SDG 9 Future of Space

Micro Module 7: Problem to Pitch - Space Design

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

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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.

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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.

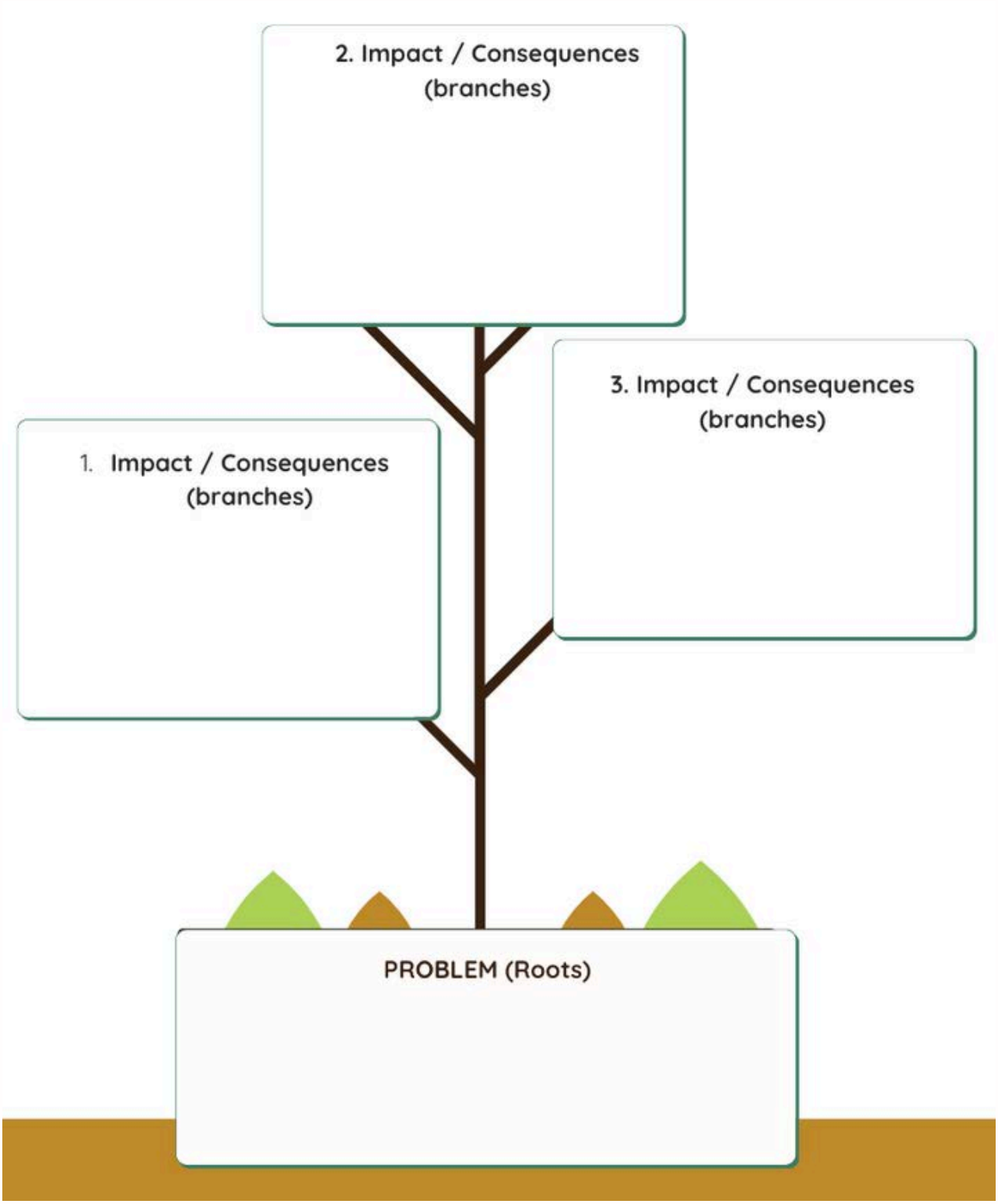
Cause = (1) It gets dark early as there's no natural light. (2) People don't feel safe using the trail in the dark. They can't see where they are going and might trip and fall. It's dull and boring in the dark.

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.

MM7 L3 TG: USING A PROBLEM TREE

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



MM7 L3WS: P2P DEFINE YOUR PROBLEM SUPPORT

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.

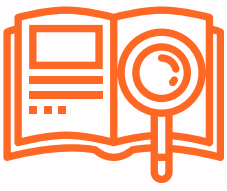
Things to think about:

- 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!

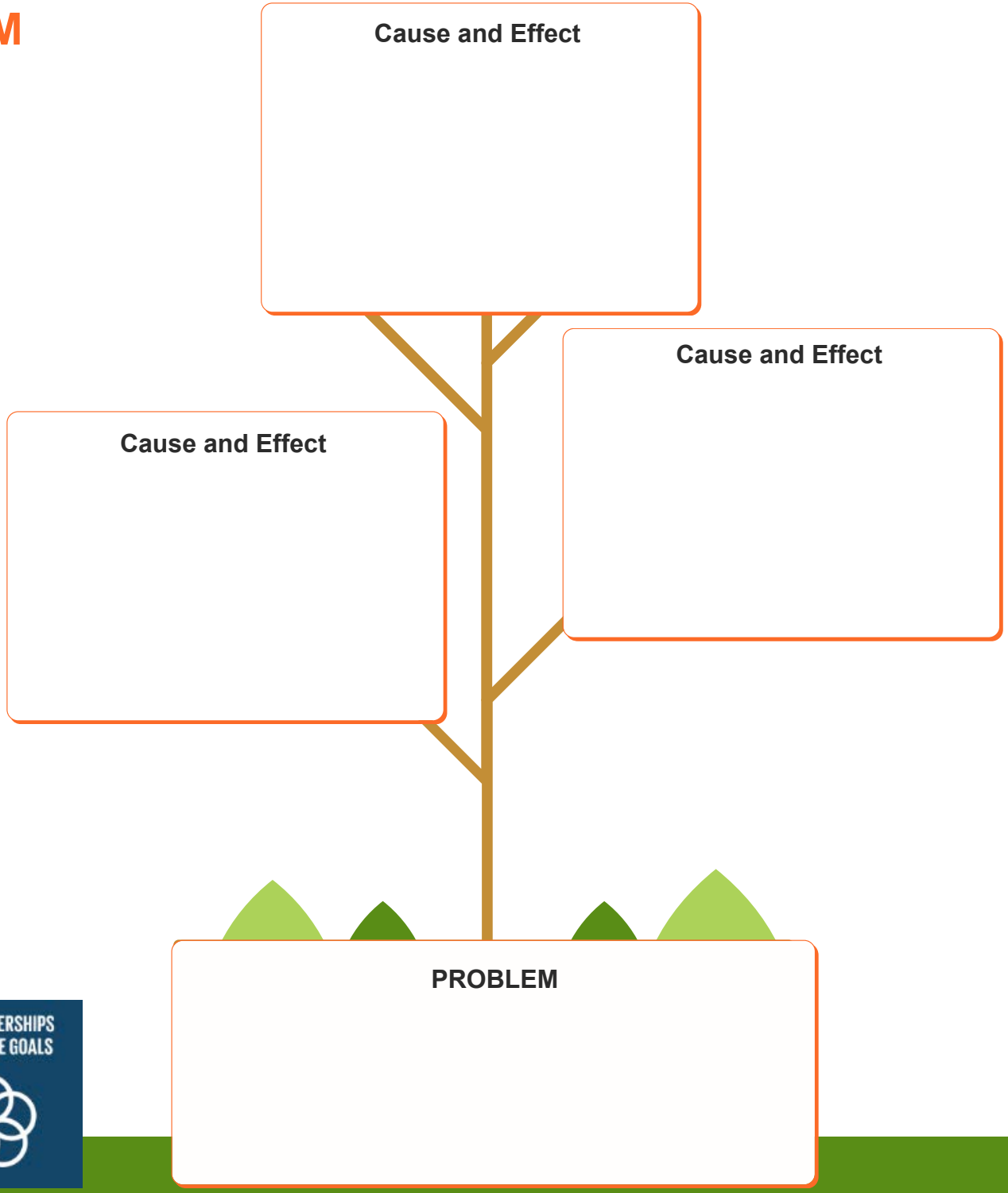
- What materials do you need?
- What will it cost?
- Can you build it yourself or will you need help?
- If you will need to collaborate on this piece, decide who that will be and make plans to work together?

MM7 L3WS: PROBLEM SOLVING TREE

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

I choose solution number _____
because _____

_____



MM7 L3WS: PROBLEM SOLVING TREE

Use your Cause and Effect Discussions to consider possible solutions

I choose solution number _____
because _____

_____