel to Jersey to present DEC to a younger school which were taking on the course. Now I currently work at Renaker Build as a trainee construction manager, and without the DEC course at college and all of the experience and help I received throughout it, I would not be able to be doing what I am today.”



A student moving from Level 3 to Higher Education at the University of Salford.

“The guest lectures were more interesting than I anticipated as I thought I would get bored much quicker. I found the lifecycle costs lecture particularly useful and the lectures gave me a great insight into what lectures at university were like. The sessions were a great experience and I have learnt many new things I thought I knew about. Life at University of Salford is good and the lectures are a lot better than anticipated and I couldn’t be happier with my University choice.”

A postgraduate research student's perspective ...

“Dealing with level 3 students helped me to recap the very basics in architecture, engineering and construction domains, to enhance my understanding of the shifts in concepts like sustainability, collaboration, and digital technologies as they become essential aspects in reshaping the contemporary AEC industry.”

“As an academic, the involvement in the DEC Programme helped me to reflect on my theoretical knowledge in learning and teaching, and making sense of those theories within a real learning and teaching environment, where students were reflecting on their understanding of architecture and what they already know about building design and construction. Subsequently, they were able to explore new concepts and therefore, build up new sort of knowledge on top of their previous knowledge.”

“The students were encouraged to discuss the new concepts with each other as well as with us (academics and practitioners). In this case, our mission was to control the direction of the discussion, and provide clues and keywords and let them explore further using different search engines, so that they were able to build the knowledge themselves under our supervision/facilitation. Again, this was a real educational context that is linked to the current advances in pedagogical systems, where students are encouraged to be independent learners by getting benefit from the vast array of information and open resources that are available online.”

“Engaging with this program and dealing with young people was an advantageous opportunity for me to enhance my comprehension of their culture (as a new generation) and to realise their highly advanced digital literacies. In fact, those students represent a sample of my future audience, and I believe that understanding their culture will enable me to inspire new ideas and ways to develop student-centred teaching approaches that consider students' culture and tools and the diversity in student approach to learning.”

“Where the growing gap between academia and practice is becoming one of the main concerns of the current AEC industry, my role at the DEC Programme enabled me to be part of the action undertaken to bridge this gap by raising awareness to the importance of BIM and the other digital advances and sustainability that are significantly affecting the shape of the industry. This was enhanced by meeting other academics and practitioners and exchanging ideas and inspirations. Not to mention the inspirations from students, not only in terms of their culture and approach to learning, but in terms of the topic itself.”

Academic reflection

One of the primary roles of a university is to engage with young people in order to showcase the opportunities that are available to them by continuing their studies in the Higher Education sector. Furthermore, and specifically for Built Environment Higher Education in light of the current drive for change through digital transformation of the construction sector, there is the challenge to positively influence the misperceptions of the industry and address the current 'digital' skills gap by engaging at both the level of School and Further Education in order to inspire young people into the industry. Furthermore, in addition to the core technical skills, it is essential to also teach students the virtues of interpersonal skills in relation to communication, mentoring, and behaving in a professional and collaborative manner. Moreover, the University also has a responsibility to engage with their local community and encourage participation through the variety of events and activities their local University are involved in. Working with DEC enables many of these activities to be realised.

An academic's perspective ...

“The DEC Programme offers a unique opportunity for our school and the wider university to develop collaborative links and partnerships with high schools. Engagement with students at an early age, who have an interest in digital construction, can provide an early insight into routes to university, to help increase the stream of talent into built environment higher education, which may otherwise have gone elsewhere. Potential also exists to influence relevant high school curricula, connecting with real built environment projects, engaging and enthusing students and supporting educational excellence.”

University/School Strategic Level Engagements

DEC engagement hits academic requirements in the area of outreach. Linking work with DEC can be used as a measure to include in the Research Excellence Framework (REF) and Teaching Excellence Framework (TEF) submissions as examples of working with external parties. These are important KPIs for universities in relation to assessment in league tables and securing funding.

DEC also evidences direct engagement with potential applicants from schools within the local community wishing to study in Built Environment subjects. Working in this way helps staff in the School realise thoughts and interests of the local community.

Activities of this kind help with the promotion of STEM careers as part of the national construction industry and UK government targets for plugging the 'Skills Gap' UK STEM Education Landscape (2016) and Delivering STEM Skills for the Economy (2018).

Invests in the future of the students: upskilling of potential applicants, particularly in the concepts and practices of Digital Construction/BIM in the context of the digital transformation of the construction sector to deliver the Digital Built Britain strategy, prior to arriving at the University of their choice.

DEC engagement aligns to one of the University's and the School of the Built Environment's core strategic objectives and the wider remit of proactively facilitating the drive for change through the digital transformation of the UK construction industry, particularly in relation to the required upskilling of the industry to address the current digital skills gap by developing capacity and establishing wider adoption across the industry.



“The engagement between St Ambrose and the School of Built Environment is an essential part of understanding the pathways to the sector. The BIM4Education project provided the basis for the establishment of the Education and Learning in the Built Environment Research Group (ELBE). This built on learning from BIM4Education Project to better understand how the professional journey for the sector starts, moves through higher education and into work. BIM4Education was not only about providing support around technology education, but also represented a major opportunity to understand how these pathways are formed and what the drivers and barriers are for people entering the industry.”

Conclusions

This report presents evidence from an 18 month engagement between the University of Salford and St. Ambrose RC, a local secondary school, to enhance the development and delivery of elements of the Level 3 DEC Programme and to better structure the linkages between Level 3 and Higher Education and employment. It is hoped that sharing the experience and derived value through this report may encourage others around the UK to establish similar engagements and further facilitate inspiring young people into a professional career within an industry that significantly affects the everyday lives of society and contributes to the nation's economic growth.

The premise of the project was to demonstrate mutual benefit of the partnership of a HEI and local school in enhancing the development and delivery Level 3 DEC Programme; addressing the relevant knowledge gaps in current Digital Construction/BIM and technical/professional aspects of the capital delivery and operation of built environment assets. This was enabled by providing direct training for DEC teachers together and shaping of the curriculum by providing opportunities for better links with current practice in industry and providing access to state-of-the-art developments in research in Digital Construction/BIM applications.

In addition, such a partnership supports the development of better pathway awareness for Level 3 students to progress to Higher Education with their local university. In addition, this enables students to enter Higher Education with a sound foundation of knowledge and understanding, which benefits both students and university programme teams, e.g. retention and progression.

Furthermore, the engagement of university students can provide effective support and training for DEC pupils in schools and the DEC Programme, and thereby develop their own skills that are essential to their self-development and future careers. Therefore, this provides university staff with a clear justification for engaging both themselves and their students with the DEC Programme.

Take away thoughts

- There is mutual benefit of the partnership of HEIs and local schools through DEC engagement, which in turn, is essential in the drive for change through the digital transformation of the UK construction industry.
- Consideration of the pedagogy at Level 3 to align with the learning preferences of millennials, in contrast to the traditional methods, is important for enhancing engagement with the subject matter, and ultimately learning.
- The skills of academic teaching staff can be enhanced by teaching at Level 3 through engagement with DEC; teaching to a different level of audience requires academics to think differently about their teaching methods and delivery.
- The pathway for Level 3 students progressing to Higher Education with their local university is enhanced through the development of stronger links and engagement.
- The transfer of leading edge knowledge from university research, teaching, and enterprise activities through DEC engagement serves to enhance both DEC teachers and the curriculum. However, the transfer of this knowledge from academia to Level 3 curriculum does need consideration.