Muinín Catalyst STEAM Education for Sustainable Development and Futures Literacy

SGD9 Future of Space

Programme Phase 3: Implementation
Micro-Module 1: Space Design Challenge - Problem to Pitch

SUBJECT AREAS: Art and Design, Climate Action and Sustainable Development, Technology

MM7: Space Design Problem to Pitch

Phase 3 Implementation

Subject Areas: Art and Design, CPSE, Climate Action and Sustainable Development, Engineering, Technology, SPHE

Problem to Pitch is a core project-based learning module that can be adapted to any topic. It introduces students to the concept and process of Design Thinking; the cognitive, strategic and practical processes for creative problem solving.

Adapted for The Future of Space this module encourages students to engage and explore real-world space related problems and concerns in meaningful and tangible ways. The module encourages the development of 21st Century skills supporting students to keep up with the lightening pace of a constantly changing technologised world.

Design Thinking helps the students to understand that they can create their own future by enabling them to design their own experiences and participation. Using linked learning and systemic thinking with practical methods of learning, including inquiry and project-based methods, the activities support teachers and students to undertake projects that address contemporary issues on a local scale, in line with the Sustainable Development Goals, Space4SDGs and the 2030 agenda.

In this project-based learning module, the learner will...

- develop skills of organising, planning and scheduling
- develop awareness of the basics of Design-Thinking for problem-solving
- practice problem solving and critical thinking skills as individuals and part of a group
- be introduced to project management tools such as Lean Canvas, Logic models, 5Ws (who, what when, why where)
- Vision boards and a Pecha Kucha presentation

This module includes:

- Lesson plans
- Accompanying resources
- Project-specific worksheets related to specific goals and other project modules,
- Optional assessments Skill support resources

As a project support module, building core skills in circular design thinking, it is recommended this is undertaken before focusing on specific modules. The module is designed to work in tandem with the Space4SDGs and the Space Design Challenge Briefs

Further, the lessons can also be supported by working key aspects of with MM4 and MM5

Lesson 1: What is Design Thinking?
Design Thinking is the cognitive, strategic and practical process for creative problem-solving. This lesson will introduce students to the 5 stages of Design Thinking to build a foundational understanding of the process.

Resources: Introduction to Design Thinking, Stakeholder Mapping, Flipped Classroom

Lesson 2: Empathy 1
Stanford Design School's five-chairs exercise encourages students to learn how to develop design principles for a user profile. Students consider the 5 users' needs and develop ideas on paper and create 3D prototypes of their designs. This activity encourages students to iterate on their designs and practice using different materials.

Resources: User profiles worksheet, Empathy Map, Step into the Problem worksheet.

Lesson 3: Defining the Problem
In this lesson students will begin to understand how to define a problem. Students are asked to begin to identify a real problem they have wanted to address on a local or global level, using the SDGs as a starting theme. Students also have an opportunity to develop an awareness of a local problem

Resources: Define the Problem support sheet, Problem Tree worksheet

Lesson 4: Ideate, Generating and Remixing - Ideas
This lesson enables students to develop an understanding of the process of generating ideas starting with their personal experience and then moving into project themes.

Resources: Ideate Remix worksheet and Remix SWOT worksheet

Lesson 5: Ideate 2 Generating and Remixing Ideas 2.0 Good Idea / Bad Idea
This lesson builds on lesson 4 and enables students to develop an understanding of the importance of developing ideas and looking for opportunities to iterate and improve on existing ideas. Students are also introduced to Open Source concepts e.g. iteration and collaboration.

Lesson 6: Prototype Your Idea
In this lesson students will begin to consider their ideas for
prototyping, develop a concept statement and look at ways to prototype their ideas depending on their users / audience.

Resources: Rapid Response prototyping worksheet and Ready, Set, Design worksheet

Lesson 7: Test Your Idea
Evaluating an idea is a key aspect of Design Thinking. In this lesson students will begin the process of testing their ideas with potential users. Students will learn that this is not the end of

the process and that they may learn something that means they might need to return to an earlier stage e.g. Define or Ideate.

Resources: 5 Ws of Business planning, 8Ws Business planning, Lean Canvas and Zone Map

Model Development and Expertise: Dr Anita McKeown
Adaptations: Rebecca White

Using the Resources:
If you wish to use these resources, we can offer an induction and online support throughout the module to help you plan integration into your projects and timetable. To register for this option, please contact us e:hello@futurefocus21c.com

For more information on the resources please visit www.muinincatalyst.com

Setting up an online learning environment for the lessons on this module:
Our lessons integrate the use of virtual learning environments. To ensure seamless use of our lessons, a module should be setup o n your school's virtual learning environment such as Teams, Google Classroom, etc. Learners are encouraged to upload documents to share with their peers. If your virtual learning environment does not support document sharing, we recommend OneDrive or Google Drive.

You can also use Google Sites or Microsoft Sway to encourage learners to present their work over the year - this can easily be set up to reflect the aims of TY and provide a showcase for their work as well as an assessment tool.

Setting up a Canva Education account.
As our lessons integrate design, our lessons also refer to Canva. Educators and schools can a free Canva for Education account by registering here: https://www.canva.com/education/

Canva for Education provides primary and secondary school teachers and students with premium features and templates. You can then also set up lessons and invite your learners to the class.

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MM7: Space Design Problem to Pitch

Phase 3 Implementation

Lesson 1 What is Design Thinking?

Subject Areas: Art and Design, CPSE, Climate Action and Sustainable Development, Engineering, Technology, SPHE

Lesson Title and Summary: What is Design Thinking?

Design Thinking is a cognitive, strategic, and practical approach to creative problem-solving that enables individuals to tackle complex challenges in innovative ways. It involves understanding the needs of users, reframing problems, and brainstorming potential solutions through a human-centred lens. This problem-solving framework is widely used in various industries, from technology and product design to education and business, making it a highly relevant and versatile approach to mastering real-world challenges.

This lesson will introduce students to the five stages of the Design Thinking process—Empathise, Define, Ideate, Prototype, and Test—providing a foundational understanding of how to navigate these phases. By guiding students through each step, the lesson fosters both creative and analytical skills, helping them learn how to deeply understand a problem, generate multiple ideas, and refine solutions through iterative feedback.

Vocabulary: Empathy, Context, Culture, Qualitative, Users, Stakeholders

In this lesson, the learner will:

- be introduced to Design Thinking
- explore the 5 stages of Design Thinking create their own understanding of the
- stages through quick practical tasks
- work as pairs and individuals to begin to
- understand the iterative processes
- practice time management

Materials:

- Worksheet: Introduction to Design Thinking
- Worksheet: Flipped Classroom worksheet
- Worksheet: Stakeholder mapping activity
- Teacher's Guide: Stakeholder Mapping support
- Computers and internet access
- pens and paper
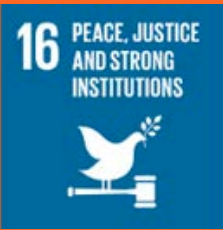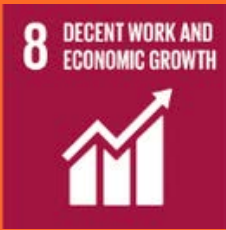
Activity Instructions

In preparation for this module, it would be useful to have the learners complete the Flipped Classroom activity, after this lesson as an introduction to the broader ideas behind this approach to developing and managing projects. This introduces key terms and concepts such as complexity, wicked problems and prepares them for a more circular approach to Design Thinking.

Activity 1 Introduction to Design Thinking (25 mins)

1. If working digitally share the worksheet: Introduction to Design thinking or this can also be projected. You can also circulate handouts and ask them to keep all their work in a folder to be assessed at the end of the module. The first activity completes the worksheet up to the section on Define.
2. Watch the short video 'What is Design Thinking? then have students working in pairs complete the activities in the worksheet: Introduction to Design Thinking, ask learners to find the meanings of the words and re-write them in their own words.
3. Have each pair share their meanings with the class, photograph or upload each groups answers to an e-classroom e.g. Microsoft Teams or Google Drive and use this to create a 'group' design thinking vocabulary list / glossary.
4. As a class discuss the 5 stages of Design Thinking image – reviewing any terms that are new.

Activity 2 Ideate Worst Idea Good Idea (25 mins)

1. Allow students 30 minutes for learners to complete the Ideate and Prototype task of the worksheet in pairs. Remind them that they will have to manage their time to allow for the prototyping and testing stage. The aim is not to create masterpieces but to work quickly and experimentally – it should be made clear that given the limitations, it's just to quickly show the idea in 3D.
2. If possible, ask learners complete the Flipped Classroom worksheet before the next lesson.

REFLECTIVE EXERCISE: 3-2-1

- Three things they feel they have learnt from the tasks
- Two things they found most interesting and would like to explore more
- One – their opinion they have about the tasks

Use Post-its or a mentimeter survey - www.mentimeter.com - to gather reflections

EXTENSION / REDUCTION ACTIVITIES

Reduction: For a shorter class remove Activity 2 and spend more time in building the collective vocabulary list – have each student type up their words and definition and add to a shared document

Extension: For a longer class give students more time and materials for the Ideate – Prototype stages of Design Thinking.

Option B :Learners could work through the Flipped Classroom worksheet rather than complete this at home

Option C: Learners could begin the worksheet: Stakeholder Mapping Scenarios and beginning working on the Design Scenarios as a way to develop skills that maybe of use to their fashion project.

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

What is Design thinking - Video - [1:57 mins] https://www.youtube.com/watch?v=a7sEoEvT8l8

Design thinking Mindsets - Applying Design Thinking in Schools poster
https://www.makersempire.com/design-thinking-for-schools-poster/

SDG Focus: MM7: Space Design SDG Challenges

- Introduction to SDGs for Young People https://www.un.org/sustainabledevelopment/youth/
- https://www.unoosa.org/oosa/en/ourwork/space4sdgs/index.html
- Explore the SDGs https://sdgs.un.org/

Local Trip / Expertise / Additional Work and Assessments

Stakeholder Mapping worksheet supports students to focus on fashion, its issues and its audience. This uses two Fashion Scenarios that supports learners to explore ideas and develop skills.

Linked learning: Communication Skills and Media Communication Skills micro-modules support the development of the 4Cs skills – Creativity, Communication, Critical Thinking and Collaboration.Tutors are encouraged to work with other tutors to develop the project through multiple outcomes such as video, poster, Pecha Kucha, Interviews or Podcasts and SDG 4 supporting Skills: Reports Writing - https://www.muinincatalyst.com/s-projects-basic

Space Stakeholder Mapping Worksheet

Facilitating the Stakeholder Mapping Activity - if you wish to undertake a stake holder mapping this could be extended into an additional lesson. This guide is designed to help teachers facilitate a stakeholder mapping activity in the context of a space project. The goal is to guide students through identifying and categorising stakeholders and understanding how to engage with them. Whether the focus is a pop-up store in a space tourism hub or a sustainable space technology show, this exercise can be applied to various contexts. By the end of this lesson, students should:

- Understand the concept of stakeholders and their role in project success.
- Learn how to map and categorise stakeholders by interest and influence.
- Develop strategies to communicate and engage with different stakeholders.

1. Introduction to Stakeholder Mapping

- Explain the Concept: Begin by introducing the concept of stakeholders: people or groups that are impacted by or can impact a project. Use simple, relatable examples (e.g., a sports event needing sponsors, venue owners, local government approval).
- Discuss the Space Scenarios: Introduce the two space project (pop-up store in a space tourism hub or a sustainable space technology show) and explain that fashion businesses also need to consider various stakeholders (e.g., designers, suppliers, customers).
- Class Engagement: Ask learners to think about what kinds of people or groups they think are important in space projects. Write these ideas on the board to create an initial list.

- **Launching a Space-Themed Pop-Up Store in a Space Tourism Hub**
    - Imagine you're launching a pop-up store that will be located in a space tourism hub, such as a spaceport or space-themed attraction. This store will sell space-related merchandise, apparel for space travellers, and collectibles celebrating space exploration.
    - You'll need to map out key stakeholders such as space tourism companies, local space enthusiasts, government regulators, potential investors, and international space organisations.

- **Stakeholder Mapping Prompt Questions:**

    - Who are the primary customers for the pop-up store?
    - Are they space tourists, local space enthusiasts, or the general public? What are their expectations for this store?
    - Which space tourism companies or organisations are involved in the area?
    - Are there partnerships or collaborations with companies like SpaceX, Blue Origin, or Virgin Galactic that could be valuable?
    - What regulatory bodies oversee commercial activities in this space tourism hub?
    - Are there any local, national, or international regulations that you need to consider, such as space commerce laws or licensing?

- What type of support do you need from local authorities or spaceport operators?
- Do you need permissions, space allocations, or security clearances to operate within the hub?

2. Organising a Sustainable Space Technology Show Featuring Innovative Space Designers

- You are organising a sustainable space technology show, focusing on eco-friendly innovations for space exploration. The show will feature local designers and engineers showcasing sustainable spacecraft materials, energy-efficient space habitats, and other green technologies for space missions.
- Stakeholder mapping for this challenge would include aerospace companies, sustainable technology advocates, space agencies, space startups, environmental organisations, and tech investors.
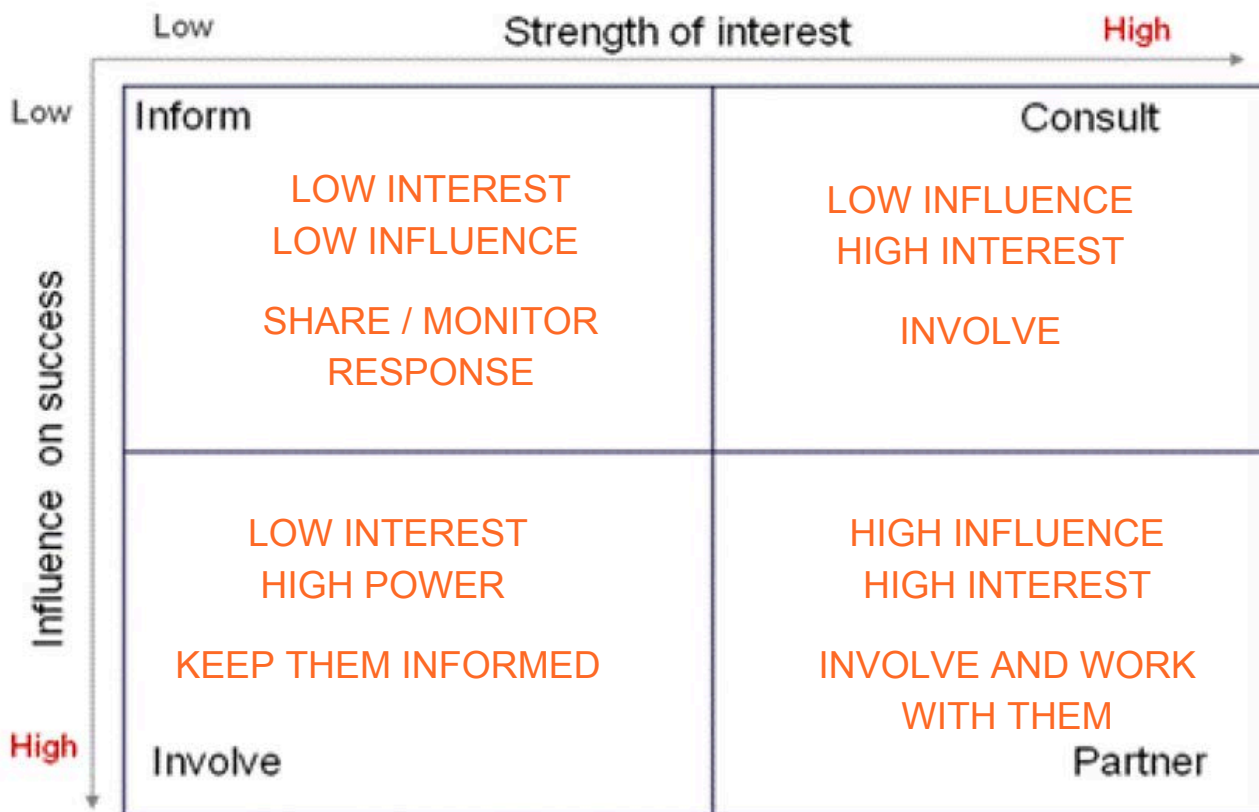
Stakeholder Mapping Prompt Questions:

- Who are the key designers, engineers, or companies focused on sustainable space technologies?
- Which individuals or organisations are leading the way in developing green technology for space missions?
- What space agencies or organisations should be involved?
- How can you engage NASA, ESA, or other space agencies to showcase their sustainability efforts or endorse the event?
- What investors or venture capitalists are interested in sustainable space technologies?
- Are there any venture funds or investors with a focus on green technology in space exploration who may want to attend or support the event?
- Which environmental or sustainability-focused organisations might want to participate?
- Can you collaborate with organisations advocating for sustainability, even those outside of the space industry?
- What is the role of government or international space organisations in this event?
- Are there regulations or governmental bodies that need to be involved? How do they impact sustainable space initiatives?
- How can the local space-tech community or universities contribute?
- Are there any academic researchers or local startup incubators focused on sustainability in space exploration?
- What are the media and public relations opportunities for promoting sustainability in space?
- Which space and environmental media outlets should you target to maximise exposure and public awareness?
- What technologies or materials are most pressing in space sustainability?
- What specific innovations (e.g., recyclable spacecraft materials, solar-powered space stations) should be highlighted to engage stakeholders?

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2. Explanation of the Stakeholder Grid (5-10 minutes)

- Walk through the Grid: Introduce the four quadrants of the stakeholder grid:
- High Interest / High Influence: Involve these stakeholders closely.
- Low Interest / High Influence: Keep these stakeholders informed but not overly engaged.
- High Interest / Low Influence: Engage these stakeholders but don't rely on them for big decisions.
- Low Interest / Low Influence: Monitor these stakeholders but minimal engagement is needed.
- Real-world Example: Use a real or hypothetical fashion example (e.g., a pop-up store needing engagement from local fashion influencers, customers, and textile suppliers) to illustrate how stakeholders might fit into the grid.

	Strength of interest	
	Low	High
Low	**Inform** LOW INTEREST LOW INFLUENCE SHARE / MONITOR RESPONSE	**Consult** LOW INFLUENCE HIGH INTEREST INVOLVE
High	**Involve** LOW INTEREST HIGH POWER KEEP THEM INFORMED	**Partner** HIGH INFLUENCE HIGH INTEREST INVOLVE AND WORK WITH THEM

(Vertical axis label: Influence on success)

Once stakeholders are categorised, tailor your communication and engagement strategies for each group. For example:

- High Influence / High Interest: Collaborate directly with key partners like ethical textile suppliers or media platforms to shape your project's direction.
- Low Influence / Low Interest: Provide updates to stakeholders like local community members or tangential industry organisations through newsletters or passive communication.

By mapping out these relationships, you can prioritise where to focus your efforts for maximum impact in launching and growing your fashion business.

3. Scenario Setup and Group Work (20-30 minutes)

- Return to the Scenarios offered:
    - Launching a Space-Themed Pop-Up Store in a Space Tourism Hub
    - Organising a Sustainable Space Technology Show Featuring Innovative Space
    - Designers

- Split the students into small groups and assign each group one of the scenarios.

- Worksheet Activity: Ask the groups to:
    - Identify stakeholders specific to their selected scenario.
    - Place all the stakeholders into the four quadrants of the grid (Interest vs. Influence).
    - Discuss and note down strategies for communicating and engaging with each group.

4. Group Presentations & Discussion (15-20 minutes) - also possible assessment activity

- Group Presentations: Have each group present their stakeholder map to the class. Encourage them to explain why they categorised stakeholders as high or low interest/influence and how they would communicate with them.
- Class Discussion: After each presentation, engage the class in discussing:
    - Were any stakeholders missed?
    - Would they place any stakeholders in different quadrants?
    - How would their communication strategies vary for different stakeholders?

5. Wrap-Up and Reflection (5-10 minutes)

- Summary: Recap the importance of understanding stakeholders in any project and how this applies to the fashion industry, emphasizing the key takeaway that different stakeholders need different types of engagement based on their interest and influence.
- Reflection: Ask students to think about other projects (either in fashion or other areas) where they could use stakeholder mapping. How might this process help them think more critically about project success?
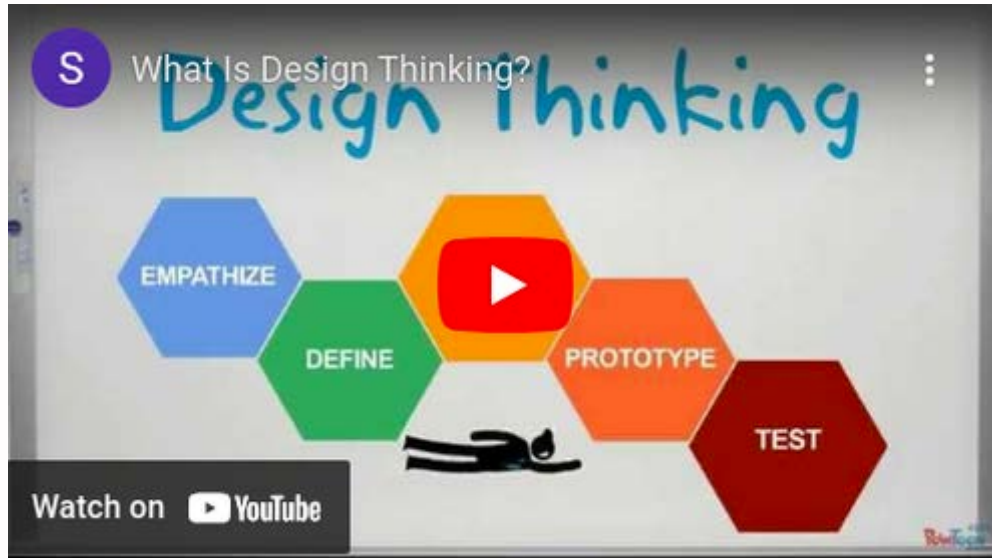
Additional Teacher Tips

- Adaptation: If students struggle with fashion-related examples, allow them to reference more familiar projects (e.g., a school event) before guiding them back to the space project.
- Subject Integration: You don't need to be a fashion expert! Encourage students to think critically, ask questions, and come up with creative ideas. Emphasise skills like communication, problem-solving, and collaboration—which are relevant across subjects.

Further Extensions / Assessment possibilities: If time permits, consider extending the project:
    - Deeper Research: Ask students to research actual stakeholders in the space industry and revise their maps.
    - Pitch Presentation: Have students create a mock pitch to one of their high-interest, high-influence stakeholders, explaining how their project would benefit that group.
    - Participation: Assess students' engagement during group work and class discussions.
    - Presentation: Use group presentations to assess understanding

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WHAT IS DESIGN THINKING?

https://www.youtube.com/watch?v=a7sEoEvT8l8

Working in pairs google these words (or use a dictionary) to find out what they mean and re-write the definitions in your own words

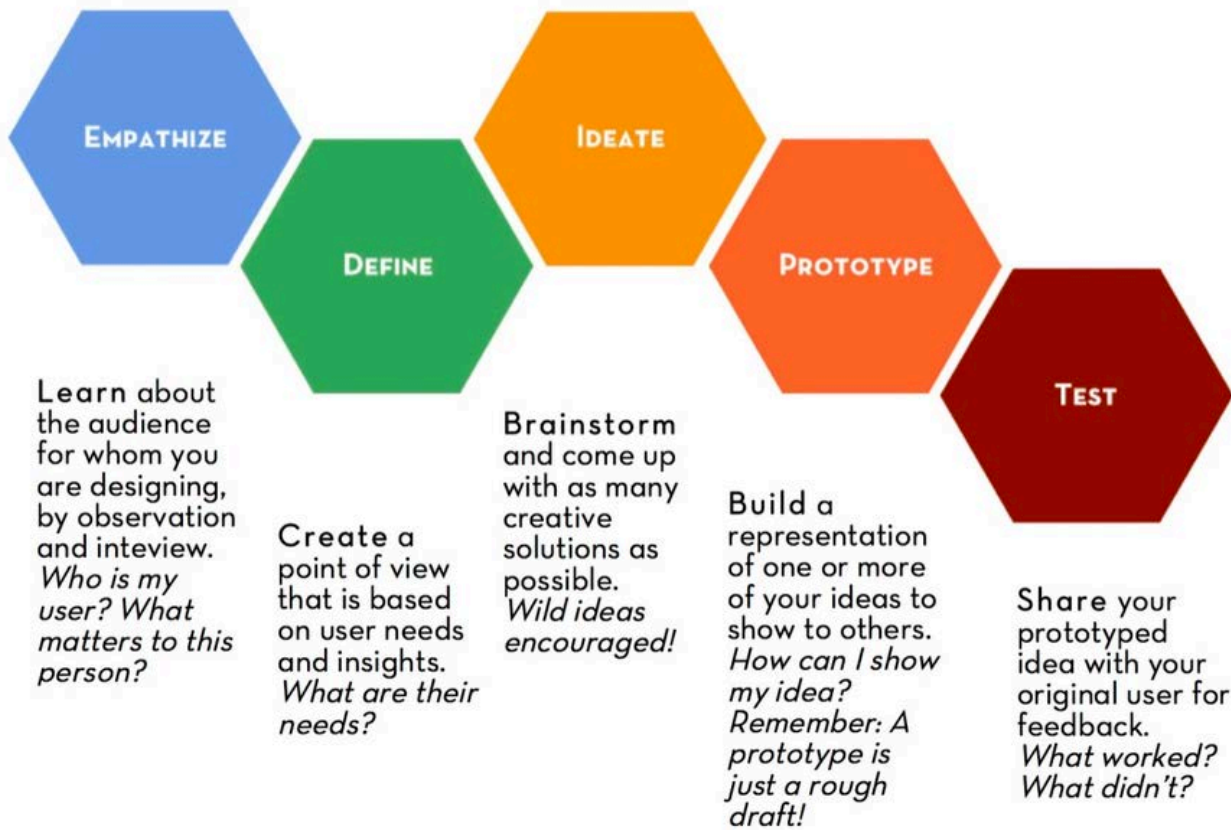1. Ergonmic -

2. Context -

3. Culture -

4. Stakeholders -

Your answers will be shared with the class to build a vocabulary list and definitions - this is called a glossary

The 5 stages of Design Thinking:

EMPATHIZE

Learn about the audience for whom you are designing, by observation and inteview. *Who is my user? What matters to this person?*

DEFINE

Create a point of view that is based on user needs and insights. *What are their needs?*

IDEATE

Brainstorm and come up with as many creative solutions as possible. *Wild ideas encouraged!*

PROTOTYPE

Build a representation of one or more of your ideas to show to others. *How can I show my idea? Remember: A prototype is just a rough draft!*

TEST

Share your prototyped idea with your original user for feedback. *What worked? What didn't?*

Before you start to work on your problem or project have a look at each stage and see what you need to think about in any project. You will also have to manage your time as the last three tasks will take more time.

Empathise - Most projects will involve people at some point. What might you need to think about - Discuss with your partner and write down 3 things that might matter to a user / audience member

1.

2.

3.

Define - What's your problem? Often we deal with symptoms - a runny nose, a sore throat but we need to deal with our immune system. In defining your problem you will look at the whole system. Write down 3 problems you know of in your community or the world.

1.
2.
3.

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The 5 stages of Design Thinking:

Ideate - This is the stage in the process to think about as many ideas as possible. For now, write down the 2 worst ideas you can think of - swap them with your partner and try to create three good ideas from each others bad ideas.
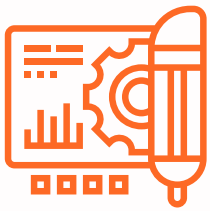
Bad Ideas.   Good Ideas

1   1.

2.   2.

Prototype- using only 1 piece of paper build or make one of the good ideas above. You will have to be creative, how will you make the shapes; folding, tearing? If you are to fix it together, how might you do this - links, cutting, what other ways of joining things together can you experriment with?

Remember: There is no right answer this is about experimentation - have fun.

Test - The final stage is testing. In this stage you learn about the product, service or idea you have created . Share your 'good idea' prototype with your partner and they will share with you.

Things to discuss / consider:

Test - The final stage is testing. In this stage you learn about the product, service or idea you have created . Share your 'good idea' prototype with your partner and they will share with you.

Things to discuss / consider and questions to ask:

1. Who might the user be?
2. Look at how it is made - remember there were limits to materials so you are looking at their problem solving and creativity.
3. Is there anything they could try to make it better or improve it using the materials they had?
4. How might you explore the idea further if time and materials were not a limit?

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Stakeholder Mapping

Usually, you will start this by having your decision challenge at the centre of your mapping, in this instance, this will be on one of the Space focused Scenarios below. These challenges align with space exploration with a sustainability focus, and will require careful identification of both space-related and environmentally focused stakeholders.

1. **Launching a Space-Themed Pop-Up Store in a Space Tourism Hub**
   - Imagine you're launching a pop-up store that will be located in a space tourism hub, such as a spaceport or space-themed attraction. This store will sell space-related merchandise, apparel for space travelers, and collectibles celebrating space exploration.
   - You'll need to map out key stakeholders such as space tourism companies, local space enthusiasts, government regulators, potential investors, and international space organisations.

2. **Organising a Sustainable Space Technology Show Featuring Innovative Space Designers**
   - You are organising a sustainable space technology show, focusing on eco-friendly innovations for space exploration. The show will feature local designers and engineers showcasing sustainable spacecraft materials, energy-efficient space habitats, and other green technologies for space missions.
   - Stakeholder mapping for this challenge would include aerospace companies, sustainable technology advocates, space agencies, space startups, environmental organisations, and tech investors.

Once you select your scenario, In small groups or as a class create a list of all the different individuals, groups, or organisations that you can begin to identify and categorise who you might need to discuss or share your project with. Use the questions below to help you .

1. Launching a Space-Themed Pop-Up Store in a Space Tourism Hub to sell space-related merchandise and apparel. Stakeholder Mapping Prompt Questions:

- Who are the primary customers for the pop-up store?
- Are they space tourists, local space enthusiasts, or the general public? What are their expectations for this store?
- Which space tourism companies or organizations are involved in the area?
- Are there partnerships or collaborations with companies like SpaceX, Blue Origin, or Virgin Galactic that could be valuable?
- What regulatory bodies oversee commercial activities in this space tourism hub?
- Are there local, national, or international regulations that you need to consider, such as space commerce laws or licensing?
- What type of support do you need from local authorities or spaceport operators?
- Do you need permissions, space allocations, or security clearances to operate within the hub?

- What suppliers or designers can provide the products for your store?
- Are there partnerships with manufacturers or designers focused on space-related apparel and merchandise?
- What media outlets or influencers focus on space tourism or exploration?
- How can you leverage these outlets to promote your store? Who has influence over the space tourism community?
- Are there any environmental concerns or sustainability requirements to consider?
- How can you ensure that your store adheres to eco-friendly practices, especially given the potential scrutiny of space-related activities?

2. Organising a Sustainable Space Technology Show Featuring Innovative Space Designers
   Stakeholder Mapping Prompt Questions:

- Who are the key designers, engineers, or companies focused on sustainable space technologies?
- Which individuals or organizations are leading the charge in developing green technology for space missions?
- What space agencies or organizations should be involved?
- How can you engage NASA, ESA, or other space agencies to showcase their sustainability efforts or endorse the event?
- What investors or venture capitalists are interested in sustainable space technologies?
- Are there venture funds or investors with a focus on green technology in space exploration who may want to attend or support the event?
- Which environmental or sustainability-focused organizations might want to participate?
- Can you collaborate with organizations advocating for sustainability, even those outside of the space industry?
- What is the role of government or international space organizations in this event?
- Are there regulations or governmental bodies that need to be involved? How do they impact sustainable space initiatives?
- How can the local space-tech community or universities contribute?
- Are there academic researchers or local startup incubators focused on sustainability in space exploration?
- What are the media and public relations opportunities for promoting sustainability in space?
- Which space and environmental media outlets should you target to maximize exposure and public awareness?
- What technologies or materials are most pressing in space sustainability?
- What specific innovations (e.g., recyclable spacecraft materials, solar-powered space stations) should be highlighted to engage stakeholders?
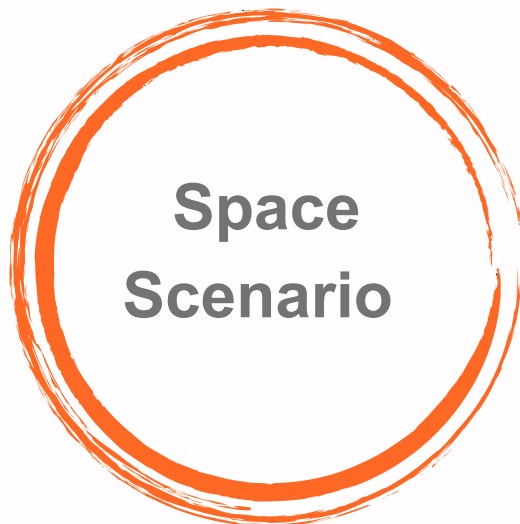
Use the diagram on the next page to think about and organise your list of stakeholders and how you will need to communicate and engage with them, as they will have a wide range of perspectives and use different media for gathering information e.g. print, audio, social media.
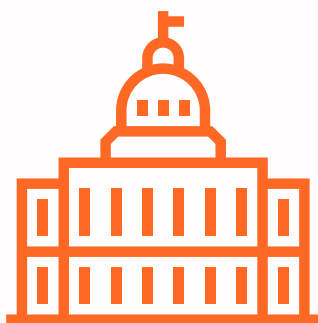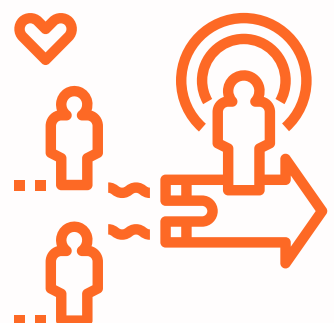
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SERVICES / PROVIDERS

USERS / BENEFICIARIES

Space Scenario

GOVERNANCE
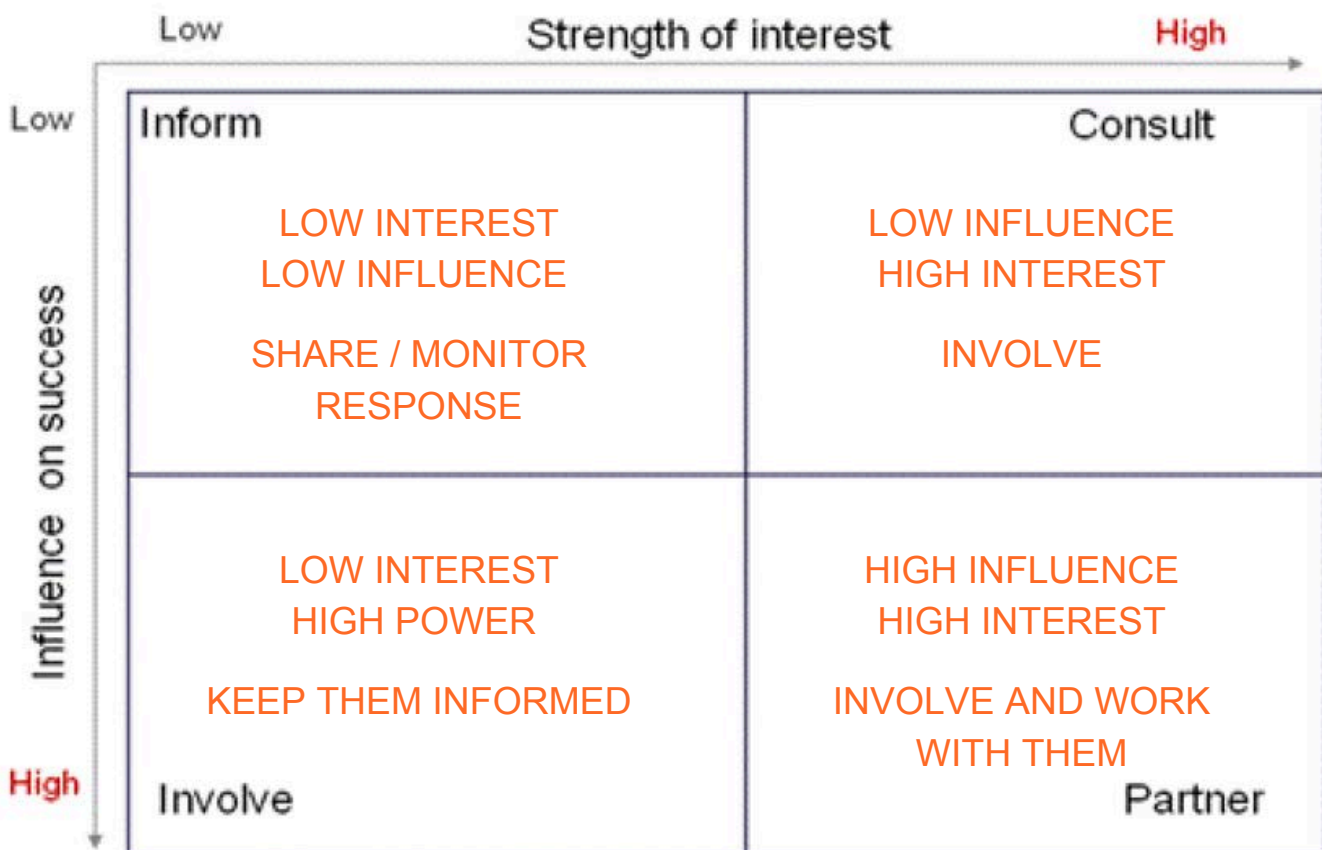
INFLUENCERS

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

CREATE STAKEHOLDER INTEREST VS. INFLUENCE MATRIX

You can also use the grid below to organise the stakeholders by their interest and influence on the project:

- High Interest / High Influence: Large buyers, fashion media, or industry regulators. These should be involved closely.
- Low Interest / High Influence: Investors or textile associations. They have power but may need just updates rather than active involvement.
- High Interest / Low Influence: Local designers or sustainable fashion enthusiasts, who may be deeply interested but not significantly influential.
- Low Interest / Low Influence: Broader public or peripheral community members—monitor and engage with them as needed.

	Low — Strength of interest — High	
Low — Influence on success — **High**	**Inform** LOW INTEREST LOW INFLUENCE SHARE / MONITOR RESPONSE	**Consult** LOW INFLUENCE HIGH INTEREST INVOLVE
	Involve LOW INTEREST HIGH POWER KEEP THEM INFORMED	**Partner** HIGH INFLUENCE HIGH INTEREST INVOLVE AND WORK WITH THEM

Once stakeholders are categorised, tailor your communication and engagement strategies for each group. For example:

- High Influence / High Interest: Collaborate directly with key partners like ethical textile suppliers or media platforms to shape your project's direction.
- Low Influence / Low Interest: Provide updates to stakeholders like local community members or tangential industry organizations through newsletters or passive communication.

By mapping out these relationships, you can prioritise where to focus your efforts for maximum impact in launching and growing your fashion business.

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Learning about Complexity

Wht are systems complex? https://www.youtube.com/watch?v=3ZpNZbLQ8Ik

What is a Wicked Problem (Rittel, 1973)?

What is a wicked problem https://www.youtube.com/watch?v=lOKpB4KtUZ8

Watch the video and give 4 qualities of a wicked problem.

1.
2.
3.
4.

Climate Change is a Wicked Problem
https://www.youtube.com/watch?v=XRoCxS6n53U

How can Design Thinking help with wicked Problems?
 https://www.youtube.com/watch?v=WrdSkqRypsg

Watch both the videos above and give 3 areas you might use Design Thinking to work on an aspect of Sustainable Fashion

MM7: Problem to Pitch - Space Design

Phase 3 Implementation

Lesson 2 Design Thinking Stage 1 Empathy

Subjects: Art and Design, Climate Action and Sustainable Development, Technology

Lesson Title and Summary: Design Thinking Stage 1 Empathy

Stanford Design School's five chairs exercise encourages students to learn how to develop design principles for a user profile. In this adaptation of this activity, focused on the individual's technology needs in space, Learners will consider the 5 users needs (this sets the design principles) and develop ideas on paper and create 3D prototypes of their technological designs.

This activity encourages students to consider users needs, iterate their designs and practice using different materials.

Vocabulary: Assumptions, (Biases, Judgement) Design Principles, Empathy, Identify, Immersion

In this lesson, the learner will:

- understand empathy in design
- develop critical thinking through the practical tasks of asking students to analyse their user's profile to find their needs.
- build, test and iterate design ideas grounded in a user's needs and a specific context.
- practice group work and develop the ability to work through design challenges collaboratively

Materials:

- Worksheet: Designing for User's Needs
- Worksheet: Empathy Map
- Teacher's Guide: Designing for User's Needs
- Pens, pencils
- Paper
- Scissors
- Corrugated Cardboard
- Fabric scraps
- Pipe Cleaners
- Modelling Clay
- Tape
- Match sticks or toothpicks
- Magazines

Activity Instructions

Activity 1 Developing design principles from user profiles (15 mins)

1. Organise students into groups of 2 or 4
2. Introduce the lesson and the importance of empathy in design
3. Hand out the worksheet: Designing for User's Needs, one per group
4. Explain the task to the students and the groups, which is to read each of the user profiles on the worksheet and underline the key points / needs of the users. Explain these are the design principles
5. Learners will develop these design principles (rules / needs) for the users' needs based on the needs of the user, in this instance a technological need while living in space

Activity 2 – Developing paper designs – (15 mins)

1. Have learners select two users they wish to work on and identify two needs (design principles) they see in the description of their selected user
2. Learners will develop design ideas on paper for two of the users, integrating the users' needs (design principles).
3. Learners could also use cut-outs from magazines and notes to show their ideas.
4. As you circulate, ask questions or use the empathy map to expand the learners' understanding e.g.

   - Did you identify the design principles required for your user?
   - Did you make any assumptions about your user?
   - Did you discover any biases / judgments about your user that you might have?

Activity 3 – Develop a 3D prototype – (25 mins)

1. Learners will select one of their 2 paper designs and build a 3D prototype using the materials provided.
2. Learners will build two design principles (needs) into their prototype
3. Learners will add one more design principle - this is to try to reflect your own style as a designer, if your goal is to create something delightful/cool for your user
4. Include further discussion – see media box

REFLECTIVE EXERCISE: 3-2-1

- Three things they feel they have learnt from the tasks
- Two things they found most interesting and would like to explore more
- One – their opinion they have about the tasks

Use Post-its or a mentimeter survey - www.mentimeter.com - to gather reflections

EXTENSION / REDUCTION ACTIVITIES

Reduction: For a shorter class select a user and profile randomly - make paper designs only for that user. Follow up with 3D designs in secondary class

Extension: For a longer class, start the class with one of the videos on empathy and include a discussion on both activities. Learners could also explore their users more using the empathy map and create a vision board - see also lesson 6 and 7 .

If learners have space project themes in mind they could also begin to develop user profiles based on their stakeholder mapping from lesson 1 and the worksheet: empathy map to build up greater understanding of their user's / stakeholder's needs.

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

- Design Thinking - Empathise [4:18 mins] https://www.youtube.com/watch?v=q654-kmF3Pc
- The importance of Empathy [3:03. mins] https://www.youtube.com/watch?v=UzPMMSKfKZQ
- Empathy Mapping [5:36 mins] https://www.youtube.com/watch?v=QwF9a56WFWA
- Empathy not Sympathy [2:33 mins] https://www.youtube.com/watch?v=HznVuCVQd10

Using worksheet: Empathy maps to develop for users profiles - activity 2

Activity 3 Design discussion questions:

- What was it like to create your designs using the design principles you identified?
- What was it like to create different iterations of your design?
- What did you change along the way? What did you learn from your prototypes?
- Did anyone get stuck at any point? What was that like? What did you do to get unstuck?
- Which material did you enjoy working with the most? Why?
- Which material did you ilke the least? Why?
- Which material best expresses the essence of the design you developed?

Local Trip / Expertise / Additional Work and Assessments

Learners can use one of the scenarios from lesson 1, stakeholder mapping activity and develop an empathy map for potential users. This can be expanded in later lessons using the mood boards / vision board and linked to activities in other modules e.g. MM2 and MM4, designing for inclusion.

Linked learning: Media Communication Skills micro-modules e.g. Future of Innovation MM7: 1 - 4 support the development for the 4Cs skills - Creativity, Communication, Critical Thinking and Collaboration and activities can be linked to the various micro-modules e.g. create a space video or a research poster or presentation on as aspects of the commercialisation of Space - see MM4 Space Innovation and Enterprise

adapted from Standford Design's 5 chairs Design Thinking exercise https://dschool.stanford.edu/resources/the-5-chair-challenge

Key needs that are linked to information in the profiles that could engage / support learners

1. Marge Simpson, 36, Space Habitat Manager

Marge is responsible for overseeing the general upkeep of the space habitat, ensuring all systems are functioning smoothly. She needs reliable tools and technology to monitor and maintain life support systems, energy use, and other critical habitat operations. Marge also focuses on ensuring the safety and well-being of the habitat's residents.

Key Needs:
- Centralised monitoring system: A user-friendly interface to track air quality, water filtration, energy consumption, and waste management across the habitat.
- Automated maintenance alerts: A system that identifies issues in real-time and sends alerts about necessary repairs or maintenance tasks.
- Resource management tools: Efficient tools for managing the use and recycling of limited resources, ensuring sustainability in the habitat.

2. Homer Simpson, 39, Spacecraft Maintenance Technician
Homer is responsible for the maintenance and repair of spacecraft docked at the habitat. He needs advanced tools to manage regular system check-ups, diagnose problems, and perform repairs, all while adhering to safety protocols. Given the demanding nature of his job, Homer also values technology that helps simplify complex tasks.

Key Needs:
- Automated diagnostic tools: Portable devices that quickly identify mechanical or technical issues in spacecraft systems.
- Multi-functional repair tools: A versatile toolkit that adapts to various spacecraft materials and systems, reducing the need to carry multiple devices.
- Hands-free augmented reality (AR) guidance: AR-enabled glasses that provide step-by-step repair instructions while keeping his hands free to work.

3. Bart Simpson, 10, Aspiring Space Explorer
Bart loves tinkering with the technology in the space habitat, often taking things apart to understand how they work. He needs access to educational and maintenance tools that allow him to safely explore his curiosity without causing harm to critical systems. He also enjoys contributing to minor maintenance tasks under supervision.
Key Needs:
- Interactive repair training module: A kid-friendly system that teaches basic space habitat maintenance, with gamified tasks and virtual rewards for completion.
- Safety-locked maintenance tools: Tools with safety features that prevent accidental misuse or damage while allowing him to experiment with real systems.
- Supervised repair tasks: A guided interface where Bart can safely assist with small, approved maintenance tasks under adult supervision.

4. Lisa Simpson, 8, Space Student and Technology Advocate

Lisa is passionate about technology and sustainability, especially in space. She i
participate in maintaining the habitat's systems and learning about sustainable space
technology. She needs tools that allow her to monitor and analyse the habitat's systems,
focusing on energy efficiency and resource conservation.

Key Needs:

- Energy monitoring dashboard: A tool that allows her to track the habitat's energy usage and see how adjustments can increase efficiency.
- Sustainability analysis tools: Sensors and systems that measure resource consumption and waste production, allowing her to suggest improvements for sustainability.
- Collaborative tech development: A platform where she can collaborate with engineers to test and implement new, eco-friendly technologies within the habitat.

5. Abe "Grampa" Simpson, 83, Retired Space Pioneer

Abe has been through many space missions in his younger years, and now he enjoys tinkering
with small repairs around the habitat in his spare time. However, due to his age, he requires
maintenance tools that are simple, easy to use, and safe for elderly hands. He values classic
technology but is open to newer, more efficient tools that help him stay involved.

Key Needs:

- Simplified repair tools: Ergonomic, easy-to-handle tools with large, clearly labeled controls for ease of use.
- Voice-activated assistance: A system that uses voice commands to activate maintenance devices or provide instructions, helping him avoid complex manual tasks.
- Memory-aid technology: A system that records his maintenance activities and reminds him of what still needs to be done, preventing repeat or missed tasks.

6. Maggie Simpson, 1, Curious Space Baby

Though too young to actively participate in habitat maintenance, Maggie's safety depends on
the proper functioning of technology around her. Her parents need tools and systems that keep
her safe from hazards while maintaining the habitat. Additionally, technology should help them
manage her needs efficiently in a space environment.

Key Needs:

- Childproofing safety technology: A system that detects when Maggie approaches potentially dangerous areas (e.g., airlocks, machinery) and triggers alarms or locks.
- Automated care systems: Tools that help with day-to-day baby care in space, such as a robot-assisted feeding or changing system, allowing her parents to multitask.
- Environmental sensors: Monitors that ensure the temperature, humidity, and oxygen levels in her sleeping and play areas are optimal and safe.

adapted from Standford Design's 5 chairs Design Thinking
exercise https://dschool.stanford.edu/resources/the-5-chair-challenge

This exercise highlights 5 users each with different needs, you will identify the users' needs to develop the design principles, which are then used to create a paper design and if time allows a 3D 'prototype'.

What do you notice about their needs?
Read each of the user profiles and underline the important points of each of the user's needs - the clues are in the descriptions. Think about designs ideas for tools and technology to meet their needs.

Marge Simpson, 36, Space Habitat Manager
Marge is responsible for overseeing the general upkeep of the space habitat, ensuring all systems are functioning smoothly. She needs reliable tools and technology to monitor and maintain life support systems, energy use, and other critical habitat operations. Marge also focuses on ensuring the safety and well-being of the habitat's residents.

Think about monitoring systems, alert systems and resource mangement

Image: Download Clipart Marge Simpson Png

Homer Simpson, 39, Spacecraft Maintenance Technician
Homer is responsible for the maintenance and repair of spacecraft docked at the habitat. He needs advanced tools to manage regular system check-ups, diagnose problems, and perform repairs, all while adhering to safety protocols. Given the demanding nature of his job, Homer also values technology that helps simplify complex tasks.

Think about diagnostic tools, hands free tools / technology, repair tools

Image: https://clipground.com/images/homer-simpson-clipart-free-4.png

Bart Simpson, 10, Aspiring Space Explorer
Bart is a playful, mischievous kid who spends his time skateboarding, avoiding homework and loves tinkering with the technology in the space habitat, often taking things apart to understand how they work. He needs access to educational and maintenance tools that allow him to safely explore his curiosity without causing harm to critical systems. Marge tries to involve him in minor maintenance tasks but he needs constant supervision.

Think about gamified interactive educational tools that teach about maintenance and repair , safety locked tools

*Image: https://clipart-library.com/image_gallery2/Bart-Simpson-Transparent.png*

Lisa Simpson, 8, Space Student and Technology Advocate

Lisa is passionate about technology and sustainability, especially in space. She is eager to participate in maintaining the habitat's systems and learning about sustainable space technology. She needs tools that allow her to monitor and analyse the habitat's systems, focusing on energy efficiency and resource conservation.

Think about energy and water monitoring, collaboration with engineers for testing or analysis of sustainability

Image: Stanford D School 5 Chairs activity
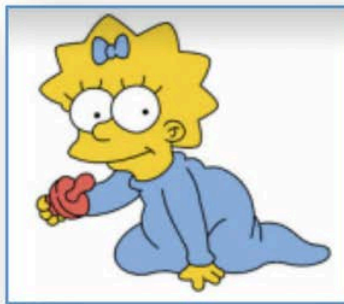
Maggie Simpson, 1, Curious Space Baby

Maggie 1, is an active and curious baby who spends most of her time crawling, exploring, and playing. Though too young to actively participate in habitat maintenance, Maggie's safety depends on the proper functioning of technology around her. Her parents need tools and systems that keep her safe from hazards while maintaining the habitat. Additionally, technology should help them manage her needs efficiently in a space environment.

Think about safety and gravity as well as technology checking and perhaps robotic care

Image: Stanford D School 5 Chairs activity

Abe "Grampa" Simpson, 83, Retired Space Pioneer

Abe, 83 is retired and enjoys a slower pace of life. He has been through many space missions in his younger years, and now he enjoys tinkering with small repairs around the habitat in his spare time. However, due to his age, he requires maintenance tools that are simple, easy to use, and safe for elderly hands. He values classic technology but is open to newer, more efficient tools that help him stay involved.

Think about easy to handle or voice activated tools or memory support

Empathy in Design

Image: Stanford D School 5 Chairs activity

Empathy is the ability to put your self in someone else's shoes. It is important to use empathy within design otherwise our designs will not be useful. In a world with limited resources sustainable design must make sure that designs are not wasting valuable resources because they don't work and there was no engagement with the user.

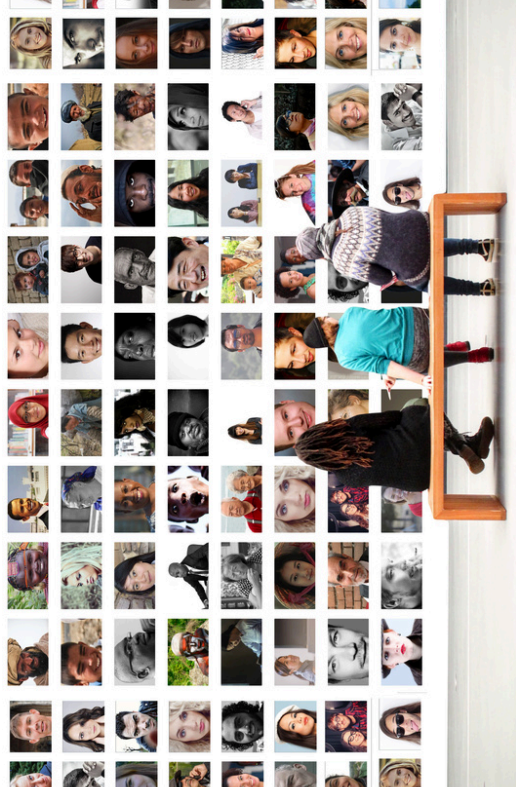## MM7 2WSB USER EMPATHY MAP - EMPATHY MAP

Walking in someone else's shoes

What does your user think and feel?

- What really matters to them?
- What do they think about?
- What are their worries, dreams or aspirations?

What does your user see?

- What sort of views might your user see?
- Where might they shop for food / clothes?
- What might ideas or trends might they notice?

SEE

THINK AND FEEL

WHAT DO THEY SAY AND DO

HEAR

What sort of things does your user hear / listen to?

- Where does your user get their information?
- Who might your user listen to or be influenced by?

- What other things might your user do?
- What other things are they interested in?

MM7: Problem to Pitch - Space Design

Phase 3 Implementation

Lesson 3 Design Thinking Stage 2 Define

Subject Areas: Art and Design, CPSE, Climate Action and Sustainable Development, Engineering, Technology, SPHE

Lesson Title and Summary: Design Thinking Stage 2 Define

In this lesson, learners will begin to understand how to define a problem. Learners are asked to identify a real problem in the space industry and linked to the SDGs as a starting theme.

By focusing the activities on space-related issues, learners can engage with real-world problems relevant to the industry, while also considering how their space solutions can align with global sustainability goals.

Vocabulary: Assumptions, Analyse, Conflicts, Define, Source

In this lesson, the learner will:

- understand the importance of getting to the source of a problem
- become more accustomed to the SDGs in particular UNOOSA and Space 4 SDGs
- develop an understanding of the connection of local, global and space issues
- complete a problem tree
- understand the complexity of wicked problems in their location
- develop critical thinking about problem solving

Materials:

- Worksheet: Define Your Problem
- Worksheet: Problem tree
- Teachers' Guide: Using a Problem Tree
- Paper
- Newspapers, Internet
- Pens, Pencils

Activity Instructions

Activity 1 Finding and defining your local problem, issue or concern (20 mins)

1. Organise learners into groups of 2 or 4
2. Ask each group to search online versions of news outlets for space-related issues or concerns.
3. Encourage learners to look for articles or features discussing space problems such as astronauts stuck in space, technological communication issues, unsuccessful missions
4. Ask each group to identify and present at least one space-related problem, issue, or concern they found.
5. As a class, create a list of space-related problems and issues that are relevant to Ireland e.g. weather observation, satellite launch problems, internet and telecommunications, space debris

Activity 2: Space Problems aligned to the Sustainable Development Goals (SDGs) (10 mins)

1. Visit the Space Sustainable Development Goals (SDGs) knowledge platform (see Media Box).
2. In groups, learners will use the SDGs knowledge platform to select the SDG that most closely aligns with the space-related problem they've identified. For example:
   - SDG 12: Responsible Consumption and Production: Sustainable Space, Emissions issues
   - Gender Equality or Reduced Inequalities SDG 5 and 10: Access and Inclusions
   - SDG 13: Climate Action: Reducing Space Debris or Weather Monitoring
3. Ask each group to explore the targets and indicators of their selected SDG and begin discussing how their potential space solution can address these targets. What impact will their solution need to have on the space industry and earth ecosystem to align with the SDG?

Activity 3 Use a Problem Tree (20 mins)

1. As a class watch the Video: Defining the Problem [1:25 mins] - see Media Box
2. Use findings from activity 2, have each group write their main space challenge (e.g., Space debris, emissions impact or exclusive labour practices or inequalities) on the trunk of the problem tree.
3. As a group, write these causes of this space problem (e.g., exclusive industry and minimal civilian or citizen access, carbon launch emissions, resource usage, known or unknown species, along with human/employee rights concerns "roots" of the tree.
4. Discuss the effects or consequences of this problem (e.g., environmental damage, exploitation of workers, excessive resource usage and wastage) and write them as the "branches" of the tree.
5. For each cause, ask what causes it (why is there space debris? Why is there investment in the space industry and when there is poverty and hunger? For each effect, ask what the broader consequences are (e.g., what happens to communities affected by inadequate space law or poor labor practices?). Continue until no further causes and effects are mentioned make notes of any assumptions, questions, conflicts, or gaps in knowledge.

REFLECTIVE EXERCISE: 3-2-1

- Three things they feel they have learnt from the tasks
- Two things they found most interesting and would like to explore more
- One – their opinion they have about the tasks

Use Post-its or a mentimeter survey - www.mentimeter.com - to gather reflections

EXTENSION / REDUCTION ACTIVITIES

Reduction: For a shorter class undertake activities 1 and 2 only

Extension: For a longer class, explore solutions to the cause and effects discussed in activity 3

Option B: watch the 'What is a Problem Statement' video and begin to try to develop a problem statement in relation to their selected fashion issue. In addition, ask students to read the P2P define support sheet and discuss.

Option C: Consider the diagram, The interconnected nature of the SDGs and how this might apply to their space-related issue https://www.researchgate.net/figure/The-interconnected-nature-of-the-SDGs-Credit-Adopted-from-Azote-Images-for-Stockholm_fig1_327884976

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

Defining the Problem [1:25 mins] https://www.youtube.com/watch?v=2rJRVv-NOaA

UN Office of Space Affairs SDGs https://www.unoosa.org/oosa/en/ourwork/space4sdgs/index.html

What is a Problem Statement https://www.youtube.com/watch?v=ezxp_yt4kDA

Local Trip / Expertise / Additional Work and Assessments

Learners could conduct interviews with Irish fashion-related organisations or individuals. This might include satellite weather observation, university researchers, or space technology manufacturers. Interviews help learners gather primary source information about the challenges these organisations face, such as sustainable production practices, ethical sourcing, or the impact of space debris. Encourage students to use the interviews to ask:

- What space-related problems are they encountering in Ireland and Europe?
- How are they attempting to address these issues?
- What are the biggest barriers they face?

Lesson Link to SDG 4 Supporting Skills - Interview skills or MM7: Future of Innovation and Enterprise Media Communication 4

MM7 L3 TG: USING A PROBLEM TREE

What is the purpose of a problem tree?

The 3 most important points of a problem tree are:

- It allows us to break down the problem, the causes and its effects, improving its analysis.
- There is a better understanding of the problem by breaking it into causes and consequences.
- Facilitates the realisation of other important components of a project in its planning stage, e.g. stakeholder analysis, risk analysis and objectives.

When introducing the exercise and worksheet: Using a Problem Tree, it might be helpful to discuss an example on the board so that students are clear on what is meant by problem, impact, cause, and effect.

Remind them that there can, and usually will be, more than one impact, cause, solution, and effect. Show them how the effect of a solution might bring up a new problem to solve and take through this process.

Step-by-Step:

- Analyse the situation: What is happening, why is it happening and what is triggering it. Collect data that will allow you to understand the problem situation, this will help
- Identify the main problems of the situation you have analysed: Use brainstorming, defining by consensus what the main problem is.
- Determine the effects and causes of the main problem: You already have the trunk of the tree, now identify the causes (roots) and the effects or consequences (leaves or branches). Again, it is better if this is done as a team, seeking to reach a consensus. If in step 2 you elaborated the Vester matrix, you will already have this step quite clear.
- Draw the tree: Simple. We will see how in the example below.

Example:

Problem = People need to access a local walking trail in the evening after work and it gets dark early in the winter.

Impact = No one uses the trail in the evenings in the winter the space is wasted.

Cause = (1) It gets dark early as there's no natural light. (2) People don't feel safe using the trail in the dark. They can't see where they are going and might trip and fall. It's dull and boring in the dark.
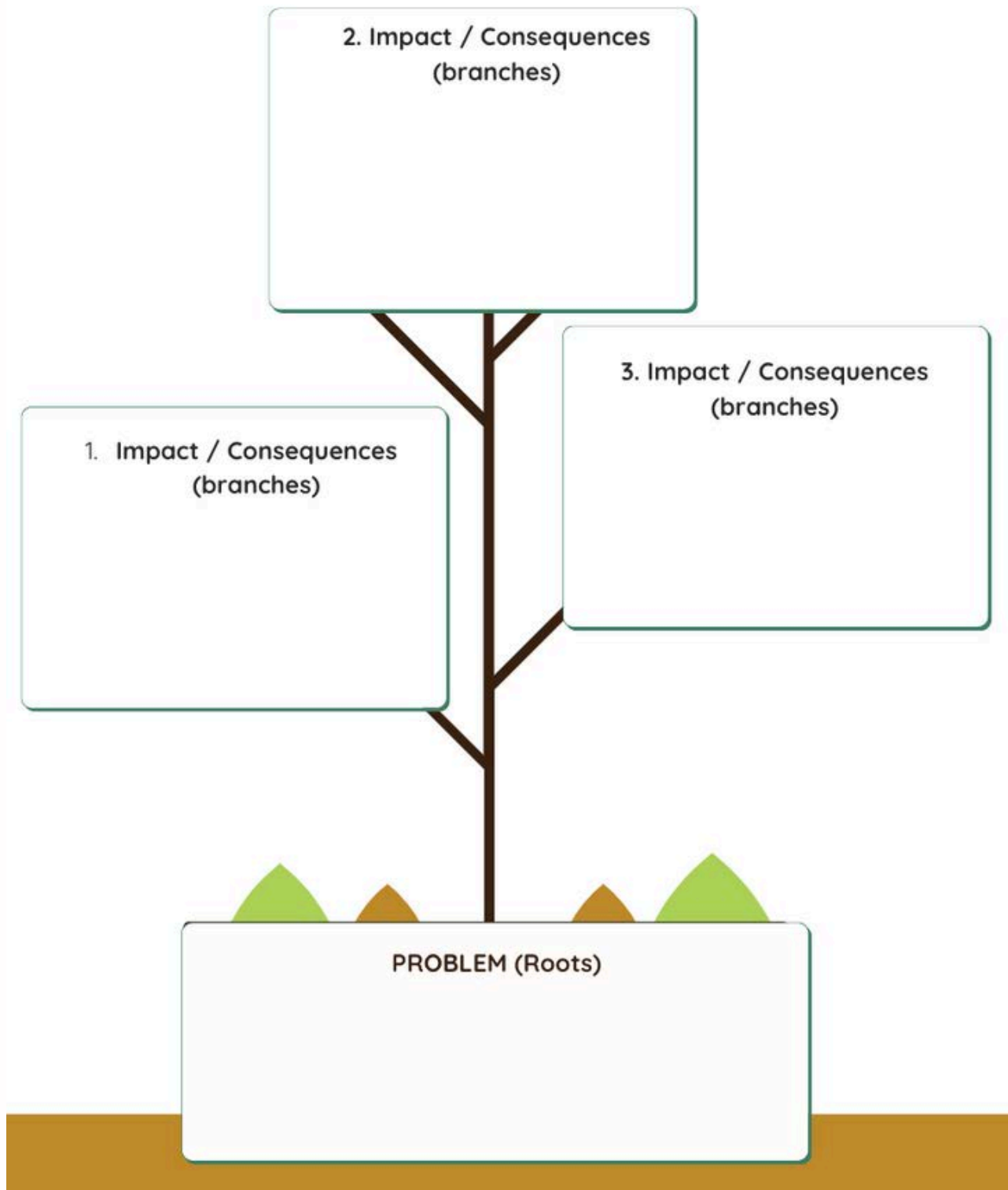
Solution 1 = We install lights.

Effect of solution 1 = We can't just install any lights, we have to align to policy SDG 7 / cSDG13 carbon emissions.

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How to Use a Problem Tree Analysis
https://www.youtube.com/watch?v=q6qYZiW5BWU
Teacher Training - World Learning

2. Impact / Consequences
(branches)

3. Impact / Consequences
(branches)

1. Impact / Consequences
(branches)

PROBLEM (Roots)

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Problem Solving

First Step in problem-solving - Understand the Problem:

While it may seem obvious, identifying the problem is not always as simple as it sounds. The biggest issue can be identifying the wrong source of a problem. This could mean your attempts to solve it are inefficient or even useless. Remember: Once the correct source of the problem has been identified you need to fully define it before it can be solved effectively.

Things to think about:

- What do I know already about the problem? – Make a list.
- Can a picture or diagram help you? Try to visually draw or map the problem.
- Who's telling me about this problem? What is their perspective?
- What do I need to find out?
- Do I need to speak with anyone else about this problem?
- Try rewriting the problem in your own words?
- What do you think the problem is?

Step two: BRAINSTORM

In this phase, you will need to think, talk, sketch, doodle, contemplate, or journal, in order to start allowing ideas to formulate. Then, set aside some daydreaming time and get started. Think big and let all the ideas you have hit the page without editing them.

Step Three: Research - How are you going to turn the idea into a reality?
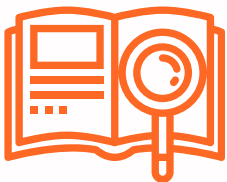
Brainstorming, researching and refining your problem go hand in hand. You will be going back and forth between the three until you come up with a plan.Once you brainstorm some great ideas for your business, you will need to research to learn more about the problem, product or service. In turn, that leads to more brainstorming and refining your problem.

In the next phase you will think of how to turn your idea into a reality. Start to make a make a list of any questions or concerns that come to mind. Its never too early!
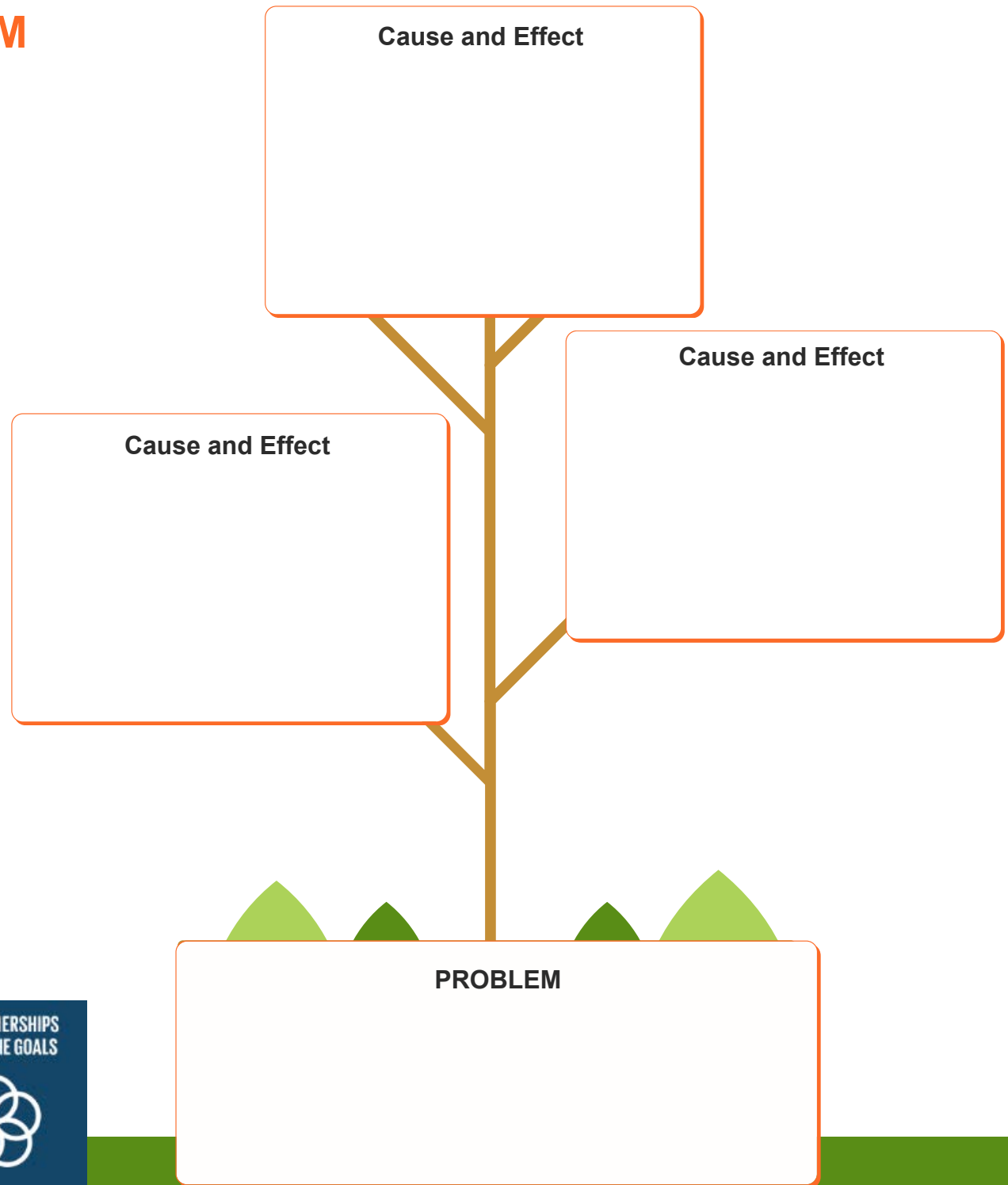
- What materials do you need?
- What will it cost?
- Can you build it yourself or will you need help?
- If you will need to collaborate on this piece, decide who that will be and make plans to work together?

MM7 L3WS: PROBLEM SOLVING TREE

Find out different ways to solve a problem.
Pick the best one.

I choose solution number _____
because _____
_____

Cause and Effect

Cause and Effect
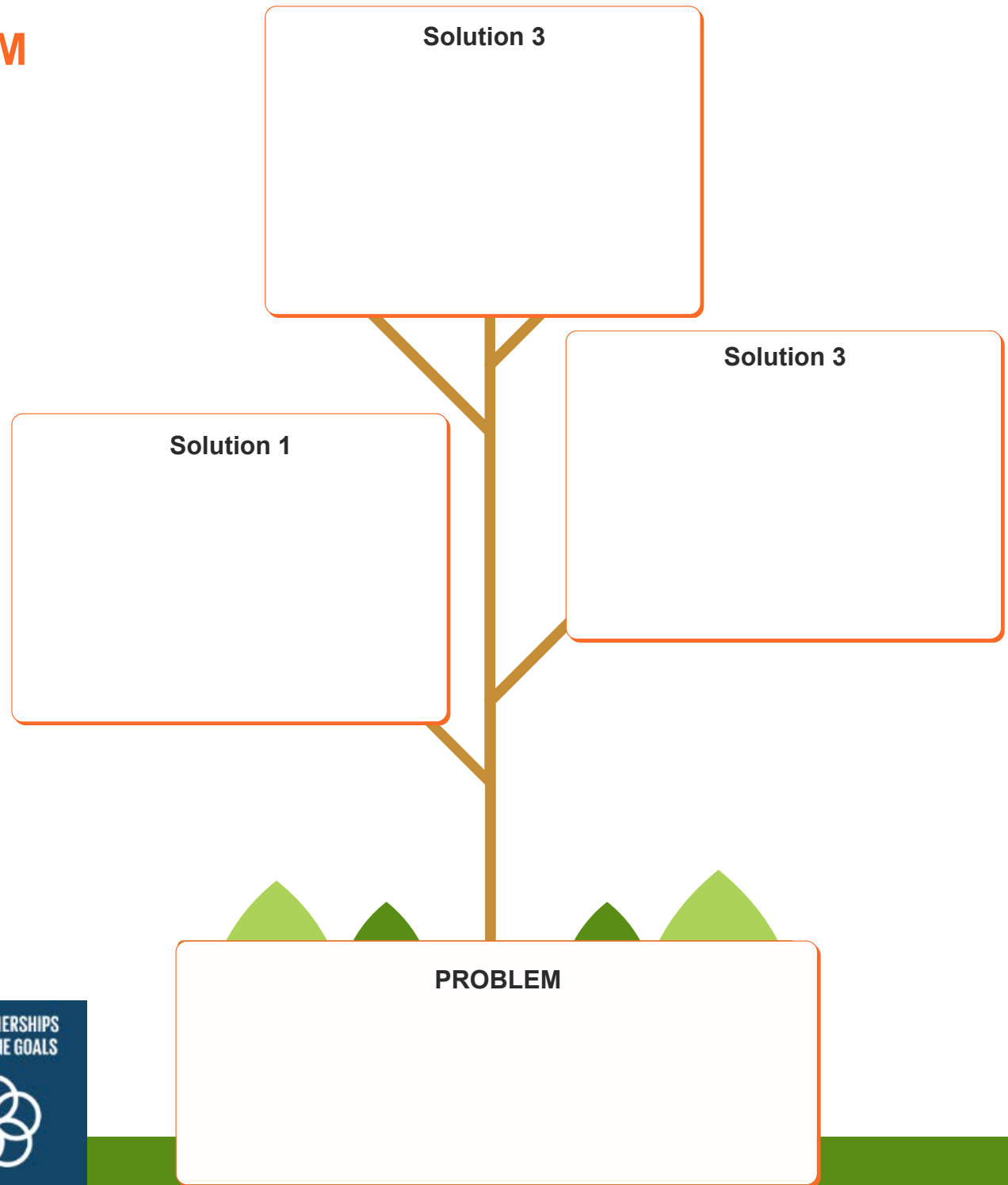
Cause and Effect

PROBLEM

MM7 L3WS: PROBLEM SOLVING TREE

Use your Cause and Effect Discussions to consider possible solutions

I choose solution number _____
because _____
_____

Solution 3

Solution 3

Solution 1

PROBLEM

MM7: Problem to Pitch - Space Design

Phase 3: Implementation

Lesson 4 Design Thinking Stage 3 Ideate

Subject Areas: Art and Design, CPSE, Climate Action and Sustainable Development, Engineering, Technology, SPHE

Lesson Title and Summary: Design Thinking Stage 3 Ideate

In this lesson, learners will develop an understanding of the process of generating ideas building their skills in creative problem-solving. The lesson will guide learners through the ideation process, focusing on solving real-world problems in the emerging space industry.

Lerners will identify obstacles they encounter in the emerging space industry and brainstorm innovative ways to solve them, preparing them to develop solutions for real-world space concerns and emerging problems.

Vocabulary: Agility, Creativity, Disruptive Innovation, Enterprise, Problem Finding and Solving

In this lesson, the learner will:

- become comfortable with exploring experimental approaches
- develop skills around idea generation
- accommodate variables and limits into design processes
- learn to transfer and apply skills
- develop an understanding of problems and concerns within the emerging space industry

Materials:

- Worksheet: Ideate Rapid Remix
- Worksheet: Remix SWOT
- Worksheet: Step Into The Problem
- Worksheet: Empathy Map
- Teacher's Guide: Ideate for Space Technology
- Internet access
- Paper, Pens, Pencils

Activity Instructions

Activity 1 Remixing ideas – Rapid Response (30 mins)

1. Explain the activity has been designed to practice the 'ideation' concept and begin to understand how to develop creative problem-solving skills.
2. Watch the Video: Design Thinking Ideate [4:03 mins] and then organise students into groups of 4
3. Working in groups, each person in the group fills in a row on Worksheet: Ideate Remix 1

- Space Technology item: e.g. oxygen filtration systems, spacecraft diagnostic tools, space habitat insulation.
- What they like about it: e.g., design, the functionality, reliability, or technology innovation
- Obstacles: challenges with the technology in a space environment (e.g., weight limitations, difficulty in repair, energy inefficiency, or resource waste)
- How they would change it: Encourage them to creatively solve the problem e.g. using AI for predictive maintenance, creating modular systems for easier repairs, or using sustainable materials to reduce waste. This can be funny, imaginative, or practical.

Teacher Prompt - Ask for input from the grid randomly e.g. "Group one tell me what's written in the second column, row 2, write their answer on the board. Repeat three more times until you have something on the board from each of the columns e.g. group 4 tell me what's written in the column 3, row 1, group 2 tell me what's in column 4, row 2, group 3 tell me what's in the column 2 row 3 – see example

Space Tech	What they like about the Space Tech Item	Annoyances / Issues	What change would remove this problem
Habitat insulation	provides reliable internet for astronauts	uses too much water which is scarce in space	create a robotic arm to work outside

Ask the groups to start coming up with possibilities for a business, activity or service that include the 4 variables above, the more random the variables the better to push their creativity.

Activity 2 Remixing ideas Rapid Response 2 (20 mins)

1. Repeat the activity replacing the variables lesson 4 outcomes, current product, service or activity, the problem and the change required.

REFLECTIVE EXERCISE: 3-2-1

- Three things they feel they have learnt from the tasks
- Two things they found most interesting and would like to explore more
- One – their opinion they have about the tasks

Use Post-its or a mentimeter survey - www.mentimeter.com - to gather reflections

EXTENSION / REDUCTION ACTIVITIES

Reduction: For a shorter class undertake activity 1 only and use activity 2 in a follow-up class, asking learners to generate 3 business, enterprise, product or service ideas from the variables created in the class.

Extension: For a longer class, use the work in activity 2 with the Remix SWOT worksheet. Ask the class to undertake the same process for the Idea Remix using one of the businesses, services or activity 1 ideas that has come out of the first part of the lesson. Learners can follow up by developing an empathy map for a user of the ideas, products or service that have come out of activity 1

Learners can also integrate learning from DT 1 Empathy and use the worksheet: 'Step into the Problem' to work through the ideas generated

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

Design Thinking Ideate [4:03 mins] https://www.youtube.com/watch?v=zbLxs6te5to

15 Space Tech Companies That Are Making Great Strides
https://www.spacecapital.com/publications/15-space-tech-companies-making-great-strides
gad_source=5&gclid=EAIaIQobChMIg5aLzuudiQMVPZFQBh3PiyxaEAAYASAAEgJAHvD_BwE

Expleo 'Expleo signs European Space Agency's Zero Debris Charter'
https://expleo.com/global/en/insights/news/european-space-agency-zero-debris-charter/

Space for the sustainable development goals [17:08 mins] https://www.youtube.com/watch?v=VHxNfP6EufA

Local Trip / Expertise / Additional Work and Assessments

Learners can begin to research Irish Space stakeholders connected to the problem they identified. These stakeholders might include engineers, universities, suppliers, influencers, and even regulatory bodies. Learners can undertake a stakeholder mapping to visually represent the influence and interest of each group in relation to their selected space problem and a corresponding Space for Sustainable Development Goals.

For example, in a problem like space debris, stakeholders may include:

- Governments (influence over space waste management)
- Engineers (interest in sustainable space innovation)
- Suppliers (influence over product sourcing)

MM7 L4TG: IDEATE FOR SPACE TECHNOLOGY

Teacher Support:

You don't need deep knowledge of space technology. By focusing on the Design Thinking process and encouraging learners to imagine solutions to space challenges, this lesson offers an engaging way for students to interact with the emerging space industry, whether or not you have expertise in the field.

The goal is to build creative problem-solving skills and an understanding of real-world technology issues, all within the exciting context of space exploration. Focus on guiding learners through the design thinking process. Here are some helpful things you can do:

- Guide creativity: Encourage learners to think outside the box. Remind them there are no bad ideas in brainstorming.
- Connect to real-world issues: Point out that space exploration isn't just about astronauts or physics and engineering, it's about solving problems like sustainability, resource management, and technology innovation.
- Fun facts: Keep things light by sharing fun facts or trivia about space (e.g., astronauts have to exercise 2 hours a day to avoid muscle loss in zero gravity!).

Prompt Questions

- What systems help astronauts maintain the space habitat (e.g., air, water, or food systems)?
- What tools do astronauts need to fix things in space?
- What challenges might arise if something breaks down in space, and how can we solve them?

Space Technology for Discussion:

- Oxygen Filtration Systems: Systems that keep the air breathable in space habitats.
- Water Recycling Systems: Technologies that recycle and purify water, since fresh water is limited in space.
- Repair Drones/Robotics: Robots or drones that can help with spacecraft maintenance, especially in dangerous situations.
- Waste Recycling Systems: Systems that recycle waste materials into usable resources, reducing the need for new supplies from Earth.
- Solar-Powered Systems: Energy-efficient systems powered by the sun, critical for energy generation in space.

Examples for activity 1 to encourage learners if they are stuck

1. Space Technology: Waste Recycling System

- What They Like: Converts waste into usable resources, reducing the need for resupply from Earth.
- Obstacles/Issues: The system is slow and requires manual sorting of waste materials, making it inefficient.

- How They Would Change It: Create an AI-powered sorting system that automatically categorises and processes waste faster and more efficiently.

2. Space Technology: Astronaut Exercise Equipment
- What They Like: Keeps astronauts healthy by preventing muscle loss in zero gravity.
- Obstacles/Issues: The equipment is bulky and takes up a lot of space, which is limited in a spacecraft.
- How They Would Change It: Develop a foldable, compact exercise machine that can be easily stored when not in use and offers the same benefits.

3. Space Technology: Space Suit Cooling System
- What They Like: Regulates astronaut body temperature during spacewalks, preventing overheating.
- Obstacles/Issues: The cooling system drains the suit's battery quickly, limiting the duration of spacewalks.
- How They Would Change It: Use thermoelectric cooling technology powered by body heat to reduce battery consumption and extend spacewalk times.

4. Space Technology: Space Habitat Lighting System
- What They Like: Mimics natural Earth sunlight to regulate astronauts' sleep cycles and improve mental health.
- Obstacles/Issues: The lights are too bright for some crew members, leading to eye strain and discomfort.
- How They Would Change It: Introduce smart, adaptive lighting that adjusts brightness based on personal preferences and circadian rhythms.

Random and intentionally mismatched examples

These intentionally mismatched examples break the logical flow between the technology, what they like, the obstacle, and the proposed change. This creates a fun and random thought exercise that offers an experimental approach to ideation.

1. Space Technology: Water Purification System
- What They Like: It can be operated remotely from Earth.
- Obstacles/Issues: The system is too loud, causing sleep disruptions for astronauts.
- How They Would Change It: Introduce a more durable, long-lasting battery system to reduce maintenance needs.

2. Space Technology: Solar Panels
- What They Like: It's lightweight and easy to install.
- Obstacles/Issues: The system uses too much water, which is a limited resource in space.
- How They Would Change It: Create a robotic arm to handle maintenance tasks outside the spacecraft.

3. Space Technology: Air Pressure Control System

- What They Like: It provides fast and reliable internet for astronauts.
- Obstacles/Issues: The system is hard to clean and frequently malfunctions.
- How They Would Change It: Use holographic interfaces to allow astronauts to monitor air pressure from anywhere inside the habitat.

4. Space Technology: Space Habitat Insulation

- What They Like: It keeps food fresh for longer periods of time.
- Obstacles/Issues: The insulation is prone to overheating during spacewalks.
- How They Would Change It: Design it to be self-repairing using nanotechnology.

Extension Ideas:

- Learners can explore SWOT analysis for one of their proposed solutions, looking at strengths, weaknesses, opportunities, and threats of their idea within the space industry.
- Invite students to create visual prototypes of their technology solutions through drawings or simple models.

MM7 L4 WS: Idea Remix 1

Team Name

Date

This worksheet will help you play with ideas using space technology items.

Fill in the boxes - to work will then work with the whole group to develop a number of possible ideas.

Name a Space Technology	What do you like about this item	Are there any issues / annoyances	What would you change / fix the issue?

Name a Space Technology	Likes	Obstacles	Change

Name a Space Technology	Likes	Obstacles	Change

MM7 L2WSB SPACE TECHNOLOGY SOLUTION SWOT ANALYSIS

Name _____

Date _____

Use this adapted SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis to consider each of your group's Space Technology ideas.

Take one idea from each of the group members and work together to complete the boxes for each Space Technology Solution

SPACE TECH PURPOSE	STRENGTHS	WEAKNESSES	USERS / CLIENTS OPPS AND THREATS

SPACE TECH PURPOSE	STRENGTHS	WEAKNESSES	USERS / CLIENTS OPPS AND THREATS

SPACE TECH PURPOSE	STRENGTHS	WEAKNESSES	USERS / CLIENTS OPPS AND THREATS

MM7 4WSc: Step into the problem

This worksheet helps you think about your users and any issues they might have

● What's the Problem - A

● Empathy A, Step into the problem

● Possible ideas / Solutions:

● What's the Problem - B

● Empathy B, Step into the problem

● Possible ideas / Solutions:

● What's the Problem - C

● Empathy C, Step into the problem

● Possible ideas / Solutions:

Assessment :

Name: _____

Date: _____

MM7 2WSB USER EMPATHY MAP - EMPATHY MAP

Walking in someone else's shoes

What does your user think and feel?

- What really matters to them?
- What do they think about?
- What are their worries, dreams or aspirations?

What does your user see?

- What sort of views might your user see?
- Where might they shop for food / clothes?
- What might ideas or trends might they notice?

What sort of things does your user hear / listen to?

- Where does your user get their information?
- Who might your user listen to or be influenced by?

What do they say and do

- What other things might your user do?
- What other things are they interested in?

SEE

THINK AND FEEL

HEAR

WHAT DO THEY SAY AND DO

MM7: Problem to Pitch Space Design

Phase 3: Implementation

Lesson 5 Design Thinking Stage 3 Ideate 2.0

Subject Areas: Art and Design, CPSE, Climate Action and Sustainable Development, Engineering, Technology, SPHE

Lesson Title and Summary: Design Thinking Stage 3 Ideate 2.0

This lesson builds on lesson 4 and enables students to develop an understanding of the importance of developing ideas and looking for opportunities to iterate and improve upon existing concepts. Learners are encouraged to view ideas as flexible, evolving processes rather than fixed solutions.

Learners are introduced to open-source concepts, such as iteration and collaboration, which emphasise the value of sharing, refining, and building on the ideas of others. To further stimulate creative thinking, students engage in the "Worst Idea Ever" exercise, where they intentionally brainstorm the worst possible ideas.

This helps break down mental barriers, allowing learners to explore new, unconventional approaches and identify opportunities for innovation in even the most unexpected ideas.

Vocabulary: Beta-test, Focus Group, Lean Canvas, Open Source, Refine

In this lesson, the learner will:

- explore how to evolve ideas
- consider opportunities to improve ideas
- feel comfortable with exploring experimental approaches
- develop skills around idea generation
- learn to transfer and apply skills

Materials:

- Teachers Guide: Worst Idea Ever
- Worksheet: LEAN Canvas
- Paper
- Pens, Pencils

Activity Instructions

Activity 1 Worst Idea ever – Rapid Response (20 mins)

1. Explain the activity – learners will work in their groups to come up with 8 - 10 examples of the worst ideas ever.
2. These will then be swapped amongst the groups to be transformed in activity 2
3. Give some some real-world starting ideas e.g. a chocolate teapot – see Teacher's guide
3. After 15 minutes ask students to share one or two of their worst ideas ever

Activity 2 Transforming Ideas – Rapid Response (20 mins)

1. Gather up the sheets from the groups and begin to swap them with other groups
2. Give some examples of a transformation of a worst idea into a good idea - Teacher's Guide
3. Give students 15 mins to transform the examples on the sheets into good ideas

Activity 3 Generating and Remixing Ideas – Rapid Response (10 mins)

1. Discuss some of the ideas that have been generated?

- What did the students notice about the process?
- Where they surprised at how hard / easy the task was?
- Which activity did they find easier?
- Can they see how they might use this method with other skills?

2. Use the activity to introduce key ideas of open source – ideas development and iteration.
3. Watch the Open Source As Explained by Lego video (see media box)
4. Ask the students to think about this for the next class

REFLECTIVE EXERCISE: 3-2-1
- Three things they feel they have learnt from the tasks
- Two things they found most interesting and would like to explore more
- One – their opinion they have about the tasks
Use Post-its or a mentimeter survey - www.mentimeter.com - to gather reflections

EXTENSION / REDUCTION ACTIVITIES

Reduction: For a shorter class, undertake activity 1 and 2 with less examples e.g. 4 – 6 of worst / transformed ideas.

Extension: For a longer class, undertake an empathy map and Remix SWOT analysis of some of the ideas for some of the ideas - see lesson 4 resources.

The open source discussion can also be extended using - Elements of Open Source Space - see media box. Learners could also complete a LEAN canvas for one of the open source projects

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

What is open source explained by Lego [4:40 mins] https://www.youtube.com/watch?v=a8fHgx9mE5U

Consensys Space https://www.consensys.space/

Elements of the Open Source Space Ecosystem https://www.opensourcesatellite.org/elements-open-source-space-ecosystem/

Animation Explaining Open Source Culture for [open source] [1:09 min]
https://www.youtube.com/watch?v=gobBQwtFeyk

Ireland's Space Industry Directory (with ESA) https://www.enterprise-ireland.com/en/supports/become-more-innovative/space-esa-homepage/esa-directory

Local Trip / Expertise / Additional Work and Assessments

Invite a representative from one of the companies in tIreland's Space Industry directory to speak to the class could discuss Ireland's role in the European Space Agency (ESA), the types of projects Irish companies work on, and opportunities for students in the space sector. Learners can develop questions before the visit, and after the talk, they submit reflective writing or short report - See Supporting Skills www.muinincatalyst.com on how Ireland is contributing to global space exploration.

Learners could research Ireland's role within the European Space Agency (ESA) using the ESA Directory and other resources, focusing on a particular aspect of Ireland's space contributions (e.g., materials science, satellite technology, or space communications) and how Irish companies collaborate with the ESA.

MM7 L5TG WORST GAME EVER SUPPORT SHEET

The session is an iteration of the 'Worst Possible Idea' a term coined by author, president and co-founder, Bryan Mattimore, The Growth Engine Company LLC.

As a facilitation tool for ideation, the 'Worst Possible Idea' (WPI) turns the process of developing ideas upside down. Rather than having the pressure of coming up with novel or innovative ideas, WPI facilitates agile creative thinking in a relaxed, fun, collaborative atmosphere. The process is used by professionals, design studios, within hackathons and start-up weekends, and has been shown to boost confidence, challenge assumptions and offers a more inclusive approach to ideation. No one fears stating the worst possible ideas, a process loaded with fun and laughter and maybe a few groans.

This session introduces learners' to this concept focused around the worst game idea ever and a playful process of transforming how they can be formed into the foundation for possible good game ideas.

To start, explain the activity using the following examples of bad to good ideas:
- a sealed metal tube for a boat / as transport - add an engine / design and pressurise it (submarine), add windows and wings (aeroplane), different wheels and slick design (bullet train)
- a chocolate teapot - why is it a bad idea? It would melt. However, the 'hot chocolate spoon' that retails for about €4-5 uses that quality as a design feature to create a gift / treat product
- windows you can't see out of / opaque windows - this how 'bathroom' or privacy glass started

To facilitate the worst game idea ever, have groups;
1. Come up with as many bad game ideas as they can. 8 -10 is a good number to aim for.
2. Ask them to list why they are bad game ideas, listing all the properties of what makes them bad as this is what forms the foundation of the transformation.
3. List what makes the WORST of these ideas SO terrible.

Here, you can decide whether to do a class activity or just swap the groups work, it is important no group works on their own bad ideas. Then either as a class (you can still swap the groups work and ask each group to offer up ideas to work on collaboratively a class) or within their groups.
1. Begin with searching for the OPPOSITE of the WORST attribute of each idea.
2. Then substitute something else in for the worst attribute.
3. Mix and match various awful ideas to see what happens - all the time considering how to make them good game ideas or how they might become good attributes for a game e.g. penalties or benefits for players, player challenges, player / character, game world or 'backstory' development. These concepts are covered more deeply in other lessons.

Problem
List your customer's top 3 problems

- worry that pet will get lost
- worry that pet is up to no good when home alone
- miss pet and want a way to connect while at work

Existing Alternatives
List how these problems are solved today

There are various collars on the market that track your pet's location. Some track steps and various other stats. There is a separate camera device that can be worn by your pet, but nothing exists that works as a GPS, camera and communication device in one.

Solution
Outline a possible Solution for each problem

worry that pet will get lost-you will be able to track your pet at all times.
worry that pet is up to no good when home alone-you will be able to see what your pet is doing at all times.
miss pet and want a way to connect while at work-you will be able to connect using your voice while you're away

Key Metrics
List the key numbers, that tell you how your business is doing

Number of units sold.

Unique Value Proposition
Single, clear compelling message, that turns an unaware visitor into an interested prospect

Love Paws makes it possible to be with your pet even when you're away.

High Level Concept
List your x for y analogy (e.g. youtube = flicker for videos

Love Paws is the Nest of pet tracking devices.

Unfair Advantage
Somthing, that can't be easily copied or bought

I am Cesar Milan, world famous dog trainer and I have my own TV show and numerous celebrity clients.

Channels
List your path to customers

Give away for free to celebrity pet owners and celebrity TV personalities on Animal Planet, then do a billboard, print and web and social media campaign.

Customer Segments
List your customer segments and users

Ideal customers are middle to high income, tech-savvy pet owners who spend a significant time away from their pets.

Early Adopters
List the characteristic of your ideal customer

Early adapters are pet owners who love to keep up and own the latest tech innovations as soon as they come out.

Cost Structure
List your fixed and your variable costs

Product design, sourcing of materials, production costs, engineering, marketing, PR.

Revenue Streams
List your sources of revenue

We will initially sell online with the goal to being on the shelves of major pet stores by end of year.

PRODUCT | MARKET

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

MM7 L5WS: LEAN CANVAS

PROBLEM
List your top 1-3 problems.

EXISTING ALTERNATIVES
List how these problems are solved today.

SOLUTION
Outline a possible solution for each problem.

KEY METRICS
List the key numbers that tell you how your business is doing.

UNIQUE VALUE PROPOSITION
Single, clear, compelling message that states why you are different and worth paying attention.

HIGH-LEVEL CONCEPT
List your X for Y analogy e.g. YouTube = Flickr for videos.

UNFAIR ADVANTAGE
Something that cannot easily be bought or copied.

CHANNELS
List your path to customers (inbound or outbound).

CUSTOMER SEGMENTS
List your target customers and users.

EARLY ADOPTERS
List the characteristics of your ideal customers.

COST STRUCTURE
List your fixed and variable costs.

REVENUE STREAMS
List your sources of revenue.

MM7: Problem to Pitch Space Design

PPhase 3 Implementation

Lesson 6 Design Thinking Stage 4 Prototype

Subject Areas: Art and Design, CPSE, Climate Action and Sustainable Development, Engineering, Technology, SPHE

Lesson Title and Summary: Design Thinking Stage 4 Prototype

In this lesson, learners will begin to consider their ideas for prototyping, develop a concept statement and look at ways to prototype their ideas depending on their users / audience.

The lesson emphasises prototyping for space challenges encouraging students to apply design thinking principles to space-specific challenges. Whether through an open-ended design task, focusing on real-world space issues they've identified in previous lessons or by selecting an SDG challenge .

Vocabulary: Concept Statement, Enterprise, Innovation

In this lesson, the learner will:

- explore how to evolve ideas
- iterate their ideas
- develop a concept statement
- explore prototyping methods
- develop prototyping skills

Materials:

- Worksheet: Rapid Response Prototyping
- Teacher's Guide Ready Set Design
- Paper
- Pens, Pencils
- Modelling material e.g. plasticene, clay, Fimo
- Ready Set Design (RSD) materials' bags
  - A fastener e.g. pipe cleaner, pin, paper clip
  - A surface e.g. material, tin foil, card
  - A strucure e.g. sticks, straws, box,

Activity Instructions

Activity 1 Prototyping – Rapid Response (10 mins)

1. Watch the video 'What is a prototype'
2. Briefly, Discuss the benefits of prototyping from the video or use the examples below

- Encourages Creativity: It allows experimentation and exploration of different design possibilities without fear of failure, promoting creative problem-solving.
- Turns Ideas into Reality: Abstract concepts are transformed into physical or visual models, helping ideas come to life provides a way to test ideas quickly, helping identify what works and what doesn't early on, making it easier and cheaper to find solution.
- Immediate Feedback: Learners can quickly see what works and what doesn't, providing opportunities for rapid iteration and improvement.

Activity 2 Developing your Prototype – Rapid Response (40 mins)

Option A: Space-Focused Prototype

Learners are tasked with creating a space item or accessory that addresses an open-ended problem and develop a concept statement based on defining the problem, create a Space vision board showcasing design inspiration, materials, technologies, and user / client needs, and build a 3D prototype model of their space solution based on insights from the activities in Lesson 2 - user profiles and empathy map. This could be problems like space debris, ethical production, or earth-centric challenges like disaster relief, telecommunications or weather observation. Learners can select one of the Space 4 Sustainable Development Goals (SDGs) and global challenges to help them focus their prototype towards a real-world challenge - see MM7 Space Design Challenge Briefs.

Option B: Space Design Challenge

If learners have not selected a specific space problem, use the Ready Set Design, a quick 3D design challenge that incorporates prototyping. Learners could consider equipment for life in space e.g. innovative spacesuit solutions and functional tools using the three items they have to use in the bag - a structural item, joining item and a surface item e.g. material, paper or other materials provided.

REFLECTIVE EXERCISE: 3-2-1

- Three things they feel they have learnt from the tasks
- Two things they found most interesting and would like to explore more
- One – their opinion they have about the tasks

Use Post-its or a mentimeter survey - www.mentimeter.com - to gather reflections

EXTENSION / REDUCTION ACTIVITIES

Reduction: For a shorter class have the students watch the What is Prototyping video at home and come into class with 3 benefits of prototyping and work on activity 2 spending time selecting and SDG and defining their open ended problem, ready for their space prototyping in a following lesson.

Extension: For a longer class, learners can spend more time considering information from the Space4SDGs website, defining their problem and developing their concept statement to take their initial prototype and move into a phase of iteration and refinement, to encourage deeper critical thinking and improvements to their original ideas based on feedback.The Rapid Response Prototyping support sheet can expand learners skills using simple structural techniques, while learners consider

- How well does this solution meet the needs of the client or situation?
- Are there any practical challenges with the design that could be improved?
- What creative elements could be enhanced or added?

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

What is Prototyping [1:17 mins] https://www.youtube.com/watch?v=_1bOaNSy5XY
Rapid Prototyping [7:31 mins] https://www.youtube.com/watch?v=JMjozqJS44M
Design Thinking Prototype [4:53 mins] https://youtu.be/Q4MzT2MEDHA

Local Trip / Expertise / Additional Work and Assessments
Learners can present their final prototype and concept statement to the class, for peer review and consideration of their

- Inspiration: What motivated their design choices?
- Key Features: What are the most important or innovative aspects of their design?
  - What aspects of the design are particularly creative or effective?
  - What suggestions would you make for further development?
- Solution-Focus: How does the prototype meet the problem area
- Client / User Needs: How does the prototype address the needs identified in their empathy map or user research?

Learners can explain any improvements made and how their prototype better meets the challenge, sharing any new ideas or next steps for future development. This also allows learners to further develop their communication and presentation skills while receiving valuable feedback.

MM7 L6TG: READY SET DESIGN FOR TEACHERS

Ready Set Fashion Design – is a quick, fun, and creative introduction to Fashion Design Thinking and related skills such as teamwork, innovation, and creativity. This strategy can be applied across different fashion-focused lessons using readily available recycled materials.

Ready:

1. Start by sharing fashion challenge cards—these are open-ended prompts that set the learners' design challenge. Depending on the age group or learning objectives, you can adjust the complexity of the challenge.

Space Challenge Card:

Using only the materials provided in front of you, create a fashion item that…

Helps promote sustainability in Space.
Could be part of a zero-waste approach.
Is adaptable for different space conditions or environments

Learners have 5 minutes to plan with their team and 15 minutes to build their prototype

Set:

2. Either have Learners select from a range of materials or give them three materials from each of the following types

a. A fastener - e.g. paper clip, string, elastic band, safety pin, pipe cleaner
b. A surface - e.g. paper, card, material, tin foil
c. A structure - e.g. empty bottle, box, paper cup, plate, stick

Design:

3. Learners have 20 minutes to design.

Students have 20 minutes to work together and design their fashion item or accessory. They will use the provided materials to develop an innovative solution related to the challenge, such as designing an eco-friendly bag, an upcycled accessory, or a multi-functional garment.

Debrief:

4. Once completed, ask each group to present their prototype and share their thought process:

- What was their design idea?
- How did they approach the fashion challenge?
- What materials did they use, and why?

Encourage other groups to provide constructive feedback:

- How would they improve or add to the design?
- What might be the next stage if this was developed further?
- What fashion-related issues should be considered (e.g., user needs, market research, sustainability)?
- Is there anyone local they could talk to if this were a real fashion project (e.g., local designers, eco-friendly fabric suppliers)?

This activity encourages students to think creatively within the context of sustainable fashion, applying Design Thinking to solve real-world problems while using limited resources.

For the extension activities: Learners can consider the following questions to iterate and improve their prototypes.

1. Refine their Prototype:

   - Using the feedback they receive, students will revise their prototypes. This may involve tweaking the design for functionality, experimenting with new materials, or adding features to better address user needs. Encourage students to think about:
   - Materials: Could they use more sustainable, durable, or functional materials?
   - Usability: Is the prototype easy to use or wear? Can it be improved for comfort or efficiency?
   - Aesthetics: How does the design look? Could the visual appeal be enhanced?

2. Documentation:

   - As students refine their prototypes, ask them to document the changes they make. They should reflect on:
   - What feedback they received and how they incorporated it?
   - What specific changes were made to improve the prototype.
   - What remaining challenges or questions they have for future iterations.

3. Final Presentation and Reflection:

   - See linked learning box in the lesson plan. MM7 Media Communication modules 1 - 4 can also be used to support final presentations in a number of ways e.g. video, research poster, presentation or audio e.g podcast or interview.

MM7: L6WS RAPID RESPONSE PROTOTYPING

INTRODUCTION

Watch the following video: 'What is Design Thinking?'
https://www.youtube.com/watch?v=a7sEoEvT8l8

Answer the questions below. You can re-watch the video as many times as you need to.

a) What or who does design thinking help you focus on?

_____

b) How do design thinkers learn?   _____

c) What do simple prototypes do?   _____

d) What do rapid prototypes do?   _____

e) If you ideate, prototype and test too early - what are three mistakes that can be made?

_____

f) Write down the two reasons for using design thinking.

_____

g) What are the five stages of design thinking?

_____   _____   _____

_____   _____

Watch the video: 'How to make a cardboard prototype'
https://www.youtube.com/watch?v=k_9Q-KDSb9o Write down as many tips as you can.

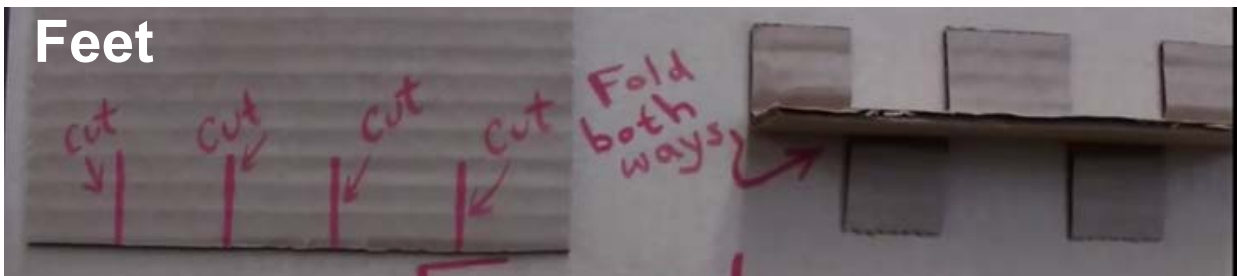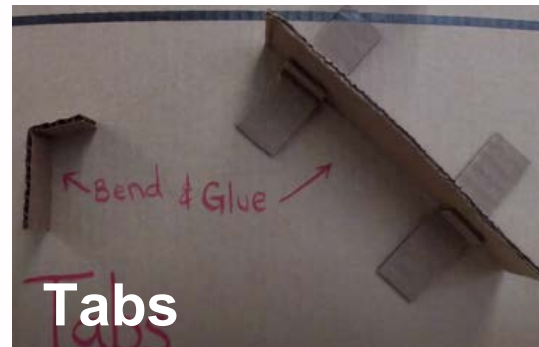# MM7: L6WS RAPID RESPONSE PROTOTYPING

READY, STEADY, BUILD: KNOWLEDGE GATHERING

Today we are going to experiment with rapid prototyping with materials that we have to hand. You will explore three basic elements - useful for rapid prototyping:

- Structure
- Fastening / Joining
- Surface

1. Structure - this will provide support and form to your prototype. The structure provides strength by load-bearing if re-enforced or solid, e.g. columns or supports for covering, or other materials, e.g. tent poles. Here's some simple tips for creating structure.

Flange

Tabs

Feet

Watch the short video on structural techniques - all these processes can be scaled up to make bigger models and forms.

Write down the key ideas in the video. Use bullet points.

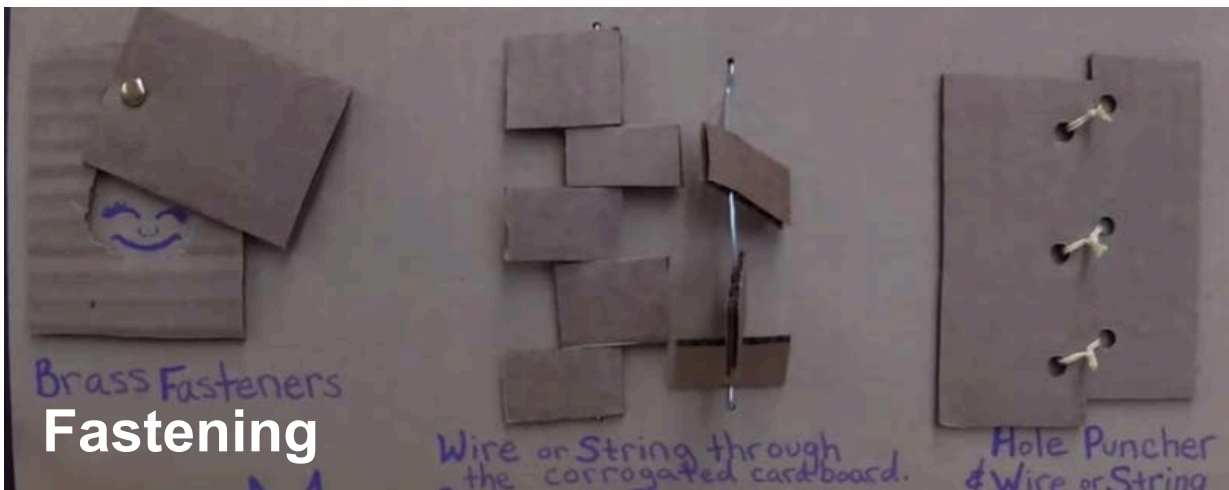Creating 3D sculptures https://www.youtube.com/watch?v=pi6Y7yCz7Y8

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2. Fastening / joining and attaching - this can be done
using structural approaches, such at slots and tabs, or using
other materials like pins, paperclips, string tape or glue.

Tabs and Slots

Fastening

Some techniques can be both structural and
used to join things together like the slots /
tabs here on the left.

**What other ways do you know of joining
things together? Discuss this in your
group and make a list.**

Knots are another useful joining technique- here's a useful website for learning to tie
knots https://www.animatedknots.com/complete-knot-list

3. A surface - a surface has a number of functions, such as protection, decorative, textural, adhesive, and are made from numerous materials, e.g. plastic, wood, fabric, paper, both natural and synthetic.


Sometimes they can be structural as well as serving other functions. This surface material could provide support and be used as an attachment or joining function as well as offering a decorative purpose.
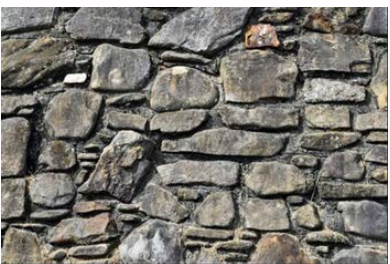
Natural materials often have other properties such as insulation, waterproofing, protection as well as being structural, making them good for outdoor construction.

Waterproof, or those that are water repellent materials (hydrophobic), are often inspired by nature, whether a rough surface that minimises water contact and absorption or the nanopatterns of insects who fly in the rain undisturbed. You can also treat materials with sprays to make them waterproof.
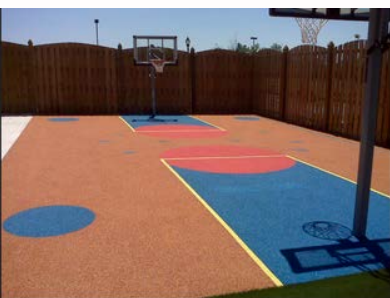
Safety surfaces can be both decorative and functional. They often use bright colours and recycled materials from other processes. They can be highly durable and so reduce maintenance.

Interior design surfaces, e.g. upholstery, curtains, wallpaper, bedding, worktops, are increasingly synthetic and made from recycled materials, e.g. SeaQual or Econyl from recycled fishing nets. They can be durable, easily cleaned and pleasurable to look at.

MM7: Problem to Pitch Space Design

Phase 3: Implementation

Lesson 7: Design Thinking Stage 5 Test

Subject Areas: Art and Design, CPSE, Climate Action and Sustainable Development, Engineering, Technology, SPHE

Lesson Title and Summary: Design Thinking Stage 5 Test

Evaluating an idea is a key aspect of Design Thinking. In this lesson learners will begin the process of testing their ideas with potential users. Learners will learn that this is not the end of the process and that they may learn something that means they might need to return to an earlier stage e.g. Define or Ideate.

This lesson can be used with the prototypes produced in lesson 6 and has supporting materials that can be applied to learners' projects if they have developed their ideas further.

Vocabulary: Beta-test, Focus Group, Lean Canvas, Refine

In this lesson, the learner will:

- explore how to test ideas
- use their vision board
- complete a lean canvas
- prepare to present their ideas

Materials:

- Completed prototypes and concept statements - lesson 6
- Worksheet: Stakeholder mapping - lesson 1
- Worksheet: 5 W's of Business
- Worksheet: LEAN Canvas
- Worksheet: 8 W's of Business Planning
- Worksheet: Vision Boards
- Worksheet: Zone Mapping
- Pens, Pencils, Paper

Activity Instructions

Activity 1 Testing – Rapid Response (20 mins)

1. Watch the video Design Thinking - Test
2. Highlight the importance of user feedback in refining prototypes to help students understand that the testing phase is not the final step but a critical opportunity for improvement.
3. In groups, learners will work with their prototypes and their concept statements from the last session to consider who they will need to speak to in terms of their audience / user.
4. Learners can also use the stakeholder worksheet from Lesson 1 to map their 'stakeholders' now that they have a prototype and a distinct space-issue project

Activity 2 Testing your Prototype – Rapid Response (30 mins)

1. Pair learner groups together for a rapid feedback session on each other's prototype, noting what works, what doesn't, and suggestions for improvement.
2. Once learners receive feedback from their user tests, allow them to make small adjustments or refinements to their prototype, even if it's just modifying the concept on paper or making minor structural changes.
3. At the same time, other members of the team can document any changes and complete Worksheet: 5 Ws of business, with particular focus on section 2 and 3, 'problem' and 'users'.
4. Through the iteration and feedback process learners can consider the following questions

   - What did your user say they liked most?
   - Can you enhance that feature?
   - What problems did your user have with the prototype?
   - How might you redesign it to solve those issues?
   - Did we miss any key user needs - this is an interative question encouraging further review

5. If circulating to support learners, these questions can also be used to prompt learners to think more deeply about the iteration and feedback process.

REFLECTIVE EXERCISE: 3-2-1

- Three things they feel they have learnt from the tasks
- Two things they found most interesting and would like to explore more
- One – their opinion they have about the tasks

Use Post-its or a mentimeter survey - www.mentimeter.com - to gather reflections

8 DECENT WORK AND ECONOMIC GROWTH

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

17 PARTNERSHIPS FOR THE GOALS

EXTENSION / REDUCTION ACTIVITIES

Reduction: For a shorter class, have the learners watch the video and complete their stakeholder map either at home or in the next lesson. If undertaken in the next lesson this can be paired with additional activities. Learners could:

- Role-play a conversation with their target client / user to anticipate the types of feedback they might receive.
- Create a simple survey or a set of questions that they could ask their users during testing.

Extension: For a longer class, learners can use the worksheets: 8Ws of business, the lean canvas, stakeholder maps, vision boards and their prototypes to produce a 'final pitch' presentation – showcasing their project. Media Communication 3 micro-module, the Pecha Kucha, can be used to support students to present and pitch their idea – this can be used as an end of module assessment.

Encourage learners to gain feedback on their as least once 'pitch' before the final presentation

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

- Design Thinking TEST https://youtu.be/UVEQCNM6X-A
- Using a lean cavas https://www.youtube.com/watch?v=WqjM2DdgUnA
- How to make a pitch using a mood board https://www.youtube.com/watch?v=8dg--KvDIX8
- Rocket Pitch - Introduction to Rocket Pitch https://www.youtube.com/watch?v=3UKzsnWU7-4
- Rocket Pitch - Gamify your event http://www.rocket-pitch.com

Local Trip / Expertise / Additional Work and Assessments

Linked learning resources: Media Communication Skills micro-modules support the development of key skills for exhibition and presentations.

- Pitch their final idea to a Local Development company or community and business Alliance
- Visit from Local Enterprise Officer to consider their ideas
- Create a local space focused enterprise event / exhibition to share their work e.g. in school, end of school year, in the local library or online
- Develop a Rocket Pitch event – create a start-up event, link with other schools in your area, province or across Ireland and beyond - see media box
- Look at enterprise competitions, Young Scientist, Student Enterprise programme, encourage this as part of the students learning process

WHAT WHY WHO WHEN WHERE

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1. WHAT Is the problem?

Give 3 reasons for your business, product or service

2. HOW does your solution 'fix' the problem?

3. WHO will use your solution?
Think of 2 - 3 users

4. WHY should anyone buy / use your solution?

5. WHERE / HOW will you reach your customer?

6. WHAT resources do you need for your business?

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WHAT WHY WHO WHEN WHERE

7. WHAT will it cost?

8 WHAT is the investment? How will you make the money you need to fund your solution?

9. WHEN should this be done?

10. WHEN / HOW will you know you are successful?

11. WHAT do you need to do next?

MM7 L7WSB: LEAN CANVAS

Problem
List your customer's top 3 problems

-worry that pet will get lost
-worry that pet is up to no good when home alone
-miss pet and want a way to connect while at work

Solution
Outline a possible Solution for each problem

worry that pet will get lost-you will be able to track your pet at all times.
worry that pet is up to no good when home alone-you will be able to see what your pet is doing at all times.
miss pet and want a way to connect while at work-you will be able to connect using your voice while you're away

Unique Value Proposition
Single, clear compelling message, that turns an unaware visitor into an interested prospect

Love Paws makes it possible to be with your pet even when you're away.

Unfair Advantage
Somthing, that can't be easily copied or bought

I am Cesar Milan, world famous dog trainer and I have my own TV show and numerous celebrity dients.

Customer Segments
List your customer segments and users

Ideal customers are middle to high income, tech-savvy pet owners who spend a significant time away from their pets.

Existing Alternatives
List how these problems are solved today

There are various collars on the market that track your pet's location. Some track steps and various other stats. There is a separate camera device that can be worn by your pet, but nothing exists that works as a GPS, camera and communication device in one.

Key Metrics
List the key numbers, that tell you how your business is doing

Number of units sold.

High Level Concept
List your x for y analogy (e.g. youtube = flicker for videos

Love Paws is the Nest of pet tracking devices.

Channels
List your path to customers

Give away for free to celebrity pet owners and celebrity TV personalities on Animal Planet, then do a billboard, print and web and social media campaign.

Early Adopters
List the characteristic of your ideal customer

Early adapters are pet owners who love to keep up and own the latest tech innovations as soon as they come out.

Cost Structure
List your fixed and your variable costs

Product design, sourcing of materials, production costs, engineering, marketing, PR.

Revenue Streams
List your sources of revenue

We will initially sell online with the goal to being on the shelves of major pet stores by end of year.

PRODUCT   *MARKET*

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9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

PROBLEM

List your top 1-3 problems.

EXISTING ALTERNATIVES

List how these problems are solved today.

SOLUTION

Outline a possible solution for each problem.

KEY METRICS

List the key numbers that tell you how your business is doing.

UNIQUE VALUE PROPOSITION

Single, clear, compelling message that states why you are different and worth paying attention.

HIGH-LEVEL CONCEPT

List your X for Y analogy e.g. YouTube = Flickr for videos.

UNFAIR ADVANTAGE

Something that cannot easily be bought or copied.

CHANNELS

List your path to customers (inbound or outbound).

CUSTOMER SEGMENTS

List your target customers and users.

EARLY ADOPTERS

List the characteristics of your ideal customers.

COST STRUCTURE

List your fixed and variable costs.

REVENUE STREAMS

List your sources of revenue.

1. **WHAT are you planning to do?**

2. **WHY do you want to do this project? WHO will benefit?**

3. **WHEN and WHERE will the activity take place?**

Date:

Time:

Location:

4. **WHAT funds are needed to do this activity?**

5. WHO needs to approve this project

8 WHAT kind of publicity is needed? WHEN?

Type of publicity   When needed?

1.
2.
3.
4.

7. WHO will do the WORK?

1 Task

Person Responsible

Date Due

2 Task

Person Responsible

Date Due

3 Task

Person Responsible

Date Due

4 Task

Person Responsible

Date Due

8. We're Done!! Was it Worthwhile?

WHAT went well?   WHAT didn't go well?

WHAT would you do differently next time?

WHO needs to receive a thank you note? Name WHO will write it?

STEP 1 THE 'WHAT' OF YOUR BUSINESS
Develop an image that represents the reason for your business - the 'problem' you want to fix. Use pictures, texts or quotes that help you tell what your business is.

Develop the central message this is an image that will represent your business idea.

Keep it colourful and visual Our brains love images.

Use can use Pinterest, Google images, cut out images and texts from magazines and drawings

STEP 3 THE 'WHO 'OF YOUR BUSINESS
Develop an image of the people who will use your business. Use pictures, texts, quotes, statistics that help to you define your customers.

STEP 2 THE 'WHY 'OF YOUR BUSINESS
Develop an image that will show what your business will provide for people or fix their problem. Use pictures, texts and quotes that help you show how your business helps your customers.

Vision board examples on Pinterest.

https://www.pinterest.ie/scrappinmichele/vision-board-samples/?lp=true

STEP 4 THE 'HOW' OF YOUR MARKETING
How will you reach your customers? Use pictures, texts and quotes, that help you tell the reason for our business.

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STEP 1 MATERIALS
You can choose to do your vision board online but if you make it you will need to gather card board, card /paper, glue, scissors, images.

STEP 2 DECIDE ON WHO WILL DO WHAT
Each person should in the group should be responsible for one of the four sections in the image board worksheet.

Will it be 1 large poster, an accordian book or 4 sections - one for each section of your project's idea

STEP 3 PLANNING YOUR BOARD
As a group you can start to plan the size, shape and format of your vision board - see examples but don't be limited. It should reflect your project.
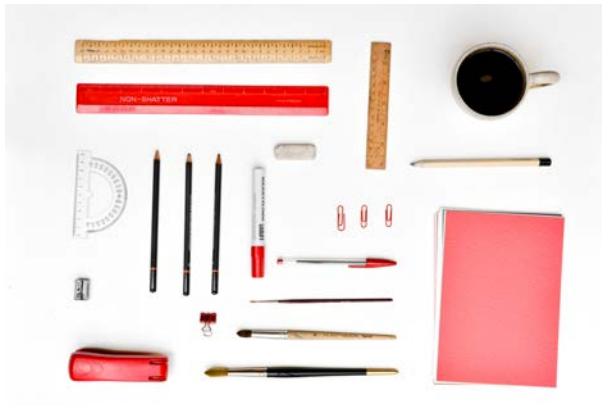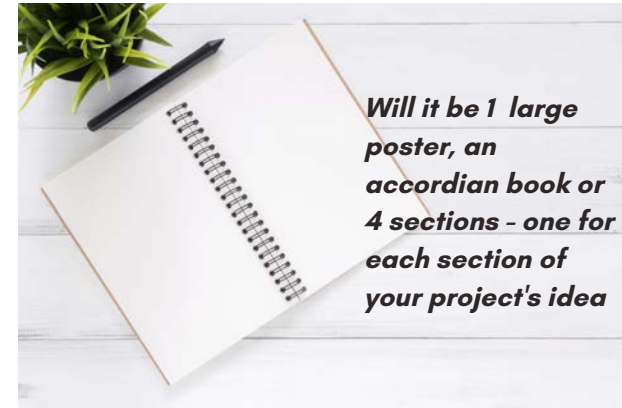

STEP 4 GATHERING IMAGES
Begin to gather images that tell the story of your project - you can use drawings, cut outs, images printed from Google or Pinterest or if digital, you can scan your images online.

STEP 5, ORGANISE YOUR INFO
You can organise the sections in different ways - think about your audience - who are you trying to reach? Look at examples of posters, communication for that audience.

REMEMBER MESSAGE AND AUDIENCE
1. Will they read left to right?
2. Will you direct them how to read using arrows or numbers?
3. Will your central idea be the biggest image?

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CREATIING A DIGITAL VISION BOARD USING CANVA

Step 1: Gather and share your digital Images

When you have decided who is working on what section – gather your digital images and save them all together in a folder. You can create and use a shared drive folder to work in a group.

Step 2: Open an account in Canva

https://www.canva.com/

Step 3: Open a new design in Canva

Once you're signed in, you'll want to click "Create a Design," and choose the template you like, perhaps poster or photo collage.

If you plan on printing your vision board, you can choose USE CUSTOM DIMENSIONS. You can see this in the top right of the screen.

Step 4: Import your images into Canva

HTTPS://WWW.PINTEREST.IE/SUNFLOWERWAYS/CREATING-A-VISION-BOARD/

MM7 L7WS: ZONE MAP EXERCISE

A zone map allows us to start from ourselves Zone 0 (our project or our town) and include other people, places or things in relationship to ourselves Zone 1 - 5

Zone 0 - the self, the project
Zone 1 - Location of project e.g. school or town
Zone 2 - Location of school or town
Zone 3 - Location of town e.g. Iveragh, Kerry
Zone 4 - Location of county e.g. Munster or Ireland
Zone 5 - Location of province or country e.g. Ireland or Europe

Zone 0

Zone 1

Zone 2

Zone 3

Zone 4

Zone 5

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