BANYULE NILLUMBIK & WHITTLESEA

TECH SCHOOLS

Steampunk Gears & Cogs Design Challenge

collaboratively
creating
the future

TEACHER BOOKLET

BANYULE NILLUMBIK TECH SCHOOL

WHITTLESEA TECH SCHOOL

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ACKNOWLEDGMENTS
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IMPORTANT INFORMATION

ACCESS TO SWAY
The Steampunk Sway web link can be accessed by typing the address below into the address bar in your browser. Sway is an online presentation tool; the Steampunk Sway contains instructions for program activities that are explained in a step by step fashion. It contains everything you and your students will need in order to successfully complete the program.

Link: bit.ly/steampunk-outreach

NOTE: This Sway is only accessible to those with the link provided above.
Please share the Sway link with your students.

FURTHER SUPPORT
Contact the Tech School if you would like to organise a skill up session to support prototyping, or if you would like any recommendations on how the curriculum content and recommended activities could be modified for longer or shorter sessions, or if you are unable to access the resources provided and need clarification/alternative access methods. If you would like to take part in any of our Pilot programs or Professional Development events let us know. For any support in implementing this program, please contact your Tech School via the following email:
banyulenillumbikTS@melbournepolytechnic.edu.au
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CONTENTS

Welcome! This Teacher Booklet is divided into 4 Sections. **Section 1 - General Overview** - presents a summary of the Banyule Nillumbik and Whittlesea Tech Schools Nillumbik Tech School background, curriculum, pedagogies and programs. Before beginning delivery to students, it is recommended that teachers read carefully through **Section 2 - About This Program** - which outlines teacher information specifically related to the program presented in this booklet, and familiarise themselves with **Section 3 - Program Content** - that outlines the curriculum content and recommended learning sequence. Reading Section 3 alongside the **Sway presentation** (link on inside front cover) is necessary in order to understand the activities in each stage of the Innovation Process. **Section 4 - Appendix** - presents worksheets, worked examples, templates, and the Victorian Curriculum mapped against General Capabilities and STEAM areas.

1 GENERAL OVERVIEW


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BANYULE NILLUMBIK & WHITTLESEA TECH SCHOOLS - OVERVIEW

The Banyule Nillumbik and Whittlesea Tech Schools are a part of the Victorian Government's commitment to equip Victoria's young people with quality skills that industry needs and the knowledge to build careers and create jobs. The aim of Tech Schools is to develop and run specialist STEM programs and activities that help prepare local students for the changing nature of work. Tech Schools are not schools in the traditional sense, but high-tech learning centres. The Government has invested $128 million to establish 10 Tech Schools across the state in 2017 and 2018.

Located at Melbourne Polytechnic's Greensborough and Epping campus, the Banyule Nillumbik and Whittlesea Tech Schools connect education, industry and community with Science, Arts, Maths, Technology and Engineering, to drive innovation in Melbourne's North. Students from independent, Catholic and government partner schools, including special development schools, have access to the Tech Schools throughout the year. Innovative educational programs developed in collaboration with industry, community and education, including teachers and students, will nurture design thinking processes and develop key capabilities for work and life in the 21st Century.

The co-construction of Tech Schools' programs is one of the key elements of professional development for teachers, positioning Tech Schools as learning incubators and enabling learning approaches and programs to be implemented in partner school settings. In addition, Tech Schools facilitate formal professional learning for teachers.

VISION AND VALUES

The vision for the Banyule Nillumbik and Whittlesea Tech Schools is to be centres of technological innovation that build the aspiration and confidence of students to engage in a future world of work, with the skills and capacities to successfully operate as global citizens. The Banyule Nillumbik and Whittlesea Tech Schools are creative hubs that inspire young people to be the innovators and entrepreneurs of now and tomorrow.

RATIONALE

We are entering an era of monumental change. In an increasingly automated, globalised and interconnected world people will need a wide range of knowledge and skills to keep up with the rapidly changing landscape of work.

Opportunities are constantly springing up in new fields, requiring not only people with high levels of education and training, but also people who can apply their knowledge to creatively solve problems and create new knowledge. Many of these jobs go unfilled for the lack of applicants with the skills employers are looking for. While unskilled work has long been in decline, many routine white collar jobs requiring high levels of literacy and numeracy have been, or are in the process of becoming, automated and computerised. Whole categories of employment are disappearing, and not just jobs formerly undertaken by the uneducated and unskilled, but increasingly jobs traditionally filled by college graduates [1].

It is estimated that 75% of all future jobs will require STEM skills, whilst 90% of jobs will need digital skills in the next 2 to 5 years [2]. The Institute For the Future (IFTF) has forecast that 85% of jobs that will exist in 2030 have not yet been invented [3]. The New Work Order Report by the Foundation for Young Australians has declared that preparing young people for the new future of work is an issue of national importance[4]. Knowledge and skills in STEM related fields include collaboration, communication, problem solving and creative thinking. These skills will be required to succeed in future workforce.

INDUSTRY FOCUS

The Future Industry Focus [5] provides an opportunity to connect the learning of the Banyule Nillumbik and Whittlesea Tech Schools with identified future industries set to expand in the north of Melbourne. This ensures that the focus of the learning is authentic and targeted towards growth economies with STEM connections.

These foci were identified based upon research and evidence informed by growth industries specific to the region. They represent industries where future directions for state wide industry trends exist and where the provision of training and education opportunities can provide support, stimulus and sustainability in these fields.

The industry focus of the Banyule Nillumbik and Whittlesea Tech Schools has been determined to be:

- Health and Social Assistance
- Entrepreneurship
- Scientific and Technical Services
- Food and Fibre
- Advanced Manufacturing

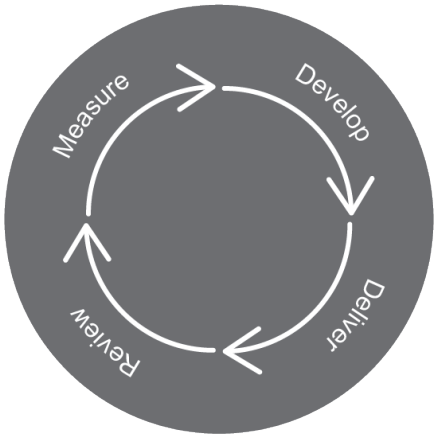
1 Fullan, M., Quinn, J., McEachen, J. (2017). *Deep learning: Engage the world change the world.* Corwin Press.
2 https://www.chiefscientist.gov.au/wp-content/uploads/DAE_OCS-Australias-STEM-Workforce_FINAL-REPORT.pdf
3 https://www.delltechnologies.com/content/dam/delltechnologies/assets/perspectives/2030/pdf/Realizing-2030-A-Divided-Vision-of-the-Future-Summary.pdf
4 http://www.fya.org.au/wp-content/uploads/2015/08/fya-future-of-work-report-final-lr.pdf
5 http://www.business.vic.gov.au/support-for-your-business/future-industries

CURRICULUM DESIGN

The Banyule Nillumbik and Whittlesea Tech School curriculum is developed in significant collaboration and co-design with a range of stakeholders. Learning is co-created with partner school students and educators, community groups, local council and industry. Our programs are developed using innovation processes, informed by the Tech School's learning program design framework, and involve extensive program prototyping.

Teacher Ambassadors are central to the curriculum design process and are consulted throughout program development, delivery and review. Teacher Ambassadors serve as a link for building capacity in partner schools, and in adopting an innovation mindset and design thinking tools for future curriculum development and delivery.

The Tech School is not a registered school and the curriculum lives in partnership with partner schools. The Tech School does not enroll students; teachers accompany students from their base school and retain duty of care. Where possible, the Tech School will provide advice and guidance regarding curriculum outcomes specific to each program, however, assessment and reporting on student progress remains with the partner school.



All aspects of the design of curriculum and delivery will be underpinned by the Collaborative Program Cycle: Measure/Develop/Deliver/Review

DESIGN PRINCIPLES AND CONTEXT

All programs are designed within a program based approach with STEAM skills enacted through design thinking processes. Learning programs will scaffold the development of STEAM concepts and learning dispositions beside an industry focus with a particular emphasis on scientific program. The model is premised on three parts of delivery. Part one: work undertaken in the partner school before visiting the Tech School; part two: encompasses the Tech School visit; part three: involves the completion of the program back in the partner school.

The Arts component is featured across the learning experience, with Performing Arts, Media Arts, Visual, Music and Visual Communication Design as an expressive and creative partner to STEM based learning. Applications of a range of technologies are embedded throughout the programs; these act as a catalyst, enabler and accelerator of learning.

The development of an 'innovation mindset' though industry led challenges and problem solving provides the learning base for the development of competences, capabilities and skills of the future. Learning is active, authentic and applied, as students work through the Tech School Innovation Process to create products of value. The following core design principles underpin the organisational structure of the Tech School programs:

- Program based with STEM (and STEAM) connections
- Multi age/multi stage
- Cross school/cross sector
- Builds capacity
- Influences and advocates
- Develops an innovation mindset
- Co-constructed: industry - education - community
- Applied and authentic learning

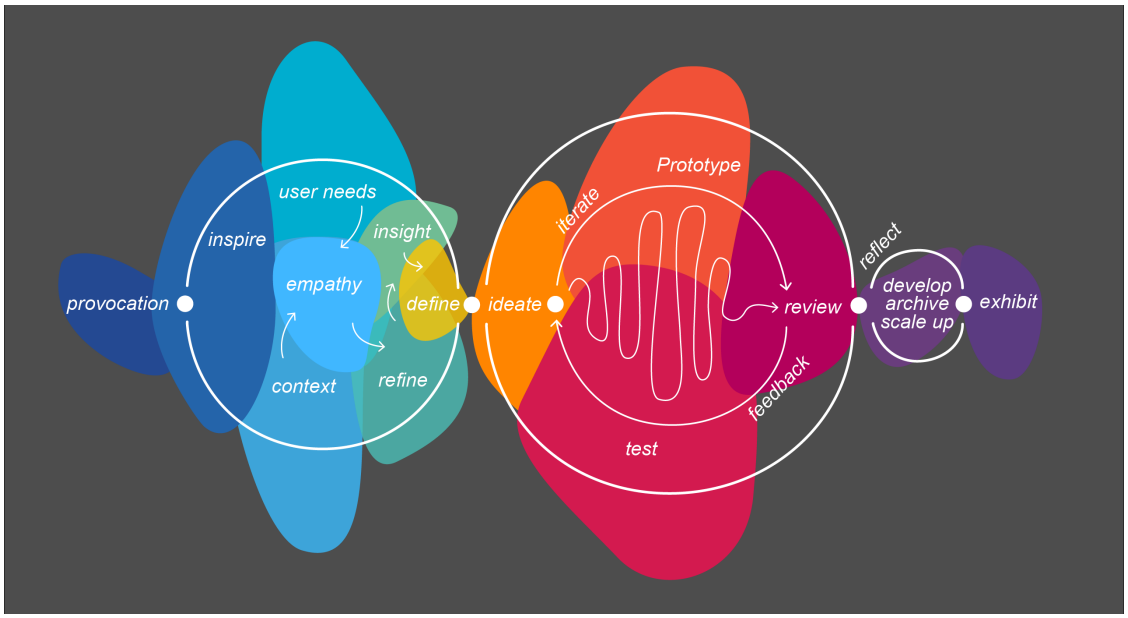
The Tech School curriculum changes in focus bi-annually over the course of the school year to match the program focus. This provides multiple entry points for schools to engage in, maximises the opportunity to 'mesh' with school curriculum and to build focused industry partnerships. With this focus, student work and industry innovation will be exhibited, privileging the learning process alongside the product and providing a multiple perspective approach to a theme.

BANYULE NILLUMBIK AND WHITTLESEA TECH SCHOOLS INNOVATION PROCESS

The Tech School pedagogical approach is informed by a range of learning models and theories. Learning is practical and applied, using program and project-based learning principles, specifically employing constructivist and constructionist strategies. All student learning transitions through the Tech School Innovation Process based on two key constructs, the Design Thinking framework and the SOLO Taxonomy. Design Thinking is a human-centred process that enables solutions to be formulated based on the needs of the client or user. SOLO Taxonomy provides a scaffold to articulate the development of understanding, or the movement from surface to deep learning.

The Tech School Innovation Process presents a holistic approach that underpins all our learning programs; the process itself is as important as the product. Working through this process enables students to have a deeper understanding of the problem and its context before they begin to create solutions. Students are encouraged to understand the entirety of a problem, as the challenge they are faced with might be a symptom of a greater problem or be simpler or more complex than it appears.

The first half of the process - Provocation to Define (see diagram below) - centres around gaining a deeper understanding of the issues at hand and around defining aspects students would like to tackle. The latter part of the process - Ideate to Exhibit - is where students generate, build, test and exhibit their ideas.



Key Pedagogical Underpinnings of the Tech School Innovation Process

- *Design Thinking: a human-centric innovation process for creative problem solving*
- *SOLO Taxonomy: a structure to ensure that both surface and deep learning are privileged*
- *Development of Deep Learning Competencies, encompassing 21st century enterprise and transferable skills and capabilities*

The Tech School Innovation Process is organic and fluid; students can cycle back and forth between different stages as required. Generally, the process begins with students being presented with a provocation or call to action to solve a 'wicked problem'. Local and global examples showcase how others have approached similar problems and aim to inspire students. Students develop an understanding of the context and user needs in the Empathy stage and are then supported to interpret and analyse data through observation, interview and survey techniques to refine their research, develop insights and define the problem in the form of 'How can we..., so that...?' question.

The Ideate stage is fast-moving, using the 'How can we..., so that...?' question to visualise, brainstorm and evaluate a large number of ideas to develop a minimum viable product. Students then run through the prototyping stage in a series of iterations, receiving feedback through testing as they develop their physical and digital prototypes. The most developed prototype is then presented for review by peers before the designs are exhibited in the Tech School gallery to inspire the next group of student innovators.

WHAT'S ON OFFER? PROGRAM SUITE

With authentic program-based problem solving at the core, students will partner with industry and community to undertake compact or extended inquiries around a theme which will transform twice a year, incorporating hands on learning, mentoring, exhibitions, events and masterclasses.

CORE PROGRAMS - INQUIRIES

Inquiry programs are designed to engage students in different concepts or challenges facing our local and global communities. Students will use the Tech School Innovation Process to develop real-word solutions to take action on topical issues. Students will develop a lived understanding of design thinking, empathise with problems at hand from different perspectives, develop prototypes of a unique solution - storyboard visualisation, 2D sketch, physical and digital prototypes, a pitch presentation. In order to do so, they will utilise a range of software, digital technologies and speciality equipment. Skills such as teamwork, critical thinking, creativity, ability to adapt to change and accept ambiguity, entrepreneurship, digital skills, communication and interpersonal skills will be fostered throughout the program.

CORE PROGRAMS - DESIGN CHALLENGES

Design Challenges provide young people with the opportunity to work through the Innovation Process to create novel or improved designs for existing products. Design challenges are shorter in duration and have a more defined focus of learning engagement than open-program learning programs. This allows a greater emphasis on mastering the skills and processes associated with design thinking. In addition, the use of technology is more directed. This gives students a well scaffolded and supported engagement whilst still developing an innovation mindset within the agreed learning design principles. As students develop in confidence through the design challenges, it is envisaged that they will be better placed to delve into more open-ended inquiries.

ENTREPRENEUR INCUBATOR PROGRAMS

The Student Start Up and Enterprise Learning Programs aim to support the next generation of inventors and entrepreneurs to realise their potential. In collaboration with the Melbourne Innovation Centre, the Tech School supports young people with seed funding, mentoring, access to online learning, a co-working space, business model design guidance and invitations to presentation and public pitch events.

AFTER SCHOOL PROGRAMS - STEAM ACADEMIES AND CLUBS

STEAM Academies and Clubs aim to develop natural creativity and curiosity using STEAM for a range of age groups. These free programs take place after school, can be volunteer, community-based, and provide mentorship. Students can learn to code, build a website, create an app or a game, and explore a range of technologies in an informal, creative, and social environment. The Lab is an after school program that runs at the Banyule Nillumbik Tech School for students with high-functioning autism and Asperger's, aged 10-18, who enjoy working with computers. The Lab offers mentoring by technology professionals in areas such as programming, 3D, digital design and gaming. The Nillumbik Youth Maker Lab is a new creative after school program for young people, aged 10-18, run by Nillumbik Shire Council youth mentors. Whether you're an enthusiast designer, producer, or crafter, this program offers something for everyone. SteamEngine is a free weekly Maker Space for local students and community members who wish to develop their technology project ideas. It runs at the Whittlesea Tech School and allows access to staff expertise, spaces and tools including 3D printers, laser cutters and high-end CAD software.

EVENT-BASED LEARNING

Event-based learning is a part of our ongoing experience at the Tech School. It provides a sustained context through which young people can connect to knowledge in practice, demonstrate their skills and exhibit their work. Our Maker Faire provides a fantastic opportunity for young people to showcase their creations and skills with local primary school students and the community. Designed by students for students, the Tech Schools Maker Faire is all about getting involved, learning new skills and becoming inspired.

SPECIALIST PROGRAMS

Food and Fibre Design Challenges allow students to combine technological, social and cultural innovation, and apply principles of sustainable and ethical practice. Students will translate their ideas into useful new food and fibre products, processes or services to solve real-world problems for local industry. The Biotechnology In Focus Program encourages our younger citizens to realise the wealth of opportunities within the biotechnology sector and provides an opportunity to authentically engage with industry through STEM program.

TARGETED LEARNING

Masterclasses provide students with an in-depth experience in a particular area or discipline. Supported or facilitated by an industry professional, they broaden student views on pathways and careers and leverage community, industry and partnership expertise and resources. They may be project based or concentrated in a single day. In 2020, we offer a variety of new master classes, including VCE Systems Engineering (years 11 & 12) and The Art of Scientific Program (years 7-10).

TEACHER PROFESSIONAL DEVELOPMENT

Teacher Professional Development at the Tech School endeavours to deliver conferences and professional development events, professional practice connections, pre-service teacher programs. Pre-service teachers have opportunities for work and research placements throughout the year.

For more details on any of our programs or PD opportunities email:
banyulenillumbikTS@melbournepolytechnic.edu.au
whittleseaTS@melbournepolytechnic.edu.au

2 ABOUT THIS PROGRAM

GETTING STARTED - ABOUT THIS PROGRAM

The objective of this program is to engage students in collaborative design and construction of props and costumes for a Steampunk-themed film titled Gears & Cogs.

Students will work through the Innovation Process, in pairs or in small groups (teams of 2-3), to create a prop or a costume element for a fictional character Shelby Caples. This character does not have any predefined physical characteristics, and it is up to the students to imagine their personality and define how they might look through prop and costume design.

UNDERSTANDING THE TECH SCHOOL LEARNING SEQUENCE

This resource provides you with all you need to know to effectively run this program at your school. The activities and materials presented here aim to support you through the innovation journey, and encourage your students to immerse themselves in the program.

The first phase of the Innovation Process - **Introduction to the Innovation Process, Provocation/ Inspiration, Empathy, Refine/Insight/Define** - can be thought of as the **information gathering phase** and should be completed as class discussions, research and related activities. These activities aim to develop vital content knowledge and enable students to gain a contextual understanding of the topic at hand and the underlying innovation process. Sound background knowledge at this stage of the program is likely to lead to students developing sophisticated insights on the topic, which will in turn result in higher order thinking during problem definition, ideation and also prototyping. The outcome may be a more authentic and personal project.

The second phase of the Innovation Process - **Ideate, Prototype/Test/Iterate** - can be though of as the **application of knowledge and skills phase** when students will think creatively to generate ideas and use critical thinking and problem solving to produce a range of prototypes of their most viable idea/ design solution. In their designs, students should consider a range of factors such as materials, production processes, cost, safety and sustainability/environment. This phase comprises several stages of product prototyping, testing and iterating. The type of prototyping students will be able to do will greatly depend on the range of materials, techniques and technologies available at your school. At the Tech School, students would have access to a range of materials and speciality equipment, software, including 3D modeling, laser cutters, milling machines, UV printers and more, to make both physical and digital prototypes.

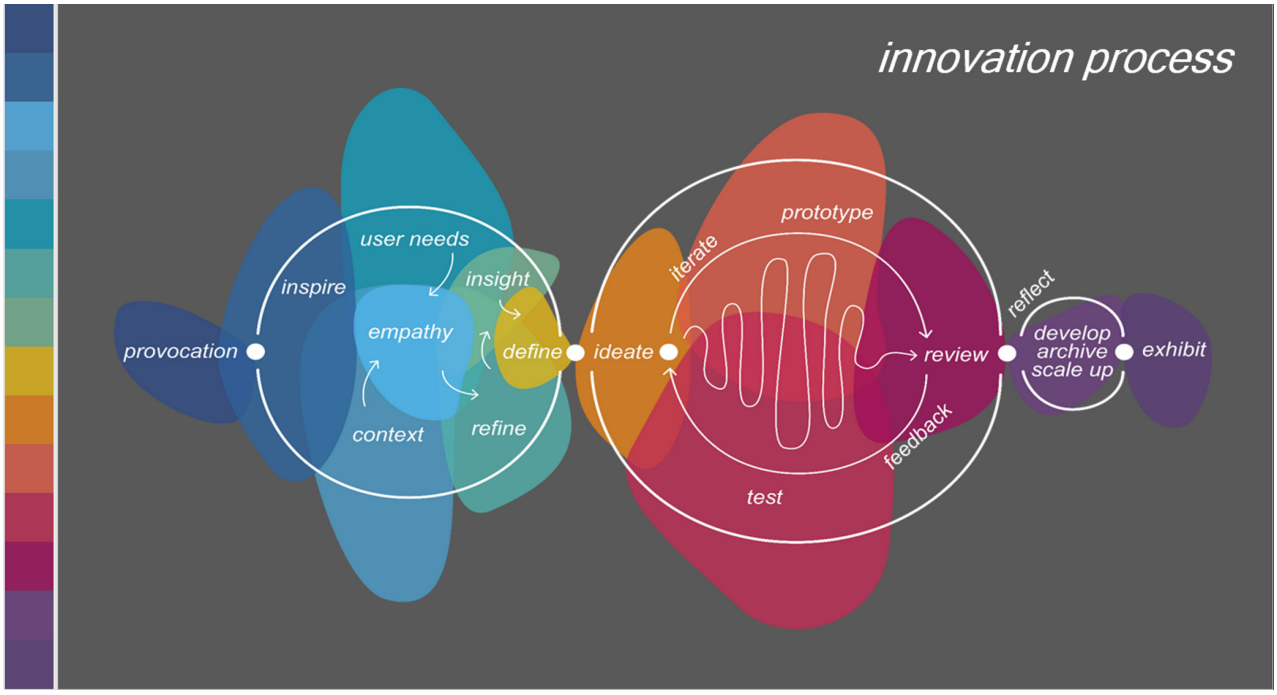
The final phase of the Innovation Process - **Pitch/Exhibit** - will see the students pitch their ideas to their peers, give and receive feedback, review and reflect on their journey. At the end of the program students should exhibit their designs to a wider audience.

Review/Reflect activities are designed to allow students to reflect on their journey, tying in all parts of the innovation process to a coherent whole. This phase also presents valuable opportunities for project assessment.

UNDERSTANDING THE TECH SCHOOL INNOVATION PROCESS

The Tech School Innovation Process underlies the development and delivery of all our programs. It is important that you and your students are familiar with the Innovation Process. Although the terminology used throughout the process may be difficult for some students to understand upfront, these terms will be unpacked in more detail as students progress through their projects, and are much easier to understand retrospectively, through reflection on the Innovation Process. The Tech School endeavours to build capacity amongst teachers in being able to adopt and incorporate inquiry learning and design thinking into their home curriculum.

The diagram below is a static representation of the Tech School Innovation Process, supported with further elaborations on each stage. In order to better understand the process and be able to guide your students through the program, you are encouraged to read the detailed descriptions of each stage.



PROVOCATION

A good provocation is a prompt that inspires curiosity, reflection, or conflict; it invokes an emotional response. It can be a 'call to action' that requires further investigation to understand in more depth.

INSPIRATION

The purpose of the inspiration stage is to build upon the provocation and demonstrate some inspiring examples of where similar problems have been solved in clever and discrete ways. Inspiration should give the students a sense of possibility and confidence in being able to tackle the challenge of the provocation, which can seem large and overwhelming.

EMPATHY

The Empathy stage involves widening of research and information gathering; it takes into account user needs and context. This stage enables students to develop an understanding of the needs and circumstances or surrounding conditions of people (animals or environments) for which we seek to create solutions. During this stage students should explore and think about problems by investigating and evaluating the perspectives of others, in order to better understand their physical and emotional needs and what is meaningful to them. Ways in which to empathise include: interviews, surveys, questionnaires, observations. The importance of the empathy stage cannot be understated. This stage underpins the insights that students will draw upon to create a unique innovation response.

REFINE/INSIGHT/DEFINE

The goal of these stages is to narrow down- refine, synthesise and make sense of information gathered in the empathise stage. Students should discover connections and patterns in order to craft a meaningful, personal and actionable problem statement with a specific focus. The result should be a guiding 'insight' statement that takes into account the conclusions/realisations that have arisen from wider research and investigations. This insight statement should be then re-framed as 'How can we..., so that...?' problem definition question.

IDEATE

During the ideation stage students will think divergently to come up with creative solutions as an answer to their specific problem definition. It involves expanding the scope of their 'How can we..., so that...?' question to generate many possibilities. Ideation is the stage that generates the energy to create prototypes. The focus is to create a quantity of ideas using a range of activities. There should be one idea (or a combination) that is selected for prototyping.

PROTOTYPE

During this stage students will design and develop a series of prototypes. A prototype can be anything that a user can interact with; a sketch, a wall of post-it notes, a gadget that is put together, a role-playing activity, or a storyboard. Ideally a prototype should be something that a user can experience. This may include walking someone through a scenario with a storyboard in the initial stages, but should develop into a real experience as the prototype develops. During the prototyping process (which in real life can take years for some products) students continually develop and refine their idea of a solution. It is important, in the early stages, to create low-resolution prototypes that are fast and cheap to make but can be used to get feedback quickly. As students create a number of prototypes, they will become more refined and detailed in their response to the problem.

TEST/REVIEW/ITERATE

During the testing and review stages, students trial and observe their prototypes, seek and evaluate feedback, and in response refine and improve their prototypes during a series of iterations. There is a close relationship between these stages and the prototype stage as they may interact many times before an innovative solution is found. Testing enables the creator of the product or innovation to better understand the user (or customer/client) needs by providing an opportunity to ask further questions. It is important to investigate user response to product benefits, functionality, use of materials and elegance, compatibility, and cost before committing valuable time and resources on developing a product. Testing is ideally conducted with a physical product, but can take form of a scenario or role play. Testing can reveal that not only is the prototype is not right, but that the 'insight' statement and problem definition question need to be re-framed.

PITCH/EXHIBIT

During the final stages of the Innovation Process students will pitch their ideas to a wider audience, reflect on their journey and make decisions about the next steps that should be taken - should the prototype be developed further, archived or scaled up. Here at the Tech School we exhibit student work in our Inspiration Gallery to inspire future work.

PROGRAM LEARNING GOALS, INTENTIONS AND SUCCESS CRITERIA

LEARNING GOALS:

- Develop a lived understanding the Tech School Innovation Process
- Solve real-world problems
- Develop critical and creative thinking
- Empathise from multiple perspectives - develop awareness, appreciation and understanding of issues related to history, humanity, technology and careers
- Develop metacognition
- Create prototypes of a unique design
- Utilise a range of technologies, software and speciality equipment

LEARNING INTENTIONS:

Skills:

- Identify problems and propose multiple solutions
- Communicate and collaborate effectively to achieve specific outcomes
- Create designed solutions suitable for identified needs and opportunities
- Speak publicly to communicate challenges, solutions and outcomes, using visual aids and correct technical terms
- Empathise to gain multiple perspectives
- Record project plans including production processes
- Reflect on processes, methods and actions, and review outcomes
- Identify tools/technologies/software and their suitability for a specific task
- Select and use technologies and techniques correctly and safely to produce designed solutions

Content knowledge:

- Understand the role or props and costumes in film and set design, and their importance for character development and for the communication of character personality traits
- Identify and describe the key characteristics of the 'Steampunk' aesthetic
- Understand techniques/technologies used during prop and costume design and production
- Identify the scope of work for a prop or costume designer and other related careers
- Understand design thinking and the Innovation Process
- Develop a rich vocabulary and understand key industry and topic-related terminology

Dispositions:

- Our inquiries aim to develop growth mindset, self-efficacy, adaptability, awareness, responsibility, perseverance, resilience, and confidence

SUCCESS CRITERIA: students will be able to...

- Use the Innovation Process to identify and define challenges and develop innovative solutions
- Collaborate effectively to create a series of prototypes: mood board, sketch, storyboard, physical prototype, digital prototype, assembled prototype, pitch presentation
- Creatively apply content knowledge of the 'Steampunk' aesthetic to design a prop/costume for a fictional character
- Select from a range of technologies, assess their suitability for a specific task, and use a range of technologies and specialist equipment
- Prepare a presentation and pitch their invention/solution to a wider audience, give and receive feedback, exhibit their product
- Reflect on their learning

RESOURCES REQUIREMENTS

The primary learning resource that accompanies this program is a Sway presentation, containing all activities suggested in this booklet. A Sway is an online application, similar to a single page website, that allows students to progress at their own pace or as directed by a teacher. Students will need to work through the various sections of Sway to complete the program. The Sway is accessible online from virtually any device. This means that activities and tasks can be completed in class, or set as homework.

It should be noted that some activities are marked as extensions. These are designed to add depth and extend and/or test student's knowledge, understanding and skills. You are encouraged to choose extension activities that best suit your cohort and local circumstances.

EQUIPMENT - TECHNOLOGY:

- Internet connection
- Teacher access to YouTube - the Sway presentation contains embedded YouTube videos to show to the class
- Please note, for the embedded YouTube videos, the closed caption/subtitles options may need to be manually selected using the 'CC' button in the bottom right of the video
- Student laptops with Internet access
- Cameras, iPads or phones - for taking photographs of student projects
- Prototyping equipment and technologies - electronics and software - depending on your local availability - see section on Prototyping (pp.23-25)

MATERIALS:

- Pens, markers, pencils, erasers, scissors, glue, sticky tape, hot glue gun
- Student workbook or blank paper for research tasks and activities
- A3 or A4 paper or card to create a mood board (optional – can be done digitally on a laptop)
- Prototyping materials - cardboard, paper, various art and craft materials - as available locally

FILES:

- Teacher Booklet

WEB RESOURCES:

- **Access to Sway** - (see inside front cover) please share the link with your students. Sway will operate with full functionality with most major, up to date browsers.

KEY TERMINOLOGY - INNOVATION PROCESS

It is recommended that teachers familiarise themselves with the vocabulary related to this program and over the course of the program discuss with students the terms listed in the table below. Definitions of the Innovation Process key terms are also included in Appendix (p.39) of this booklet. You may define these with students as the need arises. Any topic related terms should be discussed and defined as they arise.

The following are frequently used key terms of the Innovation Process

Innovation	Context	Prototype	Empathy
Provocation	Insight	Ideate	Minimum Viable Product
Inspiration	Iterate	Pitch	

HOW TO USE SWAY

Some students may not have used a Sway before. This section will give you a brief outline of how to navigate a sway. Sway is built to adapt to the screen it is being viewed on. This means that the appearance of a Sway will be slightly different between devices. It also means that refreshing or resizing the page will restart the sway.

Depending on the device you are using, you can either scroll or swipe through the Sway to view more content.

Left: By clicking on this settings button (top right), you can change the layout from the default vertical scrolling option to horizontal scrolling or presentation view.

Middle: Clicking on this discover-more button (top right) gives you the option to turn on the accessibility view, export and print the Sway. Note: this same symbol flipped vertically in the top right of Google Chrome will allow you to access the browser settings where you can increase the Zoom if needed.

Right: This menu button (bottom right) allows you to navigate directly to different sections of the Sway. The later sections to the right can be accessed by hovering the mouse over Ideate until the right-facing arrow appears and clicking on it.

Note: Some text may appear slightly blurred. This is because the text is embedded in the Sway in the form of an image. Click on the text to view the image at full resolution.

ASSESSMENT GUIDANCE

Partner schools are responsible for the evaluation and assessment of student progress throughout the program. There are a number of formative, summative and evaluative opportunities to assess student learning throughout the Tech Schools Innovation Process.

Key assessment opportunities include:

Provocation/Inspiration:
This stage provides an opportune occasion to undertake formative assessment. Students can be evaluated on their existing understanding and knowledge and also on their capacity to identify key concepts and vocabulary that may need to be targeted for further development.

Empathy/Refine/Insight/Define:
In order to develop an innovative solution, students will undertake a research component during which they will draw on data sets, observation and personal reflections. Examining a range of perspectives will assist students in understanding the problem context and empathising with user needs before defining their problem. The depth of student insights and problem definition will be a strong indicator of the rigour of understanding obtained through the Empathy stage.

Ideate:
The Ideation stage offers great opportunity to evaluate aspects of the Capabilities Curriculum as students generate solutions to complex problems. Likewise, Social and Ethical Capability will be evident as students collaborate through the ideation process to come up with ideas and determine their most viable product to move forward with in the Prototype stages.

Prototype/Feedback:
In these stages, applied feedback is a powerful tool for evaluation and to inform learning development. At structured points of the Innovation Process, students should seek feedback and evaluation from peers to test user needs and iterate their designs accordingly.

Pitch Presentation:
At the conclusion, students will be required to prepare one PowerPoint slide that summarises their project and present their designs to a wider audience during a Pitch Presentation. They will have an opportunity to critique the innovations of other groups and provide them with feedback. At this stage, you may choose to assess the visual impact and the content of their PowerPoint slide, the oral delivery, the completeness of their prototype - final product, as well as the use of technology, materials and techniques during prototyping. You may also choose to assess students' motivation and effort, and teamwork and collaboration throughout the project.

Reflection/Goal Setting:
Reflection activities at this stage present valuable opportunities for assessment as students will be asked to reflect, in writing, on their innovation journey, re-evaluate the skills and attributes they developed throughout, and set goals for future innovation projects.

CURRICULUM MAPPING

Our programs have been carefully mapped against the Victorian Curriculum General Capabilities and Competences as well as STEAM curriculum areas - Science, Design and Technologies, Digital Technologies, The Arts, Mathematics. Curriculum mapping is included in the Appendix of this document.

3 PROGRAM CONTENT

This section of the Teacher Booklet outlines the curriculum content and the recommended learning sequence, which is supported by a Sway presentation.

The table below summarises the various activities and tasks throughout the program. Introduction to the Innovation Process, Provocation/Inspiration, Empathy and Refine/Insight/Define stages comprise the information gathering phase of the program that leads to application of acquired knowledge and skills phase during Ideation and Prototype stages, followed by Pitch Presentation/Exhibition and final reflection activities.

The activities in the information gathering phase can be completed in up to three lessons. Extension activities will require additional time. Most activities can be completed through class discussions; any written tasks can be completed in a student workbook or on a piece of paper. We have provided worksheets for some activities; these are included in the Appendix of this document (pp.29-40) and are also downloadable from the Sway presentation. Please read carefully through the learning content, examine the Sway, and select extension activities that are suitable for your local context.

PROGRAM CONTENT OVERVIEW

INFORMATION GATHERING PHASE

Introduction to the Innovation Process

Activity 0: My Skills and Attributes

Provocation/Inspiration

Activity 1A: Understand the Key Characteristics of the Theme

Extension Activities:

Activity 1B: Explore the Steampunk Genera/Subculture

Empathy - Context & User Needs

Activity 2A: Understand Techniques/Technologies of Prop & Costume Design and Identify Possible Careers

Activity 2B: Understand the Importance of Costumes & Props for Character Development

Activity 2C: Analyse a Film Character

Refine/Insight/Define

Activity 3A: Create a Themed Mood Board

Activity 3B: Problem Definition

APPLICATION OF KNOWLEDGE AND SKILLS PHASE

Ideate

Activity 4A: Ideation

Extension Activities:

Activity 4B: SCAMPER Your Ideas

Prototype/Test/Iterate

1. Sketch

Activity 4C: Rapid Sketching

Activity 4D: My MVP Sketch

2. Storyboard

Activity 4E: My MVP Sketch

3. Physical Prototype

4. Digital Prototype

5. Assembled Prototype

Pitch/Exhibit

Activity 5: Pitch Presentation

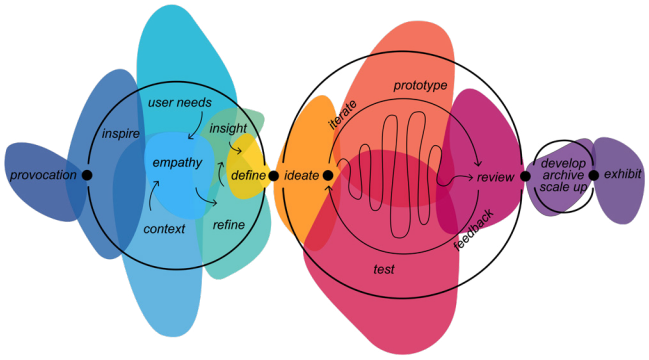
REFLECTION

Review/Reflect

Activity 6A: Re-evaluation of My Skills and Attributes

Activity 6B: Final Reflection

Activity 6C: Goal Setting



INTRODUCTION TO THE INNOVATION PROCESS

Learning Intentions:

- Introduce students to Sway
- Introduce students to the Tech School Innovation Process they will use throughout this program
- Reflect on existing skills and attributes
- Allocate student teams to create productive partnerships for the project (in industry, people with different interests, skills and backgrounds often make excellent teams)

Success Criteria:

- Form teams based on skill and attribute matching
- Gain an overview understanding of the Innovation Process

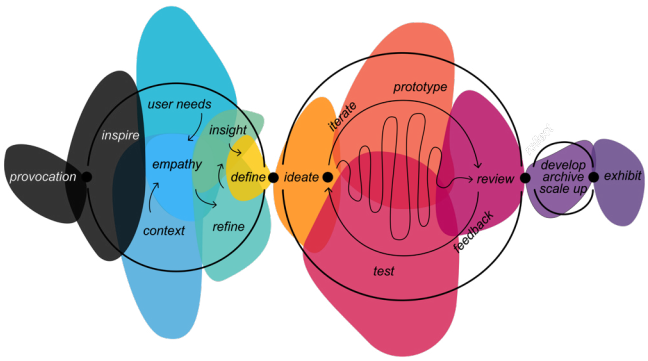
Duration: 5-25 min + homework

Lesson Checklist/Sequence:

- ☐ **Video (4:00): Tech Schools Innovation Process Animation**
- ☐ **Discuss key terms -** Appendix (p.30).
- ☐ **Define key terms -** you may split students into small groups and ask each group to research a specific term(s), then report back to class, you could set this task as homework. You may define these terms as you progress through the program - Appendix (pp.29-30).
- ☐ **Activity 0 (20min): My skills and attributes** - students to identify skills and attributes that they feel are their strengths (students will repeat this activity at the end of the program to see which ones they have improved/developed) - Appendix (p.31).
- ☐ **Form teams for the program** based on skill matching - encourage students to find someone who complements their skills, or you may be happy for students to work with their friend. Students should form **teams of 3-4**. Use your discretion.

Note: For this program, group sizes should be a maximum of **4 students**. Groups of 5 or more should be divided into smaller groups to ensure all students have an opportunity to participate in the program.

Follow the recommended Lesson Checklist/Sequence or adjust it to suit your class context. **Please ensure you watch the video animation of the Innovation Process with your students.** Activity 0 is optional but recommended. Any other activities/discussions in this stage are optional and up to your discretion. Please note the terms used throughout the Innovation Process may be foreign and overwhelming to some students. These terms will be explored in more detail throughout the program and will become more tangible as students progress through the stages of the innovation process.



PROVOCATION/INSPIRATION

Learning Intentions:

- Understand the Design Brief
- Understand the key characteristics of the 'Steampunk' aesthetic

Success Criteria:

- Explain the difference between props and costumes
- Understand the importance of props and costumes in film and set design
- Define the theme 'Steampunk'
- Imagine Shelby Caples
- Describe and discuss the key characteristic of the 'Steampunk' aesthetic

Duration: 30 min + homework

Lesson Checklist/Sequence:

☐ **Read the Design Brief**

As prop or costume designers on Steampunk film 'Gears & Cogs', set in the 1890s, your role is to build a component of main character Shelby Caples' costume.

☐ **Explore the Design Brief (10min)**

- **Read:** Who is Shelby Caples?
- **Write down:** Imagine Shelby Caples
- **Discuss:** What are props and costumes?
- **Research and share:** What is Steampunk?

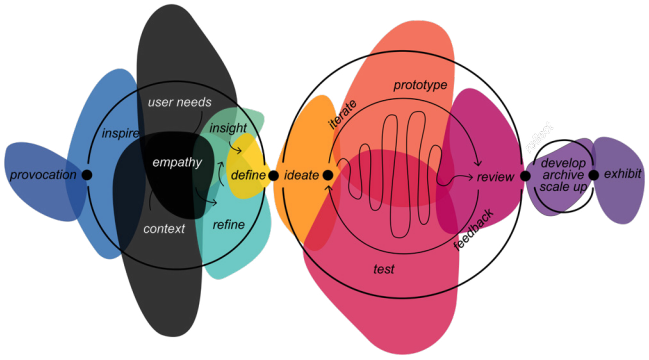
☐ **Activity 1A (15min): Understand the key characteristics of the theme**

- **Examine gallery of images**
- **Discuss the images**
- **Describe the theme** - list words that describe the images

Extension Activities:

☐ **Activity 1B (5-15min): Further research - Explore the Steampunk genera/subculture**

Note: At this stage of the program students should be introduced to the project, unpack the design brief and explore the key characteristics of the Steampunk theme and its aesthetics. Students are to look for inspiration to stimulate the creative thought process necessary for the project. Activity 1B is designed to extend students knowledge and understanding of the theme so that they can develop a deeper and more personal connection to the topic. Extensions are optional and can be incorporated based on your local circumstances and context, or on individual student basis.



EMPATHY - CONTEXT & USER NEEDS

Learning Intentions:

- Understand possible industry careers
- Understand techniques and technologies used during prop and costume design
- Understand the importance of props and costumes for character development

Success Criteria:

- Identify possible industry careers and explain their roles
- Explain how techniques and technologies are used in prop and costume design
- Analyse a film character

Duration: 65 + homework, depending on depth of discussions/research

Lesson Checklist/Sequence:

☐ **Activity 2A (20min): Understand techniques/technologies used during prop and costume design and identify possible industry careers**

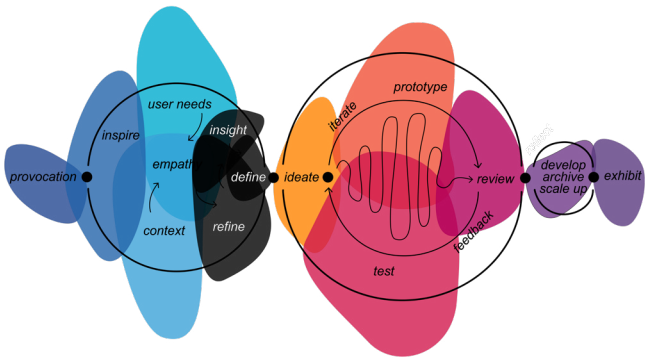
- **Watch Video (3:47):** **Pacific Rim Uprising - Making the Pilot Suits at Weta Workshop**
- **List** the different industry job titles and explain what are their roles.
- **Discuss:** What techniques/technologies were shown in the video.
- **Research:** Choose at least one of the techniques and conduct some further research into when and how it could be used and/or why might you want to use it when creating a costume or a prop. Include some examples.

☐ **Activity 2B (20min): Understand the importance of props and costumes for character development**

- **Discuss:** Why are costumes and props important for character development?
- **Observe/Investigate** prop and costume details in images of Dorothy Gale in the movie Wizard of Oz.
- **Discuss:** What does Dorothy's costume tell us about her character?
- **Observe/Investigate** most important elements of Dorothy's costume.
- **Discuss:** Rate Dorothy's costume elements in order of importance and explain why.
- **Describe:** Describe the highest ranked costume element in terms of its form and function.

☐ **Activity 2C (20 min): Analyse a film character**

NOTE: The empathy stage and related activities involve information gathering, research, observation and discussions. These will allow students to gain a deeper understanding of the importance of props and costumes for character development, as well as expose them to relevant careers, techniques and technologies used in the film and set design industry.



REFINE, INSIGHT, DEFINE

Learning Intentions:

- Reflect, analyse and evaluate the information gathered
- Synthesise research - infer relationships and patterns
- Compare, sequence, explain ideas and information generated
- Generate new conclusions, realisations, hypotheses - insights
- Define a meaningful problem

Success Criteria:

- Create an annotated Steampunk-themed mood board
- Look closely at 'What do I know so far?'
- Refine research - connect ideas, identify patterns and relationships
- Draw conclusions from research to gain insights
- Define the problem as 'How can we..., so that...?'

Duration: 60+ min

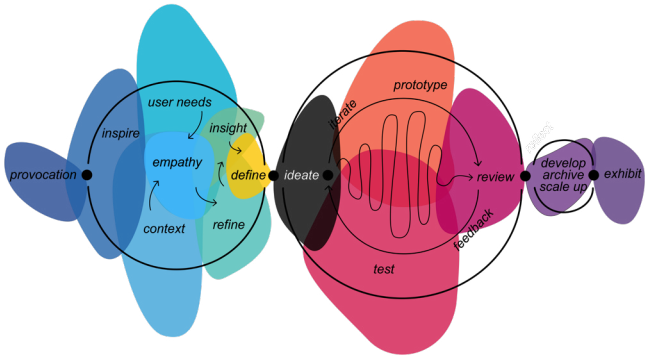
Lesson Checklist/Sequence:

- ☐ **Activity 3A (45min): Refine - Create an Steampunk-themed mood board**
  - **Curate a selection of images** that reflect the theme
  - **Annotate the mood-board**
  - **Discuss your mood board with class**

- ☐ **Read: What is an insight?**
- ☐ **Discuss your insights:** Reflect on all that you have learned thus far. You might write this as a class on the whiteboard, or make a mind map, or add to the mood board.
  - What key features describe the Steampunk theme?
  - What key features or elements stand out on your mood board?
  - What character traits could be expressed through props and costumes?
  - What key terms would you use to describe Shelby?

- ☐ **Activity 3B (10 min): Define the problem** - formulate a problem definition in the form of 'How can we..., so that...?' question. It must include the personality traits/character attributes you wish to express in Shelby and/or what the prop or costume might enable Shelby to do.

NOTE: Students should aim to *refine* their knowledge and understanding of the theme as a whole by creating an annotated mood board. Students should then reflect on what that they have learned thus far and discuss their insights - the key points, main conclusions and/or realisations that arise when they evaluate/reflect on their broader research i.e. the information gathered throughout the previous stages. Students could write down their insights by adding to their mood board, and then define the problem in the form of 'How can we..., so that..?' question which should guide their ideation in the next stage.



IDEATE

Learning Intentions:

- Use ideation techniques to come up with as many ideas as possible
- Evaluate ideas and select the most viable idea to implement as a design solution
- Engage in discussions, give and receive constructive feedback

Success Criteria:

- Think creatively to present as many ideas as possible
- Select the best idea for implementation
- Contribute to discussions and provide feedback to peers

Duration: 30+ min

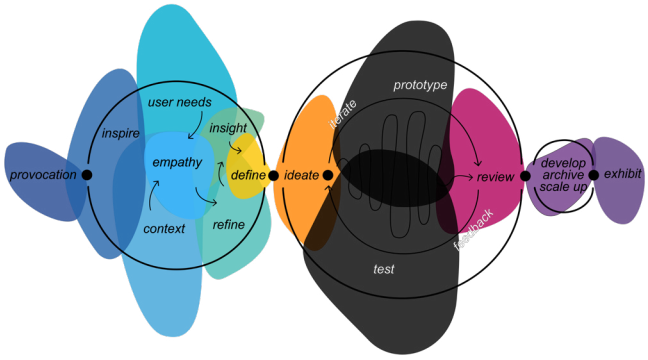
Lesson Checklist/Sequence:

- ☐ **Read: What is ideation?**
- ☐ **Activity 4A (20min): Ideation**
  - **Prepare to ideate:** use a blank sheet of paper and separate it into 4 columns - see Sway, or use the worksheet provided- Appendix (pp.33-34)
  - **Generate ideas:** spend 2-3 minutes (or more) generating as many ideas as possible for each column on your worksheet/piece of paper.
  - **Review you ideas:** circle the best ideas
- ☐ **Select your best idea and write it down as Minimum Viable Product:** write a detailed and considered description of your original idea – what exactly are you planning to build/make, what does it do, what unique features does it have? You should aim to build the most basic version of a product that illustrates your idea and addresses your 'How can we…, so that..?' question. It should have just enough features to be functional and bring value for the development of Shelby's character. It would be great if your product was also elegant/stylish but remember that functionality is No.1.

Extension Activities:

- ☐ **Activity 4B (10min): SCAMPER your ideas** - Appendix (p.35)
  - **Discuss SCAMPER** as a method for generating creative ideas
  - **Choose one of the SCAMPER prompts** and use it to generate as many ideas as possible
  - **Choose another SCAMPER prompt** and generate more ideas. As a team you are aiming for 100!

Note: In this stage of the innovation process students will come up with as many ideas as possible and select the best idea to move forward with - sketch and annotate. Each group will review their designs and chose their Most Viable Product (MVP). Students will then move into a planning stage where they decide on the procedures required to make their designs.



PROTOTYPE/TEST/ITERATE

Learning Intentions:

- Develop a series of prototypes using a range of technologies and specialist equipment
- Select from a range of technologies and assess their suitability for a specific task
- Test, evaluate and review your design to make iterations and development changes

Success Criteria:

- Create a series of physical and digital prototypes:
  - Sketch - shows what the product looks like, where things are
  - Storyboard - shows how the product works
  - Physical prototype - cardboard prototype informed by storyboard and sketch
  - Digital prototype - CAD (3D model), vector software (illustration), app, electronics and coding
  - Assembled - fabrication from various components and technologies

Duration: 2+ sessions - this part typically takes place at the Tech School over two days. Depending on availability, you may wish to allocate more time for prototyping.

Lesson Checklist/Sequence:

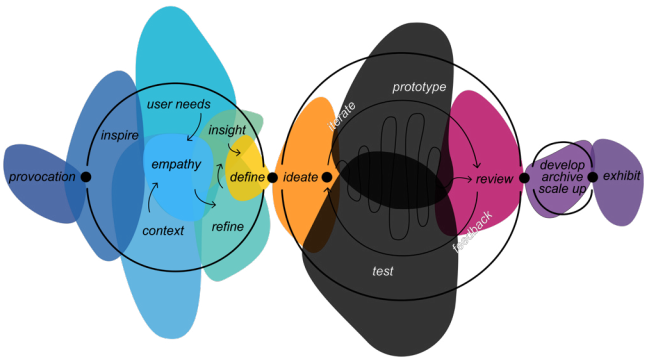
- ☐ **Read: What is a prototype?**
- ☐ **Watch video (2:01): Design Thinking 2 Rapid Prototypes HD**

Note: In general, the design solution can be many things, depending on what prototyping is possible. See note on page 25 for materials, techniques, and technologies typically used at the Tech School. In relation to the Steampunk program specifically, the solution could be anything that would qualify as a prop or a costume piece - typically a physical thing, but it could be an app (embedded in a physical object/case). Prototyping will depend on the resources and technologies available to you in your local context. Ideally, whatever the students produce should be exhibitable. **Contact your Tech School if you require support or guidance with prototyping.**

The order of prototyping can be organised depending on your needs, but typically sketch and storyboard would be followed by physical and digital prototypes that are tested and reviewed between iterations. **You should encourage students to take photos of their prototyping process,** to be used during the preparation of their Pitch PowerPoint slide, or for assessment purposes.

In general (not specific to this program), a prototype could be, but is not limited to, the following:

- A physical thing
- A digital app, web page, story map
- A piece of art, music or play to raise awareness
- A video, a film, a projection, or a podcast
- Poster, book



PROTOTYPE - SKETCH/STORYBOARD

Learning Intentions:

- Understand the purpose of a design sketch
- Understand how to draw and annotate an industry sketch
- Visualise a number of different variations to the design
- Understand the purpose of storyboard and how to draw a storyboard

Success Criteria:

- Draw and annotate a design sketch that shows what the product looks like and consider a range of factors
- Draw a storyboard - decompose the problem solution (design) as a step-by-step diagram that shows product functionality

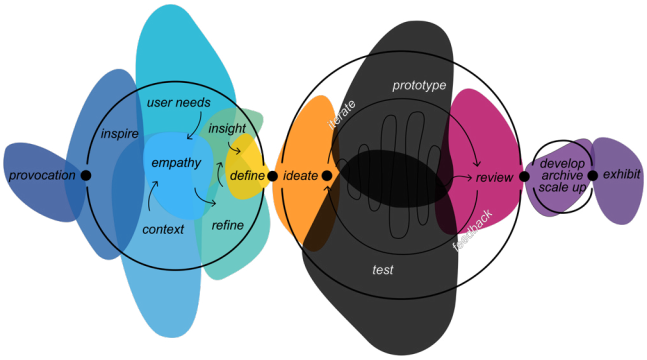
Duration: 60 min

Lesson Checklist/Sequence:

- ☐ **Read: What is a sketch?**
- ☐ **Activity 4C: Rapid Sketching** (warm up activity).
- ☐ **Read: What is Annotation in Sketching?** - unpack any unfamiliar terminology.
- ☐ **Watch Video (6:05): Annotation (a crucial tool of the product designer)**
- ☐ **Activity 3D (40min): Draw an annotated sketch of your prop or costume piece** - your design solution must be represented as an annotated (labeled) sketch

- ☐ **Read: What is Storyboarding?**
- ☐ **Activity 4E: My MVP Storyboard** - Appendix (p.39).
- ☐ **Discuss design sketches/storyboards:** students to show and explain their designs and how they relate to the Steampunk theme, students are encouraged to give feedback and critique each other's designs. You could have different groups set up 'expo stalls' and have students walking around giving feedback. You might follow this helpful feedback guide, and when giving feedback say...
  - » 'I like...' - comment on something positive.
  - » 'I wish...'- comment on something you think could be improved or done differently.
  - » 'I wonder...' - ask the presenters a question (that they should be able to respond to).

Note: In this stage of the innovation process students will sketch and annotate their best idea; they will create a storyboard of their design idea that shows the interaction of the prop or costume and the user - Shelby Caples. They will gather feedback and critique from others then begin working on a construction plan for their chosen idea. You may have some students from a team to draw a sketch and others focus on drawing a storyboard.



PROTOTYPE - PHYSICAL/DIGITAL/ASSEMBLED

Learning Intentions:

- Understand techniques and technologies used during product design and construction
- Select from a range of technologies and assess their suitability for a specific task
- Test, evaluate and review designs to make iterations and development changes
- Understand the importance of feedback in product development

Success Criteria:

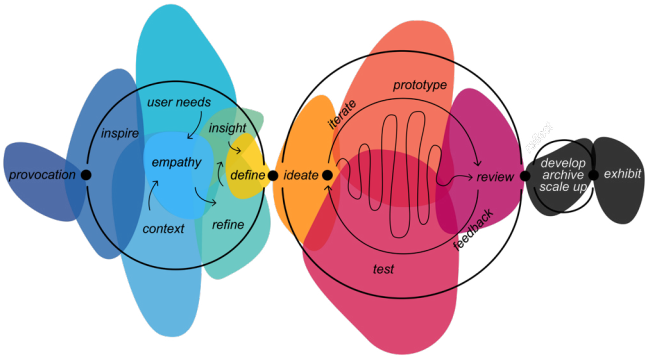
- Create a series of physical and digital prototypes that follow a design brief:
  - Physical prototype - cardboard prototype informed by storyboard and sketch
  - Digital prototype - electronics and coding, 3D modelling, vector graphics
  - Assembled - fabrication from various components and technologies
- Contribute to discussions and provide feedback to peers
- Iterate prototypes based on functionality testing and feedback

Duration: 2+ sessions - this part typically takes place at the Tech School over two days. Depending on availability, you may wish to allocate more time for prototyping.

Lesson Checklist/Sequence:

- ☐ **Discuss: What is a prototype?**
- ☐ **Watch video (2:02): How to make a cardboard prototype**
- ☐ **Watch video (7:09): What is coding?**
- ☐ **Create construction plan:** as a team discuss the project and write a list of steps you will need to do to construct the prop or costume piece, the materials needed, and how you plan to divide tasks between team members (who will do what?).
- ☐ **Review construction plan:** check in with your teacher, show them your plan, receive feedback and tick of approval to proceed with construction.
- ☐ **Commence construction:** If the planning stage is complete students may commence construction.
- ☐ **Test - check points:** you should add various check points during construction, students should review each others projects, they should seek and receive feedback, discuss any issues, explain what worked or didn't work, what challenges they have faced and how they have overcome these.
- ☐ **Finalise construction:** the final design solution should be fully functional and satisfy any design brief requirements.

Note: Here at the Tech School we would typically use a combination of the following materials, techniques and technologies during prototyping: cardboard construction techniques for cardboard prototyping; various art and craft materials (including fabrics and paint); micro:bit- for incorporation of coadable micro controllers and electronics - lights, sound, motion; Adobe Illustrator - for laser cutting, for vinyl cutting, for digital embroidery to incorporate in garment and accessory design; Fusion 360/ Tinkercad - 3D modelling for 3D printing; Sewing - for construction of garments and accessories; Wearable Technology - sewing with conductive thread to incorporate LEDs and electronics in garment and accessory design.



PITCH PRESENTATION/EXHIBIT

Learning Intentions:

- To communicate ideas to a wider audience
- Use digital media to communicate information
- Give and receive feedback
- Reflect on and evaluate the project

Success Criteria:

- Create and deliver a Pitch Presentation
- Give and receive feedback
- Showcase your project

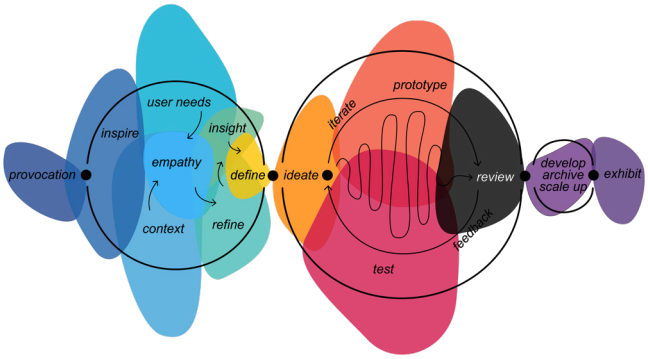
Duration: 30-45 min preparation + time for pitch

Lesson Checklist/Sequence:

☐ **Activity 5: Pitch Presentation** - the pitch presentation allows students to communicate their design solutions to a wider audience, give and receive feedback and evaluate their project.
The following steps should be followed:

- **Write a background story** that supports your prop or consume piece (gives it meaning) and explains its importance to Shelby's character development.
- **Prepare ONE PowerPoint** slide that contains:
  - » Image(s) of your prototype(s)/designs
  - » Title: Name of your product/design
  - » Your group's/brand name(s) i.e. who made the product
  - » Backstory/Caption (short blurb) - present a backstory about your design that relates to development of Shelby's character. Describe your product/design and mention any unique features/elements that are interesting or valuable.
- **Prepare a 1-minute 'Elevator Pitch'** to communicate your design solution to a wider audience. This should elaborate on the information on your slide. Make sure you connect your pitch to the design brief. Make reference to Shelby's character development, your problem definition question, and why your prop or costume piece would be worth investing in by the makers of the Gear & Cogs film.
- **Conduct Pitch Presentations:** Present your product/design to a wider audience.
- **Give/Receive feedback:** People in the audience should be prepared to give feedback to the presenters. Feedback must be constructive - comments must be thoughtful, useful and helpful. You might follow this helpful feedback guide, and when giving feedback say...
  - » 'I like…' - comment on something positive.
  - » 'I wish…'- comment on something you think could be improved or done differently.
  - » 'I wonder…' - ask the presenters a question (that they should be able to respond to).

☐ **Exhibit: Upload your project to the Steampunk Design Challenge Padlet,** link also in Sway.



REVIEW/REFLECT

Learning Intentions:

- Reflect on skills and dispositions developed through the project
- Reflect on the innovation process and the program project
- Set goals for future design projects

Success Criteria:

- Complete skills and attributes re-evaluation
- Reflect on strengths, weaknesses; discuss future improvements
- Formulate three SMART goals for future design projects

Duration: 20-50 min

Lesson Checklist/Sequence:

- ☐ **Activity 6A: Re-evaluate your skills** - Appendix (p.36)
- ☐ **Activity 6B: Final Reflection** - Appendix (p.37)
- ☐ **Activity 6C: Goal setting** - Appendix (p.38)

4 APPENDIX

4 - Appendix

Worksheets and Worked Examples:

Templates

Curriculum Mapping

✯ TECH SCHOOL INNOVATION PROCESS - DEFINE THE KEY TERMS

KEY TERM	DEFINITION
Context (noun)	
Empathy (noun)	
Ideate (verb)	
Innovate (verb)	
Innovation (noun)	
Insight (noun)	
Inspiration (noun)	
Iterate (verb)	
Minimum Viable Product (MVP)	
Pitch (noun, verb)	
Prototype (noun, verb)	
Provoke (verb)	
Provocation (noun)	

✯ TECH SCHOOL INNOVATION PROCESS - KEY TERMS EXPLAINED

KEY TERM	DEFINITION
Context (noun)	The circumstances that form the setting for an event, statement, or idea, and in terms of which it can be fully understood.
Empathy (noun)	The ability to understand and share the feelings of another.
Ideate (verb)	To form ideas.
Innovate (verb)	Make changes in something established, especially by introducing new methods, ideas, or products.
Innovation (noun)	The action or process of innovating.
Insight (noun)	The capacity to gain an accurate and deep understanding of someone or something.
Inspiration (noun)	The process of being motivated to do or feel something, especially to do something creative.
Iterate (verb)	Taking ideas or products and making changes repeatedly to develop working products or services.
Minimum Viable Product (MVP)	The most basic version of a product that illustrates an idea. It should have just enough features to satisfy the user.
Pitch (noun, verb)	To present an idea/product for consideration.
Prototype (noun, verb)	(The making of) a scaled form of a new type or design of a construction.
Provoke (verb)	To incite a strong reaction in someone.
Provocation (noun)	The act of provoking.

☆ ACTIVITY 0: MY SKILLS AND ATTRIBUTES

1. **Read over the table below and reflect on your skills/attributes.**
2. **Highlight or circle your top 3 skills/attributes** - three skills or attributes that you are best at.
3. **Draw a star next to 3 skills/attributes you think you need to work on and would like to improve.**
4. **Form a team** of 3 or 4 - establish a team with complementary skills - choose team members with different strengths to your own.

MY STRENGTHS:

Communication	**Collaboration**	**Teamwork**	**Leadership**
Problem solving	**Critical thinking**	**Creativity**	**Analysing**
Presentations skills	**Research skills**	**Organisation and planning**	**Project management**
Questioning	**Engaging in discussions**	**Active listening**	**Giving and receiving feedback**
Decision making	**Negotiation**	**Social and cultural awareness**	**Reflection and self-awareness**
Initiative	**Resilience**	**Flexibility/adaptability**	**Persistence**

MY STRENGTHS IN THE FOLLOWING CONTENT AREAS (give yourself a star rating; be honest):

Science	Technology	Engineering	Arts	Mathematics
☆ ☆ ☆ ☆ ☆	☆ ☆ ☆ ☆ ☆	☆ ☆ ☆ ☆ ☆	☆ ☆ ☆ ☆ ☆	☆ ☆ ☆ ☆ ☆

MY TEAM MEMBER'S COMPLEMENTARY STRENGTHS:

List the skills that you would like your team members to have (useful, complementary skills) so that together you will form an Innovation Powerhouse Team.

MY TEAM MEMBERS ARE:

✯ ACTIVITY 3A: CREATE A STEAMPUNK-THEMED MOOD BOARD - WORKED EXAMPLE

✯ ACTIVITY 4A: IDEATION

How can we create a prop or a costume, **so that**... **?**

ITEM/PIECE What could be the Prop or Costume?	**PURPOSE/FUNCTION** What could it do?	**MATERIALS** What could it be made from?	**COLOUR & TEXTURE** What could it look like?

✯ ACTIVITY 4A: IDEATION - WORKED EXAMPLE

How can we create a prop or a costume, **so that** Shelby's character apprears **adventurous ?**

ITEM/PIECE What could be the Prop or Costume?	**PURPOSE/FUNCTION** What could it do?	**MATERIALS** What could it be made from?	**COLOUR & TEXTURE** What could it look like?
• intergalactic space shield • outdoors vacuum cleaner • sound purifier • a hat with a bird box • a tea making machine	• allows them to travel through space time and avoid radiation • steam cleans the garden • they do not hear the negative talk in the world- remaining optimistic and willing to take risks • allows their carrier pigeon to live there that can investigate her next adventure destinations and communicate with friends around the world • to always have a cup of tea on the go	• wood • ply • cardboard • plastic • gold • metal • leather • fabric • wire • computer chips • gears • cogs	• rusty • gold • silver • shiny • bronze • lace • rough • velvety

✯ IDEATE - EXTENSION ACTIVITY 4B: SCAMPER YOUR IDEAS

What is ideation?

Ideation is the part of the Innovation Process in which you concentrate on idea generation. It requires lots of creativity. During ideation think about all the different ways that you can solve the problem and write these down. Let your imagination run wild!

Ideas are not often plucked out of thin air. The SCAMPER technique uses a set of directed questions and prompts to guide you with your idea generation.

Once you have generated lots of ideas, you will need to weigh them up and make a decision on which idea best solves your problem. You will need to evaluate how innovative your ideas are.

To innovate means to create something new. Highly innovative ideas are:

- ***Functional/Effective - fit for purpose***
- ***Original/Novel - unique***
- ***Elegant/Stylish - simple and/or beautiful***

SCAMPER Method

A guide to generating creative ideas

Substitute:
Replace a part of your product or process e.g. components, materials.
What could I use instead? What could I substitute for other properties?

Combine:
Combine two or more products or ideas into something new.
What could I combine to end up with a more effective, original or elegant output?

Adapt:
Adapt an existing idea to a different context; use borrowed features or ideas.
What could I copy and change for use as a solution?

Modify/Magnify:
Modify the features or physical qualities of a product. Change them in some way.
What other meaning, colour, motion, sound, smell, form or shape might I adopt?

Put to another use
Put an existing product to another use, for other users, to work elsewhere.
What new ways are there to use this product if I modify it?

Eliminate
Simplify or get rid of a feature, process or idea in order to improve it.
Identify the most important aspects - remove the non-essentials.

Reverse/Rearrange
Reverse or rearrange the orientation, direction, components.
What other pattern, layout, or sequence may I adopt?

SCAMPER Method adapted for the Banyule Nillumbik & Whittlesea Tech Schools, Melbourne Ploytechnic. Open Access Creative Commons Attribution Non-Commercial 3.0 IGO Licence, Asian Development Bank. Serrat O. (2017) The SCAMPER Technique. In: Knowledge Solutions. Springer, Singapore.

✯ ACTIVITY 6A: RE-EVALUATION OF MY SKILLS AND ATTRIBUTES

The objective of this activity is to think back and reflect on the skills and attributes you have brought to the project, developed and improved throughout.

1. **Reflect on your skills/attributes** - using the 5 star system reflect on your skills/attributes you think you have developed and improved during this program.
2. **Give yourself 1-5 stars** depending on how well you think you improved these skills and attributes (5 stars = excellent; 1 star = needs development). You can just cross out the number of stars you want to give yourself - be honest with yourself!

MY STRENGTHS:

Communication ☆ ☆ ☆ ☆ ☆	**Collaboration** ☆ ☆ ☆ ☆ ☆	**Teamwork** ☆ ☆ ☆ ☆ ☆	**Leadership** ☆ ☆ ☆ ☆ ☆
Problem solving ☆ ☆ ☆ ☆ ☆	**Critical thinking** ☆ ☆ ☆ ☆ ☆	**Creativity** ☆ ☆ ☆ ☆ ☆	**Analysing** ☆ ☆ ☆ ☆ ☆
Presentations skills ☆ ☆ ☆ ☆ ☆	**Research skills** ☆ ☆ ☆ ☆ ☆	**Organisation and planning** ☆ ☆ ☆ ☆ ☆	**Project management** ☆ ☆ ☆ ☆ ☆
Questioning ☆ ☆ ☆ ☆ ☆	**Engaging in discussions** ☆ ☆ ☆ ☆ ☆	**Active Listening** ☆ ☆ ☆ ☆ ☆	**Giving and receiving feedback** ☆ ☆ ☆ ☆ ☆
Decision making ☆ ☆ ☆ ☆ ☆	**Negotiation** ☆ ☆ ☆ ☆ ☆	**Social and cultural awareness** ☆ ☆ ☆ ☆ ☆	**Reflection and self-awareness** ☆ ☆ ☆ ☆ ☆
Initiative ☆ ☆ ☆ ☆ ☆	**Resilience** ☆ ☆ ☆ ☆ ☆	**Flexibility/adaptability** ☆ ☆ ☆ ☆ ☆	**Persistence** ☆ ☆ ☆ ☆ ☆

3. **List three skills (from the above) you would like to work on improving the most, and explain why?**

1. _

_ _

2. _

_ _

3. _

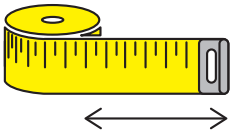
_ _

✯ ACTIVITY 6B: FINAL REFLECTION

STRENGTHS: What where your strengths during this project? Which skills did you use well and how did you use them?	**WEAKNESSES:** What were some weak points in your skills or which steps of the Innovation Process could you improve?
SOMETHING YOU HAVE LEARNED and/or WANT TO KNOW MORE ABOUT: What have you learned from participating in this project? What do you want to know more about?	**SOMETHING THAT COULD BE IMPROVED – HOW:** Choose one of the weaknesses you have listed and suggest a productive way this could be improved.

✯ ACTIVITY 6C: GOAL SETTING - SET 3 SMART GOALS FOR FUTURE INNOVATION PROJECTS

Specific
What do you want to do? Define the goal; use action words.



Measurable
How will you know you have accomplished what you set out to do?

Achievable
Is it in your power to accomplish it?

Relevant
Is your goal worthwhile? Does it link with your needs?

Timely
When do you plan to complete this goal?

1. My academic goal:

Example: *I will improve my knowledge about available/suitable materials for my product by...; I will improve my communication skills by...*

What: *I will...*

How: *by...*

2. My organisational goal:

Example: *I will plan for the day ahead by... ; I will make sure I keep my computer files organised by...*

What: *I will...*

How: *by...*

3. My behavioural goal:

Example: *I will improve my leadership skills by...; I will seek help by...*

What: *I will...*

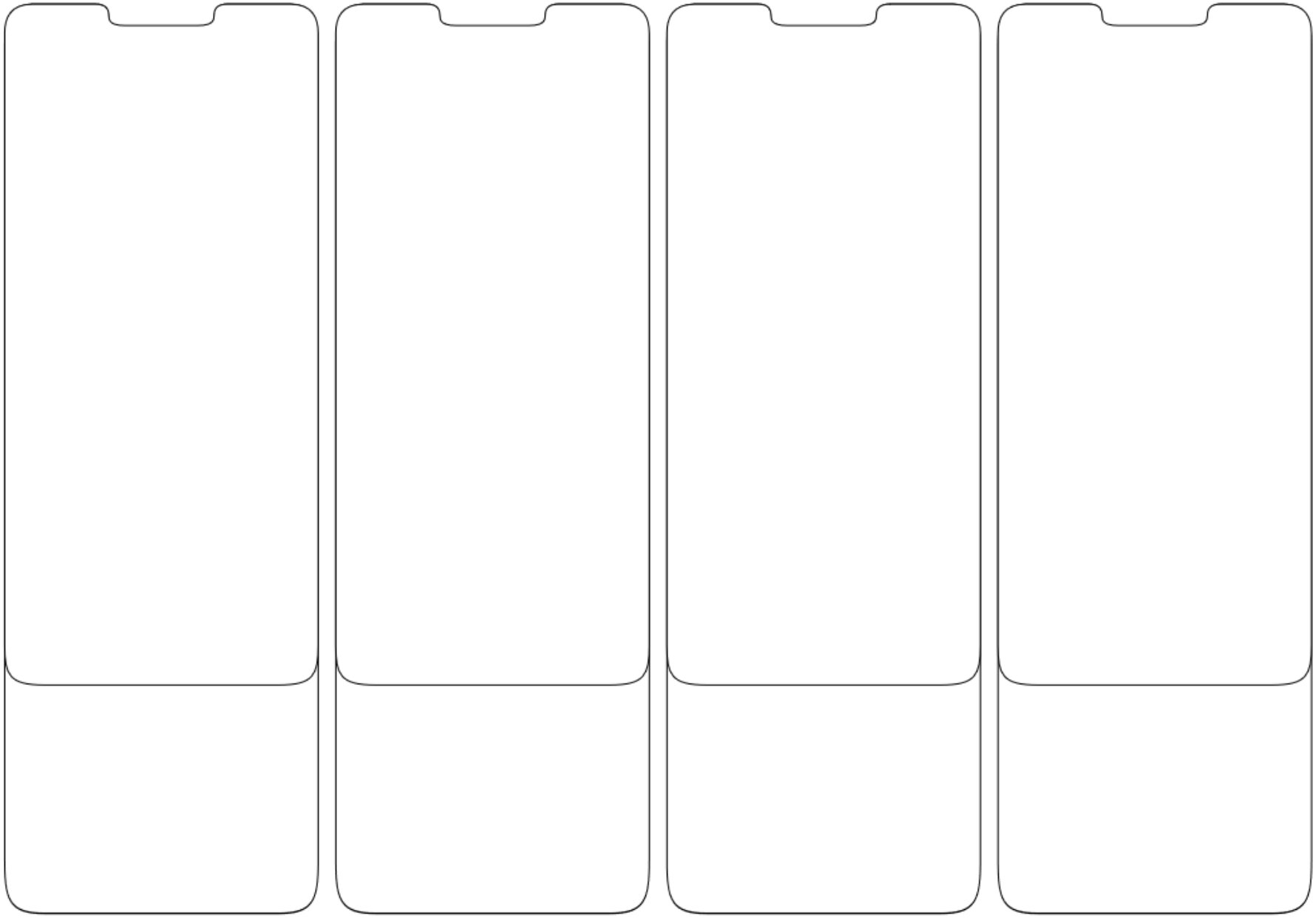
How: *by...*

✯ MY MVP STORYBOARD - *What is storyboarding?*

Storyboarding is an excellent tool designers use to communicate ideas about their product. A storyboard is a sequence of images/drawings, like a cartoon, that show an interaction of user and the product and the way in which that interaction unfolds. A storyboard is a quick drawing, you don't have to be great at it, you can draw stick figures as long as you can communicate what the product does and how it works.

✯ MY MVP APP WIREFRAME

Note: Do not make the log in, sign up, or register pages of your app - focus on making the screens that show the app's functional features.



STEAMPUNK DESIGN CHALLENGE - CURRICULUM MAPPING: CAPABILITIES AND COMPETENCES; STEAM AREAS

Capabilities and Competences

Critical and Creative Thinking 7-8

Questions and Possibilities			Reasoning					Meta-Cognition		
Consider how to approach and use questions that have different elements, including factual, temporal and conceptual elements (VCCCTQ032)	Suspend judgements temporarily and consider how preconceptions may limit ideas and alternatives (VCCCTQ033)	Synthesise information from multiple sources and use lateral thinking techniques to draw parallels between known and new solutions and ideas when creating original proposals and artefacts (VCCCTQ034)	Examine common reasoning errors including circular arguments and cause and effect fallacies (VCCCTR035)	Investigate the difference between a description, an explanation and a correlation and scepticism about cause and effect (VCCCTR036)	Investigate when counter examples might be used in expressing a point of view (VCCCTR037)	Consider how to settle matters of fact and matters of value and the degree of confidence in the conclusions (VCCCTR038)	Examine how to select appropriate criteria and how criteria are used in clarifying and challenging arguments and ideas (VCCCTR039)	Consider a range of strategies to represent ideas and explain and justify thinking processes to others (VCCCTM040)	Examine a range of learning strategies and how to select strategies that best meet the requirements of a task (VCCCTM041)	Consider how problems can be segmented into discrete stages, new knowledge synthesised during problem-solving and criteria used to assess emerging ideas and proposals (VCCCTM042)
	Refine, Insight, Define; Feedback activities	Refine, Insight, Define; Ideate; Test, Feedback, Iterate								Throughout program

Critical and Creative Thinking 9-10

Questions and Possibilities			Reasoning					Meta-Cognition		
Investigate the characteristics of effective questions in different contexts to examine information and test possibilities (VCCCTQ043)	Suspend judgements to allow new possibilities to emerge and investigate how this can broaden ideas and solutions (VCCCTQ044)	Challenge previously held assumptions and create new links, proposals and artefacts by investigating ideas that provoke shifts in perspectives and cross boundaries to generate ideas and solutions (VCCCTQ045)	Examine a range of rhetorical devices and reasoning errors, including false dichotomies and begging the question (VCCCTR046)	Examine how to identify and analyse suppressed premises and assumptions (VCCCTR047)	Investigate the nature and use of counter examples structured as arguments (VCCCTR048)	Consider ambiguity and equivocation and how they affect the strength of arguments (VCCCTR049)	Investigate use of additional or refined criteria when application of original criteria does not produce a clear conclusion (VCCCTR050)	Critically examine their own and others thinking processes and discuss factors that influence thinking, including cognitive biases (VCCCTM051)	Investigate how the use of a range of learning strategies can be monitored, evaluated and re-directed as necessary (VCCCTM052)	Investigate the kind of criteria that can be used to rationally evaluate the quality of ideas and proposals, including the qualities of viability and workability (VCCCTM053)
	Refine, Insight, Define; Ideate; Test, Feedback, Iterate	Refine, Insight, Define;								

Ethical Capability 7-10

7 and 8					9 and 10				
Understanding Concepts			Decision Making and Actions		Understanding Concepts			Decision Making and Actions	
Explore the contested meaning of concepts including freedom, justice, and rights and responsibilities, and the extent they are and should be valued by different individuals and groups (VCECU014)	Investigate why ethical principles may differ between people and groups, considering the influence of cultural norms, religion, world views and philosophical thought (VCECU015)	Investigate criteria for determining the relative importance of matters of ethical concern (VCECU016)	Explore the extent of ethical obligation and the implications for thinking about consequences and duties in decision-making and action (VCECD017)	Discuss the role of context and experience in ethical decision-making and actions (VCECD018)	Investigate the connections and distinctions between and the relative value of concepts including fairness and equality, and respect and tolerance (VCECU019)	Explore a range of ethical problems and examine the extent to which different positions are related to commonly held ethical concepts and principles, considering the influence of cultural norms, religion, world views and philosophical thought (VCECU020)	Distinguish between the ethical and non-ethical dimensions of complex issues, including the distinction between ethical and legal issues (VCECU021)	Discuss issues raised by thinking about consequences and duties, in approaches to decision-making and action, and arguments for and against these approaches (VCECD022)	Investigate how different factors involved in ethical decision-making can be managed by people and groups (VCECD023)
								Throughout program	

Personal and Social Capability 7-8									
Self-Awareness and Management				Social Awareness and Management					
Recognition and expression of emotions	Development of resilience			Relationships and diversity			Collaboration		
Describe how and why emotional responses may change in different contexts (VCPSCSE034)	Assess personal strengths using feedback from peers, teachers and others and prioritise areas for improvement (VCPSCSE035)	Discuss the range of strategies that could be used to cope with difficult tasks or changing situations (VCPSCSE036)	Reflect on their effectiveness in working independently by identifying enablers and barriers to achieving goals (VCPSCSE037)	Explore their personal values and beliefs and analyse how these values and beliefs might be different or similar to those of others (VCPSCSO038)	Investigate human rights and discuss how these contribute to a cohesive community (VCPSCSO039)	Recognise the impact of personal boundaries, intimacy, distribution of power and social and cultural norms and mores on the ways relationships are expressed (VCPSCSO040)	Perform in a variety of team roles and accept responsibility as a team member and team leader, assessing how well they support other members of the team (VCPSCSO041)	Identify ways to be proactive in initiating strategies to prevent and/or accomplish positive resolutions to conflict (VCPSCSO042)	
	Reflection activities at the beginning and end of the program		Pitch, Reflection/Review				Throughout program		

Personal and Social Capability 9-10								
Self-Awareness and Management				Social Awareness and Management				
Recognition and expression of emotions	Development of resilience			Relationships and diversity			Collaboration	
Evaluate emotional responses and the management of emotions in a range of contexts (VCPSCSE043)	Develop criteria to appraise personal qualities and use these to design strategies to plan for the future or address a challenge (VCPSCSE044)	Analyse the significance of independence and individual responsibility in the completion of challenging tasks (VCPSCSE045)	Evaluate behaviours and protective factors that contribute to the development of confidence, adaptability and self-reflection (VCPSCSE046)	Analyse how divergent values and beliefs contribute to different perspectives on social issues (VCPSCSO047)	Acknowledge the importance of empathy and the acceptance of diversity for a cohesive community and reflect on the effectiveness of strategies for being respectful of diversity and human rights (VCPSCSO048)	Investigate personal, social and cultural factors that influence the ability to experience positive and respectful relationships and explore the rights and responsibilities of individuals in relationships (VCPSCSO049)	Evaluate own and others contribution to group tasks, critiquing roles including leadership and provide useful feedback to peers, evaluate task achievement and make recommendations for improvements in relation to team goals (VCPSCSO050)	Develop specific skills and a variety of strategies to prevent or resolve conflict, and explore the nature of conflict resolution in a range of contexts (VCPSCSO051)
	Self evaluation and reflection activities				Throughout program		Throughout program	

Intercultural Capability							
7 and 8				9 and 10			
Cultural Practices		Cultural Diversity		Cultural Practices		Cultural Diversity	
Analyse the dynamic nature of own and others cultural practices in a range of contexts (VCICCB013)	Examine how various cultural groups are represented, by whom they are represented, and comment on the purpose and effect of these representations (VCICCB014)	Identify the challenges and benefits of living and working in a culturally diverse society (VCICCD015)	Evaluate the ways in which the community demonstrates the value it places on cultural diversity, and why this valuing of cultural diversity is important to the community (VCICCD016)	Analyse the complex and dynamic interrelationships between and within cultures in a range of contexts and the impact of these interrelationships on their own and others cultural practices (VCICCB017)	Analyse the ways in which intercultural relationships and experiences have contributed to the development of attitudes, beliefs and behaviours, and how they are manifested in various contexts (VCICCB018)	Identify and analyse the challenges and benefits of living and working in an interconnected and culturally diverse world (VCICCD019)	Analyse the components of a cohesive society, and the challenges, benefits and consequences of maintaining or failing to maintain that cohesion (VCICCD020)

Science 7-8

Science Understanding Strand

Science as a human endeavour		Biological sciences				Chemical sciences			
Scientific knowledge and understanding of the world changes as new evidence becomes available; science knowledge can develop through collaboration and connecting ideas across the disciplines and practice of science (VCSSU089)	Science and technology contribute to finding solutions to a range of contemporary issues; these solutions may impact on other areas of society and involve ethical considerations (VCSSU090)	There are differences within and between groups of organisms; classification helps organise this diversity (VCSSU091)	Cells are the basic units of living things and have specialised structures and functions (VCSSU092)	Interactions between organisms can be described in terms of food chains and food webs and can be affected by human activity (VCSSU093)	Multicellular organisms contain systems of organs that carry out specialised functions that enable them to survive and reproduce (VCSSU094)	Mixtures, including solutions, contain a combination of pure substances that can be separated using a range of techniques (VCSSU095)	The properties of the different states of matter can be explained in terms of the motion and arrangement of particles (VCSSU096)	Differences between elements, compounds and mixtures can be described by using a particle model (VCSSU097)	Chemical change involves substances reacting to form new substances (VCSSU098)
	Throughout program								

Earth and space sciences				Physical sciences			
Predictable phenomena on Earth, including seasons and eclipses, are caused by the relative positions of the Sun, Earth and the Moon (VCSSU099)	Some of Earth's resources are renewable, but others are non-renewable (VCSSU100)	Water is an important resource that cycles through the environment (VCSSU101)	Sedimentary, igneous and metamorphic rocks contain minerals and are formed by processes that occur within Earth over a variety of timescales (VCSSU102)	Change to an object's motion is caused by unbalanced forces acting on the object; Earth's gravity pulls objects towards the centre of Earth (VCSSU103)	Energy appears in different forms including movement (kinetic energy), heat, light, chemical energy and potential energy; devices can change energy from one form to another (VCSSU104)	Light can form images using the reflective feature of curved mirrors and the refractive feature of lenses, and can disperse to produce a spectrum which is part of a larger spectrum of radiation (VCSSU105)	The properties of sound can be explained by a wave model (VCSSU106)

Science Inquiry Skills Strand

Questioning and predicting	Planning and conducting		Recording and processing	Analysing and evaluating		Communicating
Identify questions, problems and claims that can be investigated scientifically and make predictions based on scientific knowledge (VCSIS107)	Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (VCSIS108)	In fair tests, measure and control variables, and select equipment to collect data with accuracy appropriate to the task (VCSIS109)	Construct and use a range of representations including graphs, keys and models to record and summarise data from students' own investigations and secondary sources, and to represent and analyse patterns and relationships (VCSIS110)	Use scientific knowledge and findings from investigations to identify relationships, evaluate claims and draw conclusions (VCSIS111)	Reflect on the method used to investigate a question or solve a problem, including evaluating the quality of the data collected, and identify improvements to the method (VCSIS112)	Communicate ideas, findings and solutions to problems including identifying impacts and limitations of conclusions and using appropriate scientific language and representations (VCSIS113)

Science 9-10

Science Understanding Strand

Science as a human endeavour			Biological sciences					Chemical sciences	
Scientific understanding, including models and theories, are contestable and are refined over time through a process of review by the scientific community (VCSSU114)	Advances in scientific understanding often rely on developments in technology and technological advances are often linked to scientific discoveries (VCSSU115)	The values and needs of contemporary society can influence the focus of scientific research (VCSSU116)	Multicellular organisms rely on coordinated and interdependent internal systems to respond to changes to their environment (VCSSU117)	An animal's response to a stimulus is coordinated by its central nervous system (brain and spinal cord); neurons transmit electrical impulses and are connected by synapses (VCSSU118)	The transmission of heritable characteristics from one generation to the next involves DNA and genes (VCSSU119)	The theory of evolution by natural selection explains the diversity of living things and is supported by a range of scientific evidence (VCSSU120)	Ecosystems consist of communities of interdependent organisms and abiotic components of the environment; matter and energy flow through these systems (VCSSU121)	All matter is made of atoms which are composed of protons, neutrons and electrons; natural radioactivity arises from the decay of nuclei in atoms (VCSSU122)	The atomic structure and properties of elements are used to organise them in the periodic table (VCSSU123)
	Links to technologies and their use								

Chemical sciences (continued)			Earth and space sciences			Physical sciences			
Chemical reactions involve rearranging atoms to form new substances; during a chemical reaction mass is not created or destroyed (VCSSU124)	Different types of chemical reactions are used to produce a range of products and can occur at different rates; chemical reactions may be represented by balanced chemical equations (VCSSU125)	Chemical reactions, including combustion and the reactions of acids, are important in both non-living and living systems and involve energy transfer (VCSSU126)	The theory of plate tectonics explains global patterns of geological activity and continental movement (VCSSU127)	Global systems, including the carbon cycle, rely on interactions involving the atmosphere, biosphere, hydrosphere and lithosphere (VCSSU128)	The Universe contains features including galaxies, stars and solar systems; the Big Bang theory can be used to explain the origin of the Universe (VCSSU129)	Electric circuits can be designed for diverse purposes using different components; the operation of circuits can be explained by the concepts of voltage and current (VCSSU130)	The interaction of magnets can be explained by a field model; magnets are used in the generation of electricity and the operation of motors (VCSSU131)	Energy flow in Earth's atmosphere can be explained by the processes of heat transfer (VCSSU132)	The description and explanation of the motion of objects involves the interaction of forces and the exchange of energy and can be described and predicted using the laws of physics (VCSSU133)

Science Inquiry Skills Strand

Questioning and predicting	Planning and conducting		Recording and processing	Analysing and evaluating		Communicating
Formulate questions or hypotheses that can be investigated scientifically, including identification of independent, dependent and controlled variables (VCSIS134)	Independently plan, select and use appropriate investigation types, including fieldwork and laboratory experimentation, to collect reliable data, assess risk and address ethical issues associated with these investigation types (VCSIS135)	Select and use appropriate equipment and technologies to systematically collect and record accurate and reliable data, and use repeat trials to improve accuracy, precision and reliability (VCSIS136)	Construct and use a range of representations, including graphs, keys, models and formulas, to record and summarise data from students' own investigations and secondary sources, to represent qualitative and quantitative patterns or relationships, and distinguish between discrete and continuous data (VCSIS137)	Analyse patterns and trends in data, including describing relationships between variables, identifying inconsistencies in data and sources of uncertainty, and drawing conclusions that are consistent with evidence (VCSIS138)	Use knowledge of scientific concepts to evaluate investigation conclusions, including assessing the approaches used to solve problems, critically analysing the validity of information obtained from primary and secondary sources, suggesting possible alternative explanations and describing specific ways to improve the quality of data (VCSIS139)	Communicate scientific ideas and information for a particular purpose, including constructing evidence-based arguments and using appropriate scientific language, conventions and representations (VCSIS140)

Technologies

Technologies – Design and Technologies 7-8

Technologies and Society		Technologies Contexts				Creating Designed Solutions				
Not applicable		Engineering principles and systems	Food and fibre production	Food specialisations	Materials and technologies specialisations	Investigating	Generating	Producing	Evaluating	Planning and managing
Examine and prioritise competing factors including social, ethical, economic and sustainability considerations in the development of technologies and designed solutions to meet community needs for preferred futures (VCDSTS043)	Investigate the ways in which designed solutions evolve locally, nationally, regionally and globally through the creativity, innovation and enterprise of individuals and groups (VCDSTS044)	Analyse how motion, force and energy are used to manipulate and control electromechanical systems when creating simple, engineered solutions (VCDSTC045)	Analyse how food and fibre are produced when creating managed environments and how these can become more sustainable (VCDSTC046)	Analyse how characteristics and properties of food determine preparation techniques and presentation when creating solutions for healthy eating (VCDSTC047)	Analyse ways to create designed solutions through selecting and combining characteristics and properties of materials, systems, components, tools and equipment (VCDSTC048)	Critique needs or opportunities for designing and investigate, analyse and select from a range of materials, components, tools, equipment and processes to develop design ideas (VCDSCD049)	Generate, develop and test design ideas, plans and processes using appropriate technical terms and technologies including graphical representation techniques (VCDSCD050)	Effectively and safely use a broad range of materials, components, tools, equipment and techniques to produce designed solutions (VCDSCD051)	Independently develop criteria for success to evaluate design ideas, processes and solutions and their sustainability (VCDSCD052)	Use project management processes to coordinate production of designed solutions (VCDSCD053)
Refine/Insight/ Define; Ideate; Prototype, Review					Inspiration activities, mood board	Prototyping	Prototyping	Prototyping		Throughout program

Technologies – Design and Technologies 9-10

Technologies and Society		Technologies Contexts				Creating Designed Solutions				
Not applicable		Engineering principles and systems	Food and fibre production	Food specialisations	Materials and technologies specialisations	Investigating	Generating	Producing	Evaluating	Planning and managing
Critically analyse factors, including social, ethical and sustainability considerations, that impact on designed solutions for global preferred futures and the complex design and production processes involved (VCDSTS054)	Explain how designed solutions evolve with consideration of preferred futures and the impact of emerging technologies on design decisions (VCDSTS055)	Investigate and make judgements on how the characteristics and properties of materials are combined with force, motion and energy to create engineered solutions (VCDSTC056)	Investigate and make judgements on the ethical and sustainable production and marketing of food and fibre (VCDSTC057)	Investigate and make judgements on how the principles of food safety, preservation, preparation, presentation and sensory perceptions influence the creation of food solutions for healthy eating (VCDSTC058)	Investigate and make judgements on how the characteristics and properties of materials, systems, components, tools and equipment can be combined to create designed solutions (VCDSTC059)	Critique needs or opportunities to develop design briefs and investigate and select an increasingly sophisticated range of materials, systems, components, tools and equipment to develop design ideas (VCDSCD060)	Apply design thinking, creativity, innovation and enterprise skills to develop, modify and communicate design ideas of increasing sophistication (VCDSCD061)	Work flexibly to safely test, select, justify and use appropriate technologies and processes to make designed solutions (VCDSCD062)	Evaluate design ideas, processes and solutions against comprehensive criteria for success recognising the need for sustainability (VCDSCD063)	Develop project plans to plan and manage projects individually and collaboratively taking into consideration time, cost, risk and production processes (VCDSCD064)
					Prototyping		Throughout program	Prototyping	Prototyping and Review stages	

Technologies

Technologies – Digital Technologies 7-8

Digital Systems	Data and Information				Creating Digital Solutions				
Investigate how data are transmitted and secured in wired, wireless and mobile networks (VCDTDS035)	Investigate how digital systems represent text, image and sound data in binary (VCDTDI036)	Acquire data from a range of sources and evaluate their authenticity, accuracy and timeliness (VCDTDI037)	Analyse and visualise data using a range of software to create information, and use structured data to model objects or events (VCDTDI038)	Manage, create and communicate interactive ideas, information and projects collaboratively online, taking safety and social contexts into account (VCDTDI039)	Define and decompose real-world problems taking into account functional requirements and sustainability (economic, environmental, social), technical and usability constraints (VCDTCD040)	Design the user experience of a digital system, generating, evaluating and communicating alternative designs (VCDTCD041)	Design algorithms represented diagrammatically and in English, and trace algorithms to predict output for a given input and to identify errors (VCDTCD042)	Develop and modify programs with user interfaces involving branching, iteration and functions using a general-purpose programming language (VCDTCD043)	Evaluate how well student-developed solutions and existing information systems meet needs, are innovative and take account of future risks and sustainability (VCDTCD044)
					Refine, Insight, Define; Storyboard	Possible - if a digital solution	Possible - if using electronics, programming, digital solutions	Possible - if it's a digital solution	Review/Reflect

Technologies – Digital Technologies 9-10

Digital Systems	Data and Information				Creating Digital Solutions				
Investigate the role of hardware and software in managing, controlling and securing the movement of and access to data in networked digital systems (VCDTDS045)	Analyse simple compression of data and how content data are separated from presentation (VCDTDI046)	Develop techniques for acquiring, storing and validating quantitative and qualitative data from a range of sources, considering privacy and security requirements (VCDTDI047)	Analyse and visualise data to create information and address complex problems, and model processes, entities and their relationships using structured data (VCDTDI048)	Manage and collaboratively create interactive solutions for sharing ideas and information online, taking into account social contexts and legal responsibilities (VCDTDI049)	Define and decompose real-world problems precisely, taking into account functional and non-functional requirements and including interviewing stakeholders to identify needs (VCDTCD050)	Design the user experience of a digital system, evaluating alternative designs against criteria including functionality, accessibility, usability and aesthetics (VCDTCD051)	Design algorithms represented diagrammatically and in structured English and validate algorithms and programs through tracing and test cases (VCDTCD052)	Develop modular programs, applying selected algorithms and data structures including using an object-oriented programming language (VCDTCD053)	Evaluate critically how well student-developed solutions and existing information systems and policies take account of future risks and sustainability and provide opportunities for innovation (VCDTCD054)
					Refine, Insight, Define; Storyboard	Possible - if a digital solution	Possible - if using electronics, programming, digital solutions	Possible - if it's a digital solution	

The Arts				
Visual Arts – Visual Communication Design 7-8				
Explore and Represent Ideas	**Visual Communication Design Practices**	**Present and Perform**	**Respond and Interpret**	
Explore and apply methods, materials, media, design elements and design principles to create and present visual communications (VCAVCDE001)	Use manual and digital drawing methods and conventions to create a range of visual communications (VCAVCDV002)	Develop and present visual communications for different purposes, audiences and in response to specific needs (VCAVCDP003)	Identify and describe the purpose, intended audience and context in a range of visual communications from different historical, social and cultural contexts (VCAVCDR004)	Identify and describe the use of methods, media, materials, design elements and design principles in visual communications from different historical, social and cultural contexts (VCAVCDR005)
Prototyping	Prototyping	Prototyping		

Visual Arts – Visual Communication Design 9-10					
Explore and Represent Ideas		**Visual Communication Design Practices**	**Present and Perform**	**Respond and Interpret**	
Develop and present visual communications that demonstrate the application of methods, materials, media, design elements and design principles that meet the requirements of a specific brief and target audience (VCAVCDE006)	Generate, develop and refine visual communication presentations in response to the brief (VCAVCDE007)	Use manual and digital drawing methods to create visual communications in the specific design fields of Environmental, Industrial and Communication Design (VCAVCDV008)	Develop a brief that identifies a specific audience and needs, and present visual communications that meet the brief (VCAVCDP009)	Analyse and evaluate the factors that influence design decisions in a range of visual communications from different historical, social and cultural contexts (VCAVCDR010)	Analyse and evaluate the use of methods, media, materials, design elements and design principles in visual communications from different historical, social and cultural contexts (VCAVCDR011)
		Prototyping			

The **Steampunk Gears & Cogs Design Challenge** will engage students in collaborative design and construction of props and costumes for an imaginary Steampunk-themed film titled Gears & Cogs. Students will work through the Innovation Process, in pairs or in small groups, to create a prop or a costume element for a fictional character Shelby Caples. This character does not have any predefined physical characteristics, and it is up to the students to imagine their personality and define how they might look through prop and costume design.