



'Build Your Own Digital Railway' Mentor Guide



Build Your Own Digital Railway

Student Design Brief

Have you ever been riding on a train and wondered, "What could I be doing with the time I'm sitting here?" Now is your chance to put those ideas into action. Your task, while working in a team of four, is to design a *Digital Railway* where you can carry out parts of your daily routine while you ride the train. You should be as creative as possible, but you must keep the following factors in mind while developing your railway:

Cost – How much will your team's railway cost the public to build?

Location – Where do you want your team's railway to run?

Health and Safety Concerns – Is your rail accessible to people with disabilities? Is it safe to ride for the general public?

Rail Traffic – How many people are going to ride your team's railway daily?

City Planning – Is your team's railway going to disrupt existing structures?

You and your team will have ten weeks to provide the following deliverables:

Proposal – An outline of your team's idea for the Digital Railway and how your team plans to design and construct it.

Concept Model – A semi-completed physical representation of your idea. This is your time to test things out and see how they look before finalizing the design.

Design Plans from Concept Model – A set of blueprints for your final structure.

Final Model – A scale model of your structure based on your final design. **Presentation** – A final report to show off your digital railway in action and how your team has collaborated effectively.

Two of you will be finishing this project to complete the requirements for an Engineering Design Level 2 qualification, while two will be attempting to complete the Creative iMedia Level 2 qualification requirements. The entire team will need to work as a unit, each member's strengths complementing another's weaknesses. **Collaboration** and proper **Data Management** is key to a successful *Digital Railway* project!



Welcome to the 'Build Your Own Digital Railway' program! As a Young Crossrail ambassador you will have the opportunity to work alongside students and teacher as a mentor in this exciting and engaging project. The overall goal of this project is to educate students on STEM fields and inspire them to pursue engineering career paths. Throughout this project students will be exposed to the engineering design process and BIM concepts in order to develop their own digital railway. Students will learn that collaboration and creativity is key when working on an engineering design project.

This handbook will serve as a guide throughout your mentorship and should be referred back to throughout the program. It includes a program overview, program rules, mentor role overview, and other support materials related to your role as a mentor.

Mentor participation in this program is invaluable to the students and this program. A good mentor should:

- ⇒ have strong understanding of STEM/engineering concepts and/or collaboration techniques
- ⇒ work in STEM-related/engineering field
- ⇒ show enthusiasm
- ⇒ have a working understanding of Building Information Modeling (specifically the collaborative, non-technical side of BIM)

Throughout this program you will be expected to meet with teams of four students to aid and advise them throughout their projects. Although it is not required for you to attend every weekly meeting, it is encouraged that you try to attend at least half. Students who participate in this program are attempting to receive one Cambridge Nationals qualification (Engineering Design Level 2, Creative iMedia Level 2) along with a possible vocational qualification in Employability Skills Level 2. Your attendance at meetings will help students work towards these qualifications, but more importantly they will gain a full understanding and appreciation of the engineering design process.

The mentor/mentee relationship is crucial during this program. Mentees will look to their mentors for personal and professional development. As a mentor it is important to remember that you are a supportive guide for the participating students. A mentee will expect active communication with their mentor. They will also expect their mentor to be knowledgeable in their career field. You will also be expected to serve as a resource hub for students.

Resources will be provided to you for your management and distribution. However, you are also welcome to provide additional resources that may help the students in their projects. Some challenges that may arise throughout your mentoring experience is



difficulty answering questions, behaviour management, and communication with your mentee team.

This mentoring experience is a great way to facilitate your own professional development. You will have the opportunity to share your engineering experiences with the students. Providing relatable and 'real world' stories increases student engagement and creates an open environment for the mentor and mentee to share stories, opinions, and questions. As you are sharing your experiences, you are helping to create a Crossrail legacy among the students. This program will require continuous interaction with your designated mentee team via email and group meetings. Mentoring will allow you to strengthen your communication skills as you work to serve as a leader and coach for your mentee team. Mentors will leave this program with increased feelings of self-efficacy and the ability to lead a cross-functional team. This will be a very rewarding experience as you aid the students in creating their own digital railways.



PROGRAM RULES

The 'Built Your Own Digital Railway' project educates students on the five Building Information Modeling (BIM) phases: Concept/Brief, Design, Construction, Handover and Commission, and Operate and Maintain. Learners are required to collaborate in small teams while they design and build their "digital railway." Learners can use this project to work towards the Cambridge Nationals qualifications: Engineering Design Level 1/2 and Creative iMedia Level 1/2, depending on which track they are on. The qualifications will deviate into two separate tracks (the Engineering Strand and the Creative Strand), allowing learners from both tracks to effectively collaborate over this twelve-week program. Teams will consist of four learners, two on the engineering track and two on the creative track. Learners will choose their strand and each will have designated roles and responsibilities within the team.

The intention of this project is to have learners understand how effective data management and evaluation and collaboration is pivotal to designing a safe, cost-effective, transport system. Over the course of the project, learners will be taught a range of skills that live within each of the units for the Engineering and Creative Strands. Learners will be offered review activities after each module that apply similar design and manufacturing concepts. At the same time, learners will be taught how

a media-focused approach can translate the concepts into visual presentations.

Learners will be able to work on the final project while carrying out the activities at the end of each module, as not to restrict the teams' design choices, but offer helpful guides to handle example design and visual project briefs. The program is split into five modules, one for each BIM concept, that may be taught for the recommended session times. Learners may also wish to attend two separate modules (0 and 00) that guides learners to assess a team's weaknesses and strengths, assess members' skills and attributes, and identify skills that will be needed for the project. By attending Module 0 and Module 00, learners can work towards receiving an employability skills qualification.

By the end of this program, learners from either the Engineering or Creative Strand must be able to present evidence of individual work and impact on the final project for the respective assessed units. Student deliverables are as follows:

- ⇒ Proposal
- ⇒ Concept Model (CAD or Physical)
- ⇒ Design Plans from Concept Model
- ⇒ Final Presentation
- ⇒ Final Model



Module Overview

Module 0	<ul style="list-style-type: none"> Learners must come together and execute team and individual evaluations. Learners will audit their own skills and personal attributes, obtain feedback in order to make a career choice, and identify own development needs for a chosen career.
Module 1	<ul style="list-style-type: none"> Students will create a design proposal to address their design criteria for their digital railways. Students will also develop a plan to delegate responsibilities amongst group members while maintaining a collaborative mindset.
Module 2	<ul style="list-style-type: none"> Students will use their design proposal to create a 3D model- using CAD or crafting materials- that incorporates multi-level information. Students should begin forming a preliminary budget and investigating which careers would be working on each aspect of the model
Module 3	<ul style="list-style-type: none"> Students will translate 3D models into a set of design drawings. Students in the engineering strand will critically analyze the logistics of their build plan and will proceed with the construction of their final model. Students in the creative strand should begin to layout the 'digital' aspects of the digital railway. All students will create a spreadsheet of the cost of their constructed model.
Module 4	<ul style="list-style-type: none"> Students will reflect on their construction and begin creating their final reports. Students in the engineering strand will critically analyze their models to evaluate its success. Students in the creative strand will begin to develop graphics for their final report. All students will assemble a detailed cost report of their model.
Module 5	<ul style="list-style-type: none"> Students will deliver a final presentation of their entire design process.
Module 00	<ul style="list-style-type: none"> Learners will take part in a post evaluation. They will reflect on their work and performance, establish if personal goals were achieved and reflect on how this experience might influence future job choices

MENTOR ROLE

Your role as a mentor is to act as a resource and guide for the learners participating in the 'Build Your Own Digital Railway' program. A good mentor will not take the lead on directing the project, but instead they will:

- ⇒ Listen and be patient
- ⇒ Provide non-judgmental support
- ⇒ Provide guidance and resources
- ⇒ Pass on knowledge and experience

Your goal as a mentor should be to enhance the learners project experience by sharing personal experiences and insights into engineering. Mentors should seek to create a welcoming atmosphere and environment where students can effectively collaborate on this project. Mentors should continuously inspire their mentee groups to perform to the best of their abilities.

Mentor Expectations

- ⇒ Set realistic goals and expectations for your team. Remember to encourage students to complete their work rather than demand.
- ⇒ Be mindful of how you are addressing and talking to the students.
- ⇒ Maintain a positive attitude when working with the students. Often times, the mentor's attitude is mimicked and reflected in a student's work. Students who observe an enthusiastic mentor will project that same attitude towards their work.

- ⇒ Respect the uniqueness of each student and be open to ideas even if they are obviously not feasible.
- ⇒ Ask guiding open-ended questions as oppose to giving students answers.
- ⇒ Be present. When you are with the team, show you are invested in their project.
- ⇒ Lead by example. Mentees will look to you as a role model.

Mentor Requirements

- ⇒ Mentor may need to agree to availability during a ten to twelve-week time period.
- ⇒ Mentor should expect to participate in face-to-face meetings with his or her team of [four] students one time per week in a one hour meeting over the course of ten to twelve weeks. If this is not feasible, it is recommended to meet once every two to three weeks to have a team catch-up.
- ⇒ School may ask for mentors to interview with teachers or higher authorities to prepare with student-mentor interactions.
- ⇒ Mentor should be available to correspond with students via email on a regular basis.
- ⇒ Mentor should understand how and why mentees have chosen this project to receive the qualifications. Mentor should familiarize themselves with the two separate strands that are offered (Engineering Strand + Creative Strand).

RELATIONSHIP DEVELOPMENT AND MAINTENANCE

The mentor-team relationship will develop over the time of the project. A mentor's first goal should be to make sure he or she is offering a welcoming environment for the students to work in. Once an effective relationship has been formed with the mentor and the team, a mentor is expected to maintain the welcoming environment by continuously supporting the team.

An effective mentor/mentee relationship is broken up into four phases as seen in the diagram below.

MENTOR CHALLENGES

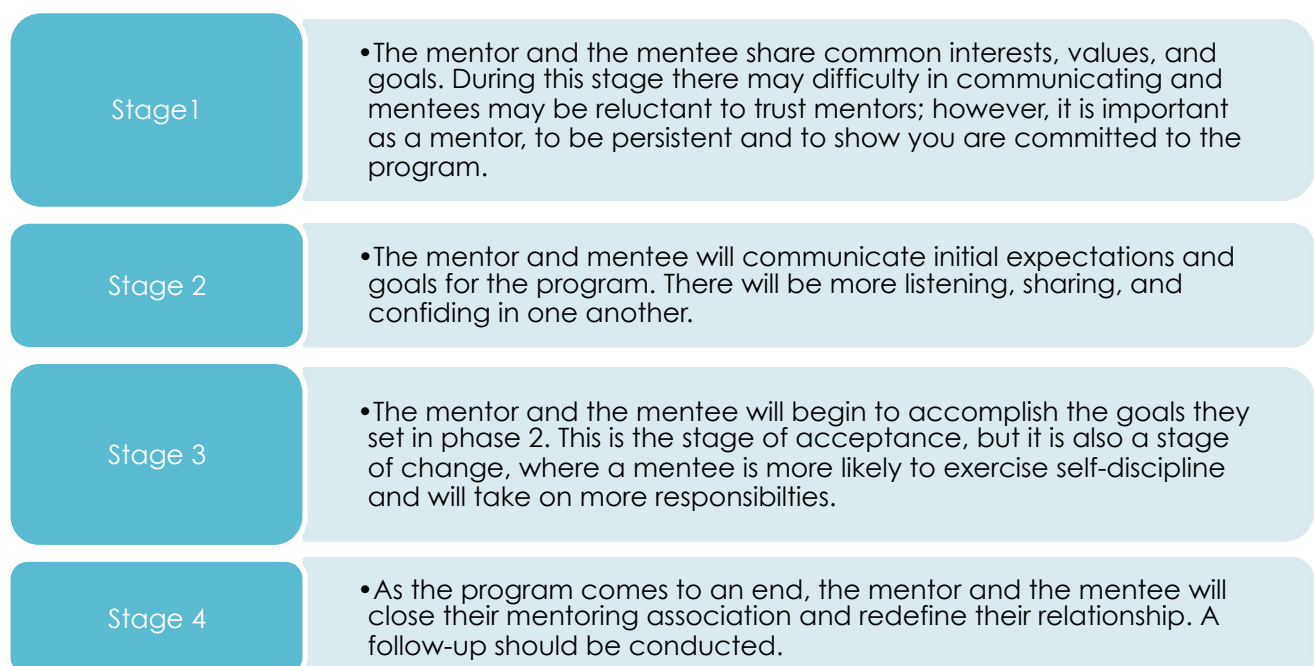
Difficult Questions

At some point during your mentor experience you may encounter a question that may be difficult to answer. If you are unsure of an answer you should not try to make up an answer. It is best to tell the students that you are unsure of the answer; however, you will do your best to research the question and find an answer. This shows students that you are willing to help them, while not risking giving false information.

Managing Behaviour

During your mentor experience there may be times when learners are not behaving properly. If you encounter a student who is not

The Mentoring Cycle



behaving properly it is best to remain calm and work with the student to find out why they are misbehaving. Never revert to physical punishment or abusive language. Talk with the student and explain why their behaviour is unacceptable and try to find ways that can better engage the student in the activities.

CLOSURE

Mentors should plan ahead to attend the team presentations at the end project where there will be a mentor-team sendoff. At this time it is important for the mentor to make one last point of contact with his/her mentee team. Discuss the team's achievements and give positive feedback. If you feel comfortable, you may offer yourself as a continual resource and may encourage your mentees to stay in contact with you via email.

MENTOR SUPPORT

Mentors will be recommended to record their observations over the time of the project and finish a final team/project reflection.