# Stage 5 iSTEM Project Based Learning Fire-Ed Up – Learning Sequence



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# Project-Based Learning: Fire-Ed Up

Project-based learning is an approach to teaching and learning that engages students in rich and authentic learning experiences. It is a transformative teaching practice that requires a commitment to innovation and contemporary pedagogies. In project-based learning environments, students gain knowledge and skills by investigating and responding to engaging questions, problems or challenges.

In this core topic, students develop and realise solutions to STEM focused project-based learning tasks. It requires students to utilise problem-solving strategies to apply appropriate design, production and evaluation skills to real-world problems. Teachers are encouraged to use project-based learning pedagogies to extend student-centred learning opportunities across a range of specialised topics. Teachers may choose to select problems which are relevant to local school contexts.

To complete this topic students should follow design thinking processes. Curriculum Secondary Learners have produced a sample [iSTEM engineering design process and engineering report guide](https://education.nsw.gov.au/teaching-and-learning/curriculum/department-approved-courses/istem#/asset4) to provide a scaffold that will engage students in their personal learning journey

## Fire-Ed Up

Welcome to Fire-Ed Up, a Stage 5 iSTEM unit of work designed to empower young Australians in bushfire resilience. In response to the devastating Black Summer fires and the findings of the Royal Commission, the Office of the Chief Scientist and Engineer has introduced the Bushfire STEM in Schools Initiative, known as Fire-Ed Up. This unit, aimed at Year 9 and 10 students, equips them with practical skills and knowledge to reduce bushfire risks and contribute to their communities' safety. The Black Summer fires of 2019-2020 had a profound impact, emphasising the need for education and preparedness. The Royal Commission highlighted community engagement and a skilled workforce as crucial in mitigating bushfire risks. Fire-Ed Up directly addresses these needs.

### Duration of learning

Indicative time – 10 weeks 25 hours.

### Aim

The aim of this unit is to provide students with opportunities to develop fluency in a general-purpose programming language and use these skills to solve problems related to bushfire and to automate repetitive tasks.

### Purpose and audience

This teaching resource is for teachers delivering or planning to deliver the course. The learning sequence demonstrates how a combination of outcomes can be used to develop teaching and learning activities. It also suggests a range of resources to support teachers when planning and/or teaching the course.

### When and how to use this document

Use this resource when designing learning activities that align with the course outcomes and content. The activities and resources can be used directly or may be adapted based on teacher judgment and knowledge of their students. The column for adjustments and registrations is intentionally left empty so that each class teacher can fill it in, considering the specific adjustments needed for their class based on the unique needs of their students. Teachers should complete the registrations, including any notes, on a weekly basis.

### Outcomes

A student:

* **ST5-1** designs and develops creative, innovative, and enterprising solutions to a wide range of STEM-based problems
* **ST5-2** demonstrates critical thinking, creativity, problem solving, entrepreneurship and engineering design skills and decision-making techniques in a range of STEM contexts
* **ST5-3** applies engineering design processes to address real-world STEM-based problems
* **ST5-4** works independently and collaboratively to produce practical solutions to real-world scenarios
* **ST5-5** analyses a range of contexts and applies STEM principles and processes
* **ST5-6** selects and safely uses a range of technologies in the development, evaluation, and presentation of solutions to STEM-based problems
* **ST5-7** selects and applies project management strategies when developing and evaluating STEM-based design solutions
* **ST5-8** uses a range of techniques and technologies, to communicate design solutions and technical information for a range of audiences
* **ST5-9** collects, organises, and interprets data sets, using appropriate mathematical and statistical methods to inform and evaluate design decisions
* **ST5-10** analyses and evaluates the impact of STEM on society and describes the scope and pathways into employment.

**All outcomes referred to in this unit come from Technology Mandatory Syllabus Year 7-8 Syllabus**

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### Weeks 1 and 2

Table 1 – Fire-Ed Up weeks 1 and 2 learning sequence

|  |  |  |  |
| --- | --- | --- | --- |
| Outcomes and content | Teaching and learning | Evidence of learning | Adjustments and registration |
| **Week 1 – Define and Traditional Aboriginal Technologies**  **ST5-3, ST5-5**  Students:   * examine traditional technologies used by Aboriginal and Torres Strait Islander peoples to solve problems * define problems or needs to gain understanding of requirements | **Teacher**   * introduces traditional techniques and perspectives used by Aboriginal and Torres Strait Islander peoples to manage bushfires * presents [Indigenous fire methods protect land before and after the Tathra fire (11:00)](https://youtu.be/RM72NtXxyLs) * shows [Cultural burning used for fire management on Walbanga Country | ABC (3:10)](https://www.youtube.com/watch?v=-meDcXoIhjE&t=3s) * show Traditional Knowledge – Cool Burning video <https://www.youtube.com/watch?v=YzuV5jsoqGY&t=2s> (2:26 minutes)   **Teacher and students**   * discuss some problems, past and present, that cultural burning solves.   **Overview of Fire-Ed Up**  Introduce the unit of work and the tasks to be completed – **Group work** - prototype design and pitch video, **Individual** – portfolio.  **Teacher**   * **distribute Fire-Ed Up –** [Student Resource Folio (SRF)](https://fire-edup.com.au/wp-content/uploads/2024/01/iSTEM-Fire-Ed-Up-Digital-Technologies-Student-Design-Portfolio.pdf) **to students** * distribute Fire-Ed Up [assessment task](https://fire-edup.com.au/wp-content/uploads/2024/01/Fire-Ed-Up-iSTEM-Assessment-Task.pdf) * **introduce the design situation, design brief and learning intentions page 2 SDF** * **introduce the Design Scenarios, page 3 SDF** | * Students can identify traditional techniques to manage the environment. * Students can describe cultural burning. * Students can describe the types of tasks that they are expected to complete as part of the Fire-Ed Up unit of work. * Student completion of assigned activities in the Student Design Folio (SDF). * Students can describe the tasks and learning intentions of the unit of work. * Students can explain the design situation. | (Add adjustments and registration) |
| **Defining**  **ST5-3, ST5-5, ST5-9**  Students:   * Utilise components of a design process * define problems or needs to gain understanding of requirements * collect and organise data in a range of formats * analyse data to inform decisions and draw conclusions, using a range of evaluation techniques. * work individually or collaboratively to apply an engineering design process to complete a practical, real-world project-based learning task * document design processes using engineering reports or design portfolio * select and apply appropriate research methods to solve contextualised STEM-based problems | **Teams**  **Teacher**   * introduce [Gardner’s Multiple Intelligences](https://fire-edup.com.au/wp-content/uploads/2016/02/Fire-Ed-Up-Multiple-Intelligences-Information-Guide.pdf) and associated learning styles and get students to complete [survey](https://fire-edup.com.au/wp-content/uploads/2016/02/Fire-Ed-Up-Multiple-Intelligences-Survey-Instrument.pdf) * utilise Gardner’s Multiple Intelligences results to assist students to select diverse teams * discusses ‘What makes a good team’ page 5 SDF * explains how to complete a basic skills audit * discusses role types for the Fire-Ed Up unit   **Students**   * complete Multiple Intelligences survey and discover their optimum learning styles * enter data into a table and create a basic bar graph of the data * use information from Gardner’s theory of Multiple Intelligences sheets provided to evaluate their own individual strengths and weaknesses * complete a skills audit page 5 SDF * organise themselves into teams based on skills audit and Gardner’s theory of Multiple Intelligences results, must have group members with different strengths * students select team roles and document in folio page 5 SDF   **Project Tasks**  Introduce the project task/assessment  **Teacher**   * introduce the three main project tasks and assessment, page 4 SDF * Engineering Design Portfolio * Pitch Video * Prototype   **iSTEM Engineering Design Process**  **Teacher**   * introduce the iSTEM engineering design process, provide a copy of the [A4 poster](https://education.nsw.gov.au/content/dam/main-education/teaching-and-learning/curriculum/elective-courses/media/documents/istem-s5-engineering-design-process.pdf) to each student and describe the basic components. The [iSTEM process guide](https://education.nsw.gov.au/content/dam/main-education/teaching-and-learning/curriculum/elective-courses/media/documents/istem-s5-engineering-design-process.docx) is available to support teachers | * Students complete survey to collect data, evaluate and analyse results to make informed decisions in team selections. * Students can enter data into a table and analyse results. * Students organise themselves into teams based on evaluation and analysis of data. * Students work individually and collaboratively to apply an engineering design process to complete a practical tasks related to the Fire-Ed Up design brief and scenarios. * Students can explain the requirements of the Fire-Ed Up assessment task. * Students can work effectively in teams to produce solutions to design problems. * Students can recall the different ‘cogs’ that make up the iSTEM Process. * Students can plan and manage the production of designed solutions using the iSTEM process. | (Add adjustments and registration) |
| **Defining**  **ST5-1, ST5-5, ST5-8, ST5-10**  Students:   * investigate organisations who produce innovative solutions and evaluate their processes * identify the types of STEM professions that would be required for the commercialisation of a design solution * document design processes using engineering reports or design portfolio | **Design a Brigade Patch**  Use page 6 of the SDF for this design exercise  **Teacher**   * describes the NSW rural fire service area commands and brigades * show [video](https://www.youtube.com/watch?v=tRwbYbF_Mvk) about volunteering for the NSW rural fire service   **Students**   * locate their [local area command](https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0015/13326/NSWRFS_AreaCommands_A3.pdf) and [local brigade](https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0003/170481/RFS_BrigadesList.pdf) * research typical patch designs used by fire authorities in Australia and internationally * sketch some patch designs and select a final design and document in portfolio, page 6 SDF | * Students can identify their local NSW rural fire service area command and their local brigade. * Students apply design processes in the development of a brigade patch. | (Add adjustments and registration) |
| **Week 2  Defining**  ST5-5  Students:   * investigate information communication technologies, tools, materials, and processes to produce a solution to an identified problem * evaluate the benefits of using information communication technologies to solve problems * investigate organisations who produce innovative solutions and evaluate their processes * define problems or needs to gain understanding of requirements * select and apply appropriate research methods to solve contextualised STEM-based problems * collect and organise data in a range of formats * document design processes using engineering reports or design portfolio | **NSW RFS Pocketbook**  Get students to download the App or demonstrate it to students.  **Teacher**   * demonstrate how the NSW rural fire service use the pocketbook to determine the FBI and fire rating for their area   **Extension**   * Asks a representative of the NSW RFS to visit the classroom.   **Students**   * Explore the different calculators available on the App including; * The Superseded McArther MkV forest Fire danger * The superseded grassland fire danger and * Current fire behaviour calculators   **Teacher and Students**   * evaluate the suitability of the pocketbook information system to get accurate fire ratings and fire behaviour index for their district. | * Students are able to input various variables into the App and get outputs. * Students can evaluate existing information systems used in fire management. * Students collect and enter data into the RFS Pocketbook App. * Students are able to determine the suitability of the use of the hardware (Phone) and software (App) to their local area. * Students are able to determine the suitability of the use of the hardware (Phone) and software (App) to meet the needs of different users. | (Add adjustments and registration) |
| **Defining and Identifying**  **ST5-2, ST5-3, ST5- 5**  Students:   * utilise components of a design process * define problems or needs to gain understanding of requirements * identify constraints and outline the scope for which the project will be confined * evaluate solutions * document design processes using engineering reports or design portfolio | **Fire-Ed Up Scenarios**  Use page 3 and pages 7 – 9 for this section.  **Teacher**   * describes the different Fire-Ed Up scenarios and show students where additional resources for each scenario are located on the [website](https://fire-edup.com.au/stage-5/)   **Students**   * evaluate each scenario providing pro’s and con’s for selecting, complete exercise on page 7 and 8 SDF * select the scenario for which they would like to solve and provide a justification on its selection, page 9 SDF * complete a PMI on their scenario selection, page 9 SDF   **Design brief statement**  **Teacher**   * describe ‘What is a design brief statement’, page 10 SDF * explain what traits a design brief statement should have * describe how to produce a design brief statement, page 10 SDF   **Students**   * complete the analysing the problem worksheet, page 11 SDF * list possible constraints that may on their chosen design solution, page 11 SDF * complete problem solving task, who, what and why, page 11 SDF   **Brainstorming**  **Teacher**   * demonstrates how to use the space, saturate and group method of brainstorming, page 12 SDF * direct students to complete brainstorming and design thinking activities to come up with a range of problems that could be solved for their chosen scenario, page 12 -17   **Students**   * brainstorm ideas for potential problems to be solved for their chosen scenario * complete a space, saturate and group brainstorming task, page 12 SDF * individually complete a design thinking task to further develop ideas, page 13 * as a group combine their collective ideas into 9 new ones and document them page 14 SDF * evaluate each idea, ranking them from 1 to 9 | * Students can evaluation design situations and make decisions based on analysis, evaluation and teamwork. * Students produce a clearly defined design brief statement. * Students select a Fire-Ed Up scenario suited to their teams skills and interest. * Students identify project constraints. * Students list the different constraints that their team might have in solving this problem. * Students identify who their problem is being solved for. * Students describe what they are going to solve. * Students explain why the problem needs to be solved. * Students can evaluate their ideas. * Students brainstorm many innovative design problems that could be solved for their chosen scenario. | (Add adjustments and registration) |
| **Defining**  **ST5-2, ST5-3, ST5- 5**  Students:   * design solutions, synthesise ideas, and plan * utilise components of a design process * define problems or needs to gain understanding of requirements * evaluate solutions * document design processes using engineering reports or design portfolio | **Synthesize**  **Students**   * as a team choose their top four ideas, providing pro’s and con’s for each design decision, pages 15 – 16 SDF * evaluate their four ideas and select a final problem for which they wish to solve * document their design problem based on their chosen scenario in their student design folio page 17   **Empathy Mapping**  **Teacher**   * show empathy mapping [video](https://www.youtube.com/watch?v=9HwpR3Njq00&t=4s) (2:51) * describe empathy mapping and explain how to create one, page 18 SDF * explain how to write a design brief statement based on the problem they have chosen to solve * provide examples of design brief statements related to the Fire-Ed Up unit, page 20 SDF   **Students**   * complete an empathy map for the problem that the team has chosen to solve, page 19 SDF * produce a design brief statement for their selected problem based on their chosen Fire-Ed Up unit scenario | * Students work independently and collaboratively to produce practical solutions to fire management-based problems. * Students demonstrates critical thinking, creativity, problem solving, in selecting a problem to be solved. * Students analyse data and evaluates ideas in order to make decisions. * Students to produce an empathy map for their chosen problem, outline what an individual or group might think, feel, say, and do in response to the given problem. | (Add adjustments and registration) |

### Week 3

Table 2 – Fire-Ed Up week 3 learning sequence

|  |  |  |  |
| --- | --- | --- | --- |
| Outcomes and content | Teaching and learning | Evidence of learning | Adjustments and registration |
| **Week 3 – Identify**  **ST5-2, ST5-3**  **Students:**   * utilise components of a design process * identify constraints and outline the scope for which the project will be confined * document design processes using engineering reports or design portfolio * design solutions, synthesise ideas, and plan | **Constraints**  Use pages 21-25 of the SDF for this section.  **Teacher**   * explain ‘what are design constraints’ * show [video](https://vimeo.com/742931303) from Dr Nick De Leon * show Power of creative constraints [video](https://www.youtube.com/watch?v=v5FL9VTBZzQ&t=19s) (5:09) * discuss why constraints are important * discuss the types of constraints that might be on a project like Fire-Ed Up * describe how to produce a quality mind map of constraints, page 22-23 SDF * discuss how to identify the criteria for success * explain the importance of project management   **Students**   * using the template on page 23 of the SDF as a guide produce a detailed mind map for the constraints of the Fire-Ed Up program * documents all the pertinent constraints on page 24 SDF * produce a list of criteria for success for the Fire-Ed Up brief * produce a list of materials, tools and equipment that students might require for their design solution * produce a Gannt Chart and a basic action plan | * Students develop criteria to evaluate design ideas, processes and solutions, the functionality, aesthetics, and a range of constraints. * Students define what are constraints. * Students mind map ideas on the different constraints for the brief * Students list a number of constraints for the complete of the Fire-Ed Up design task. * Students produce a list of criteria to assess the success of their design solutions. * Students produce a simple Gannt chart and action plan for the completion of the Fire-Ed Up design project. * Students can define and decompose real-world problems, taking into account functional requirements and a range of constraints. * Students produce a basic Gannt chart and action plan for the completion of their Fire-Ed Up design solution. | (Add adjustments and registration) |
| **Design**  **ST5-1, ST5-2, ST5-3**  **Students:**   * brainstorm and generate ideas * design solutions, synthesise ideas, and plan * develop and evaluate creative, innovative, and enterprising design ideas and solutions to a range of problems * document design processes using engineering reports or design portfolio * demonstrate ability to communicate design ideas using a range of drawing techniques as described in the STEM fundamentals core topic * identify and use a broad range of problem-solving strategies in the development of practical solutions to project-based learning tasks | **Design Thinking**  **Teacher**   * explain how design thinking works and define divergent and convergent thinking, page 27 SDF * show Anne Manning [video](https://www.youtube.com/watch?v=xjE2RV6IQzo&t=2s) (3:38) on divergent/convergent thinking * present [Convergent Thinking Versus Divergent Thinking](https://www.youtube.com/watch?v=cmBf1fBRXms) (1:51). Seek initial reactions from students to gauge understanding   **Teacher and Students**   * briefly compare both videos to see how they presented similar definitions in different ways * identify the importance of diverse ways of presenting information * complete the divergent / convergent thinking activity based on the work of Anne Manning page 24 SDF   **Brainstorming**  **Teacher**   * describe how to effectively brainstorm to come up with creative solutions to problems, page 28 SDF * explain the guidelines for effective brainstorming, page 28 SDF   **Students**   * brainstorm ideas by producing simple, annotated 3D thumbnail sketches, page 29 SDF | * Students demonstrate understanding of divergent and convergent thinking. * In their portfolio, students can identify resources they may need and possible constraints. * Students performing brainstorming following the standard rules. | (Add adjustments and registration) |
| **Design**  **ST5-1, ST5-2, ST5-3**  **Students:**   * brainstorm and generate ideas * design solutions, synthesise ideas, and plan * develop and evaluate creative, innovative, and enterprising design ideas and solutions to a range of problems * document design processes using engineering reports or design portfolio * demonstrate ability to communicate design ideas using a range of drawing techniques as described in the STEM fundamentals core topic * identify and use a broad range of problem-solving strategies in the development of practical solutions to project-based learning tasks | **Brainstorming**  **Teacher**   * **provide instruction on how to produce 3D sketches** * **show** [video](https://vimeo.com/735333409) **on drawing for design (16:18)** * **use video catalogue from the Splat 3D website to demonstrate how to produce 3D shapes** <https://www.youtube.com/c/splat3d> * **explain how to brainstorm by producing annotated thumbnail sketches**   **Student**   * brainstorm ideas by producing simple, annotated 3D thumbnail sketches, page 21 SDF   **Brainstorming**  **Teacher**   * demonstrate how to brainstorm using the Crazy 8’s process * to explain how to use an impact effort matrix, page 32 SDF   **Students**   * complete an individual Crazy 8’s brainstorming session, and discuss with group * complete a group Crazy 8’s brainstorming session * complete convergent thinking activity choosing six designs from the Crazy 8’s brainstorming session, page 31 SDF * evaluate their six ideas using the impact effort matrix page 26 SDF | * Students can design the user experience of a digital solution, generating, evaluating and communicating alternative ideas. * Students produce quality 3D sketches using a range of techniques. * **Students can evaluate how student solutions address defined functional requirements and constraints.** * Students produce a large number of annotated thumbnail sketches. * Students produce creative design solutions using Crazy 8’s brainstorming technique. * Students evaluate design solutions. * Students can explain the difference between divergent and convergent thinking. | (Add adjustments and registration) |

### Week 4

Table 3 – Fire-Ed Up week 4 learning sequence

|  |  |  |  |
| --- | --- | --- | --- |
| Outcomes and content | Teaching and learning | Evidence of learning | Adjustments and registration |
| **Design**  **ST5-1, ST5-2, ST5-3**  **Students:**   * brainstorm and generate ideas * design solutions, synthesise ideas, and plan * develop and evaluate creative, innovative, and enterprising design ideas and solutions to a range of problems * document design processes using engineering reports or design portfolio * demonstrate ability to communicate design ideas using a range of drawing techniques as described in the STEM fundamentals core topic * identify and use a broad range of problem-solving strategies in the development of practical solutions to project-based learning tasks | **Convergent design**  **Students**   * select two design ideas and document them on page 33 of the SDF   **Final design idea**   * select their final design idea and produce an annotated sketch on page 34 of the SDF * evaluate why this design solution is the best   **Designing**  Use pages 35-36 of the SDF for this section.  **Teacher**   * defines What is design? * explains What are design drawings? * demonstrates how to create an orthogonal drawing * show video on orthogonal sketches, <https://iteachstem.com.au/resources/143-orthogonal-drawing-fundamentals/>   **Students**   * produce an orthogonal sketch of one aspect of their final design idea, page 35 SDF.   **Teacher**   * explains how to produce an isometric pictorial drawing * show video on isometric sketches, <https://iteachstem.com.au/resources/142-pictorial-drawing-fundamentals/>   **Students**   * practice sketching small part of their design solution using an isometric sketch * produce an isometric sketch of their design solution, page 36 of the SDF | * Students can demonstrate convergent thinking techniques. * Students can define ‘design’ and explain what is the purpose of a design drawing. * Students can produce basic orthographic sketches. * Students can produce basic isometric sketches. | (Add adjustments and registration) |
| **Design**  **ST5-1, ST5-2, ST5-3**  **Students:**   * demonstrate ability to communicate design ideas using a range of drawing techniques as described in the STEM fundamentals core topic * design solutions, synthesise ideas, and plan * develop and evaluate creative, innovative, and enterprising design ideas and solutions to a range of problems * document design processes using engineering reports or design portfolio | **Design drawings**  Use pages 37-39 of the SDF for this section.  **Teacher**   * describes the difference between colouring and rendering * Show [video](https://vimeo.com/413405563) on how to produce high quality rendered 3D design drawings,   **Students**   * watch videos on how to render different shapes, see page 37 SDF for links * students produce multiple annotated pictorial sketches of different aspects of their design solutions, page 38 SDF * produce a final set of design drawings of their design solution, page 39 SDF | * Students can produce design solutions, generating, evaluating and communicating alternative ideas. * Students can produce rendered drawings of 3D objects, showing the effects of light and shade. * Students to produce a set of annotated and rendered design drawings suitable for construction into a prototype. | (Add adjustments and registration) |
| **Prototype**  **ST5-2, ST5-3**  **Students:**   * prototype design solutions * construct models and prototypes using a variety of media * work collaboratively to apply an engineering design process to complete a practical, real-world project-based learning task | **Prototype**  **Teacher**   * defines ‘Prototyping’ * describes the different types of prototypes, page 40 SDF * direct students to produce prototype solutions | * Students can describe different types of prototypes. | (Add adjustments and registration) |

### Weeks 5 and 6

Table 4 – Fire-Ed Up weeks 5 and 6 learning sequence

|  |  |  |  |
| --- | --- | --- | --- |
| Outcomes and content | Teaching and learning | Evidence of learning | Adjustments and registration |
| **Week 5 – Prototype**  ST5-3, ST5-4, ST5-5, ST5-6 Students:   * construct models and prototypes using a variety of media * utilise components of a design process * prototype design solutions * work collaboratively to apply an engineering design process to complete a practical, real-world project-based learning task | **Prototype construction**  **Teacher**   * assist students in the completion of their digital prototypes   **Students**   * working in teams students produce prototype Fire-Ed Up solutions using digital solutions and using coding | * Students have produced a basic prototype of their design idea based on their design documentation. * Students can manage projects by following a set design process. | (Add adjustments and registration) |
| **Week 6 – Prototype Testing**  ST5-3, ST5-4, ST5-5, ST5-6 Students:   * construct models and prototypes using a variety of media * utilise components of a design process * prototype design solutions * work collaboratively to apply an engineering design process to complete a practical, real-world project-based learning task | **Prototype testing**  **Teachers**   * **revise criteria for success and discuss how these will be tested** * **describe ways in which design solutions can be tested, page 41 of the SDF** * **Show** [video](https://vimeo.com/413403698) **of how to test a prototype**   **Students**   * **document their criteria for success, page 41 of the SDF** * **plan how they will test their prototypes** * **document the production of their prototypes, page 42 SDF** * **list the steps in producing their prototype design and describe how they overcome at least two problems, page 42 SDF** | * Students can manage projects by following a set design process. * Student document the production and any problems encountered during the prototyping phase. | (Add adjustments and registration) |

### Weeks 7 and 8

Table – Fire-Ed Up weeks 7 and 8 learning sequence

|  |  |  |  |
| --- | --- | --- | --- |
| Outcomes and content | Teaching and learning | Evidence of learning | Adjustments and registration |
| **Week 7 – Evaluation**  ST5-2, ST5-3, ST5-5, ST5-9  Students:   * utilise components of a design process * evaluate solutions * document design processes using engineering reports or design portfolio * analyse data to inform decisions and draw conclusions, using a range of evaluation techniques. * identify and use a broad range of problem-solving strategies in the development of practical solutions to project-based learning tasks | **Evaluation and Testing**  **Teachers**   * describe how to complete a PMI evaluation * explain how to evaluate using a SWOT analysis   **Student**   * complete further testing and modification of their prototypes * complete a PMI based on the result of one of the tests, page 43 of the SDF * evaluate their design solutions against the criteria to evaluate the success of their prototypes using the table on page 44 SDF * argue if their prototype has been successful based on the evaluation against the criteria for success set at the beginning of the process * complete a SWOT analysis of their prototype designs, page 45 of the SDF | * Students can complete evaluations of their design ideas using, PMI and SWOT. | (Add adjustments and registration) |
| **Iterate**  ST5-1, ST5-2, ST5-3, ST5-4, ST5-5, ST5- 9  Students:   * utilise components of a design process * iterate designs * develop and evaluate creative, innovative, and enterprising design ideas and solutions to a range of problems * demonstrate ability to communicate design ideas using a range of drawing techniques as described in the STEM fundamentals core topic * construct models and prototypes using a variety of media * identify and use a broad range of problem-solving strategies in the development of practical solutions to project-based learning tasks * work individually or collaboratively to apply an engineering design process to complete a practical, real-world project-based learning task | **Iteration**  **Teacher**   * explains iteration * describes how to use the ideas blitz, and describe the steps, page 47 SDF   **Students**   * document 4 possible improvements to their designs that they learnt from testing and evaluation, page 46 SDF * complete steps 1 and 2 of a design blitz to come up with improvements for design solution, page 48 SDF * complete step 3 of design blitz, page 49 SDF * complete step 4 of design blitz, page 50 SDF * complete step 5 of design blitz, page 51 SDF | * Students can manage projects by following a set design process. * Students can make modifications to prototypes based on the evaluation of results from testing. * Students can apply findings from testing and evaluation to improve design solutions. | (Add adjustments and registration) |
| **Week 8 - Iterate**  ST5-1, ST5-2, ST5-3, ST5-4, ST5-5, ST5- 9  Students:   * utilise components of a design process * iterate designs * develop and evaluate creative, innovative, and enterprising design ideas and solutions to a range of problems * demonstrate ability to communicate design ideas using a range of drawing techniques as described in the STEM fundamentals core topic * document design processes using engineering reports or design portfolio * construct models and prototypes using a variety of media * identify and use a broad range of problem-solving strategies in the development of practical solutions to project-based learning tasks * work individually or collaboratively to apply an engineering design process to complete a practical, real-world project-based learning task | **Iteration**  **Teacher**   * assist students in the iteration of their prototypes using a range of materials and tools   **Students**   * produce design drawings of possible improvements to the prototype, page 52 SDF * produce orthographic sketches of design improvements, page 53 SDF * produce isometric sketches of design improvements, pages 54 and 55 SDF * based on the results of the testing and evaluation make modifications to their prototype designs * produce final design drawing for improvements to their Fire-Ed Up design solutions, page 56 SDF * students to make modifications to their Fire-Ed Up prototype design | * Students utilise different components of a design process to address real-world STEM-based problems related to bushfire management. * Students can apply findings from testing and evaluation to improve design solutions. * Students can document design projects using graphical techniques. * Students can make modifications to prototypes based on the evaluation of results from testing. | (Add adjustments and registration) |

### Weeks 9 and 10

Table – Fire-Ed Up weeks 9-10 learning sequence

|  |  |  |  |
| --- | --- | --- | --- |
| Outcomes and content | Teaching and learning | Evidence of learning | Adjustments and registration |
| **Week 9 – Communicate**  **ST5-8**  Students:   * effectively communicate solutions to problems using relevant information communication technologies * apply high level communication skills to pitch solutions to a range of different audiences * communicate and share solutions * use technologies to communicate design solutions | **Communications**  **Teacher**   * **discuss how to effectively display the final design solution/prototype design using graphical techniques, page 57 SDF** * **explains how to produce a quality product pitch** * **describes what should be in a pitch deck, page 59 SDF** * briefly describe the typical structure of a pitch, page 59 SDF * present examples of entrepreneurs and engineers pitching or demonstrating their design ideas, page 59 SDF   **Students**   * use a variety of technologies to communicate design solutions * produce a graphical/pictorial representation of the final design solution, page 58 SDF * produce a story board for their design pitch and pitch deck, page 60 SDF * create a pitch deck to be used for their pitch video * create a 5 minute pitch video based on the assessment criteria in the marking guideline matrix. | * Students produce a pictorial representation of the final design solution. * Students can articulate the role of a pitch to communicate a design solution. * Students produce a pitch deck. * Students produce a pitch that communicates their design solution properties and effectiveness. | (Add adjustments and registration) |
| **Week 10 – Communicate**  **ST5-8**  Students:   * communicate solutions to problems through information communication technologies. | **Teacher**   * review the creation of a design pitch   **Students**   * continue to create their design pitch video. | * Students can articulate the role of a pitch to communicate a design solution. * Students produce a pitch that communicates their design solution. | (Add adjustments and registration) |
| **Careers**  **ST5-4, ST5-5, ST5-6**  Students:   * investigate the nature of work and pathways into STEM careers * investigate a range of external STEM initiatives, gaining skills, knowledge, and understanding of authentic, real-world problem-solving opportunities | **Teacher**   * present different career opportunities that students may consider in the fire management industry * discuss the types of industries that support bushfire protection, management and support, page 62 SDF   Students   * brainstorm all the types of organisations that are involved in bushfire protection, management and support and the different types of roles within these organisations, pages 62 -63 SDF * research different course and training opportunities that are available in these organisations, pages 62 -63 SDF   **Extension**   * invite RFS volunteers to visit the classroom to discus fire management careers and pathways | * Students can identify STEM careers related to the fire management industry. * Students undergo self-reflection in relation to a career they would like to possibly pursue and can describe pathways to different STEM careers. | (Add adjustments and registration) |