INSTRUCTIONS/RECOMMENDATIONS FOR TEACHERS

The **Research and Scientific Method** workshop/section consists of 5 parts. The *Saving My Territory* Guide explains the contents of each workshop/section in detail, and contains recommendations for classroom work.

This part/session is accompanied by 2 presentations:

1) **Presentation-guide: *Scientific activity* for teachers** with the instructions and recommendations required to teach each part/session in the classroom. The presentations include audiovisual content, discussion activities and other dynamics and challenges for working on the content presented. A timeframe to organise the session is provided, but teachers should adjust the time spent on each activity or audiovisual material at their discretion: as progress is made in the classroom, depending on the students' needs, or if they prefer to review some contents rather than others. There are also slides with characters providing a common theme, and suggesting the final task in each session.

2) **Presentation for students** to provide them with the key ideas in each part. The content of this presentation is taken from the teacher's presentation-guide.

The instructions and recommendations for teachers are shown in PURPLE text, like the text used here, so that they can be clearly identified as supplementary text. The activity slides have a grey background.

We hope you find the content interesting and useful.

Saving my territory

Research and Scientific Method Workshop

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Research and the scientific method

Objectives

1. Understand science as a means to improve our surroundings.
2. Learn about research and the scientific method.
3. Understand why it is important to use the scientific method when carrying out research.
4. Learn the steps involved in carrying out research scientifically.
5. Learn how to apply these steps in your own research project.

Research and the scientific method

Summary

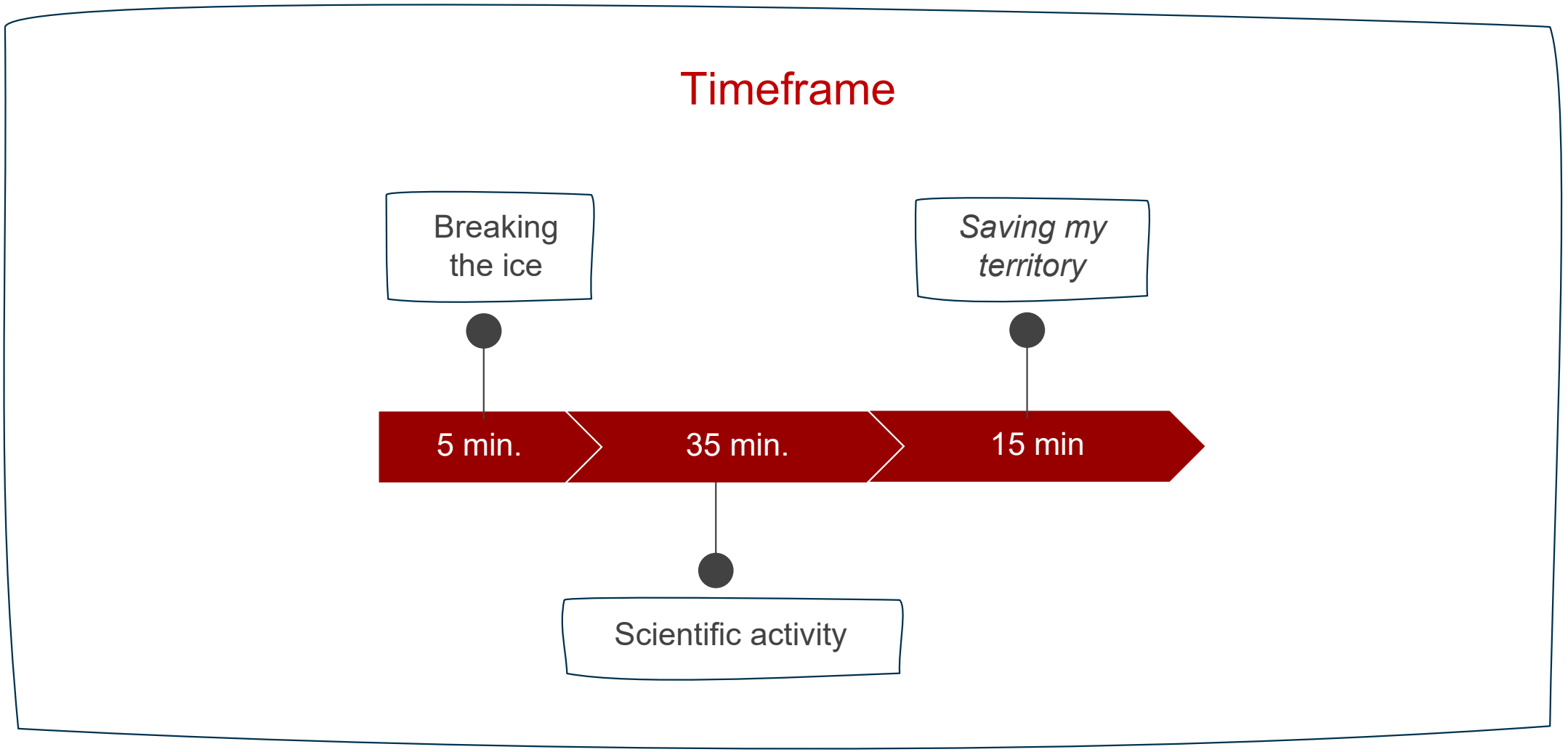
Research and the scientific method

Part II

Scientific activity

2.1. Scientific activity
2.2. *Saving my territory*

Scientific activity



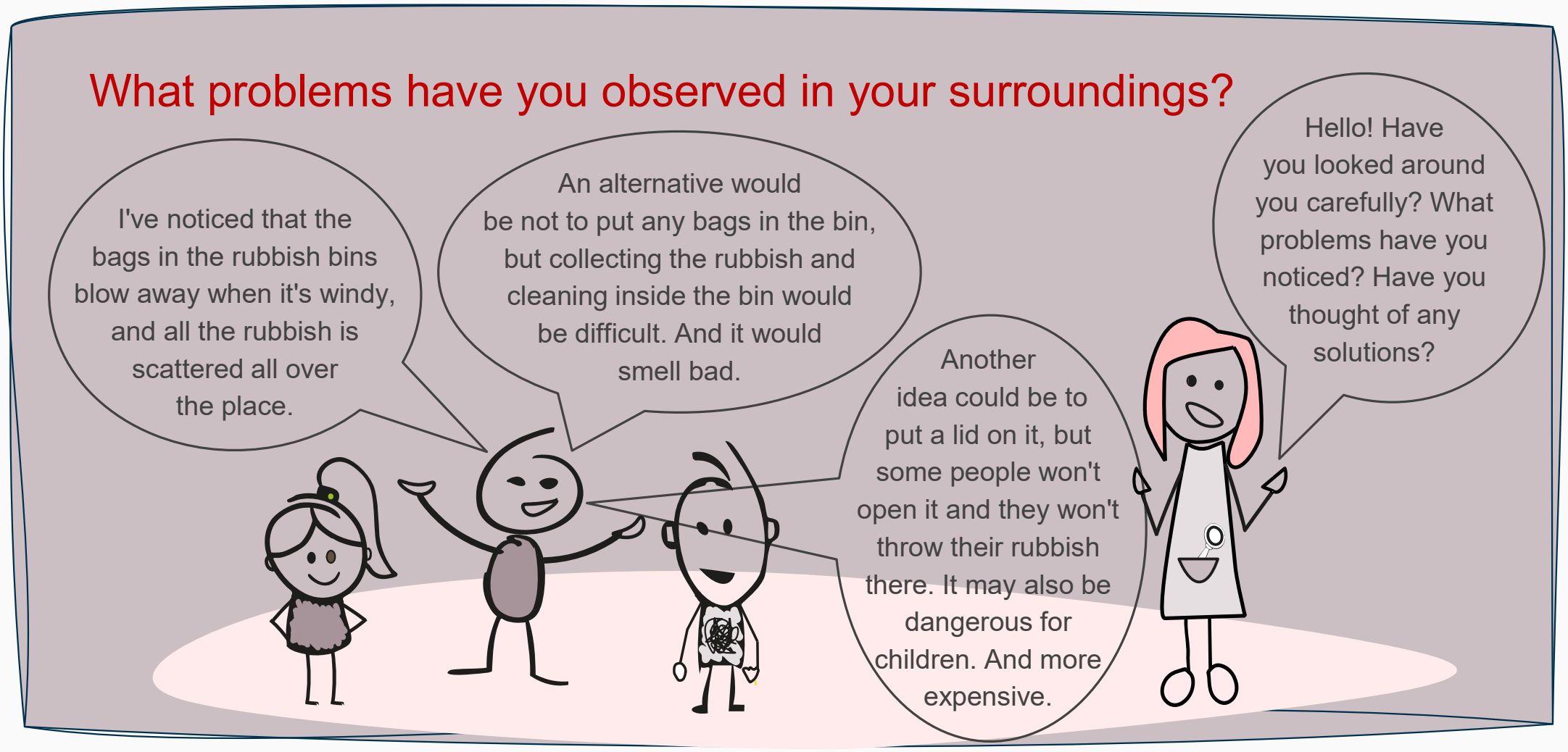
Scientific activity

What problems have you observed in your surroundings?

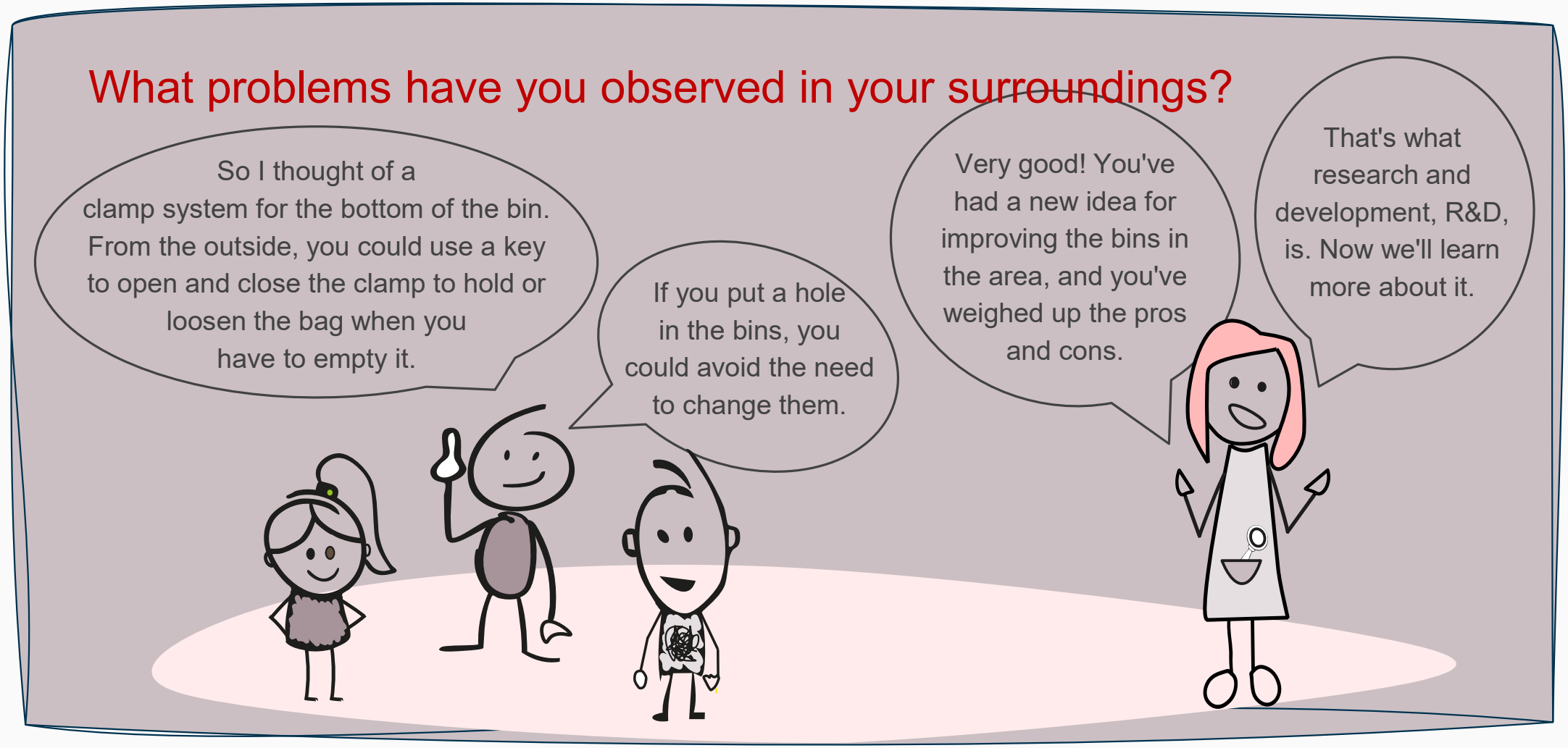
The next slide presents the task discussed in the previous session, and introduces the focus for this session. Although an example is provided, students should be given 10-15 minutes to share their ideas. Then begin with the contents of the session.

Scientific activity

What problems have you observed in your surroundings?



Scientific activity



Scientific activity

2.1. Scientific activity

Research and development (R&D) is the creative and systematic work carried out in order to increase the volume of knowledge (including the knowledge of mankind, culture and society) and devise new applications for the existing knowledge.

There is a series of common characteristics that identify R&D activities which aim to achieve general or specific objectives, even when they are carried out by different people.

Scientific activity

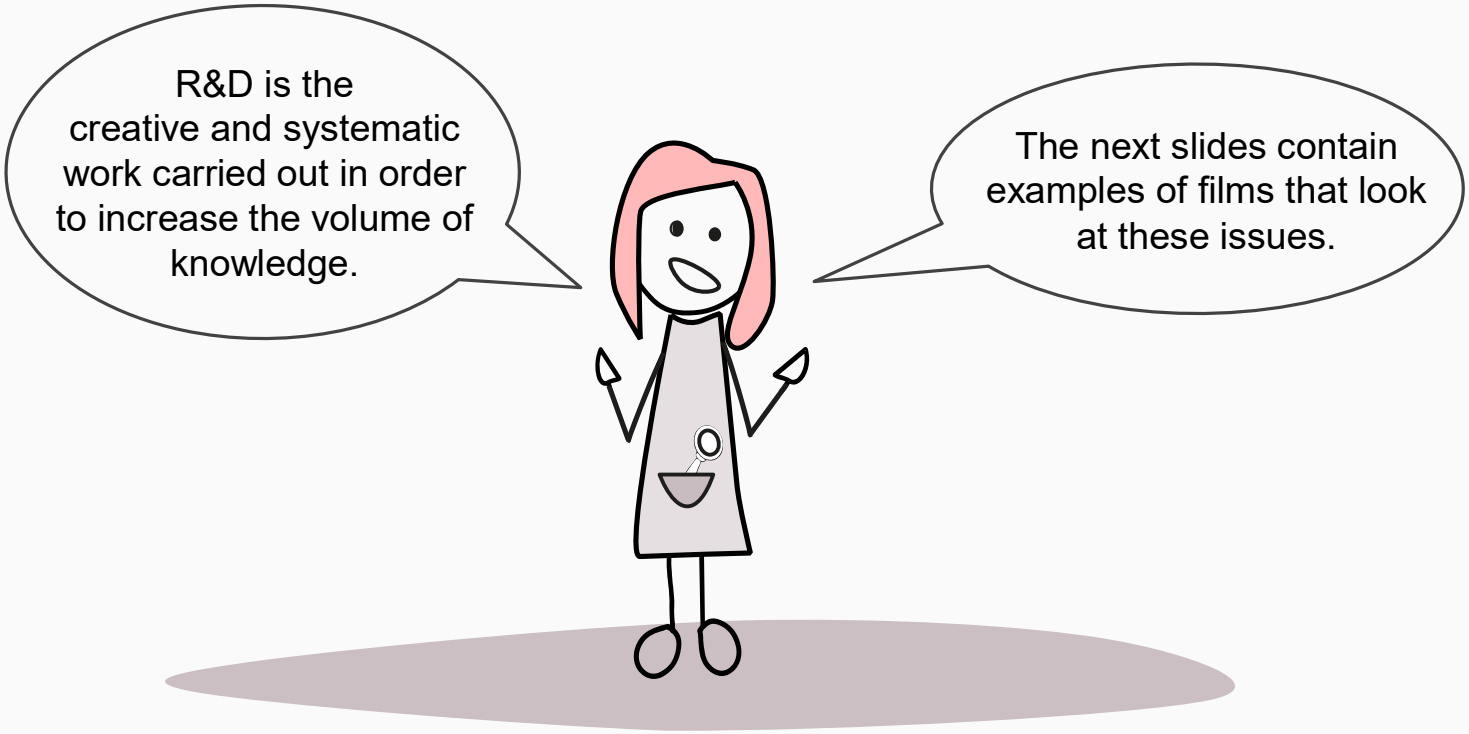
2.1. Scientific activity

For an activity to be considered R&D, it must be:

- Novel, focused on new discoveries.
- Creative, with original concepts or ideas that improve knowledge and are not obvious.
- Uncertain, because when a project is carried out, we do not know if the results will be those we expect.
- Systematic, following a plan and recording both the process and the results.
- Transferable and/or reproducible, i.e., enabling new knowledge to be transferred, guaranteeing its use and allowing other researchers to reproduce it as part of their R&D activities.

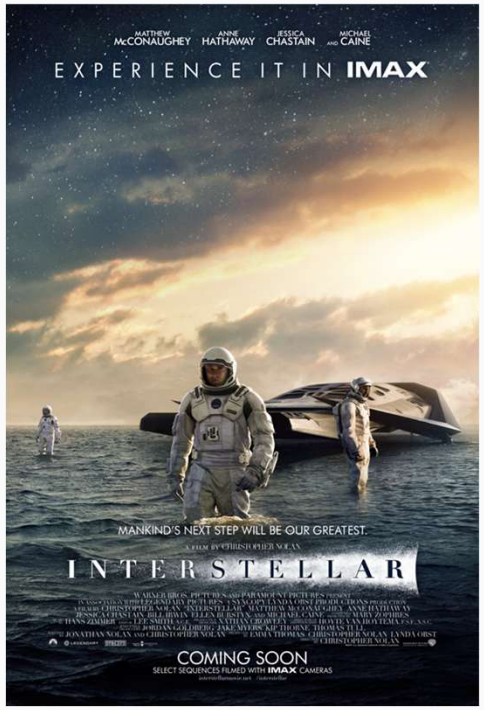
Scientific activity

2.1. Scientific activity



Scientific activity

2.1. Scientific activity



Scientific activity

2.1. Scientific activity

There are 3 types of research (R&D) (Frascatti Manual):

Basic Research	Applied Research	Experimental Research
Increases our knowledge of something, without looking for a solution to a specific problem.	Uses knowledge of something to solve a real related problem or to improve it.	Transforms applied knowledge into a tangible and marketable solution.

Scientific activity

2.1. Scientific activity

Basic Research

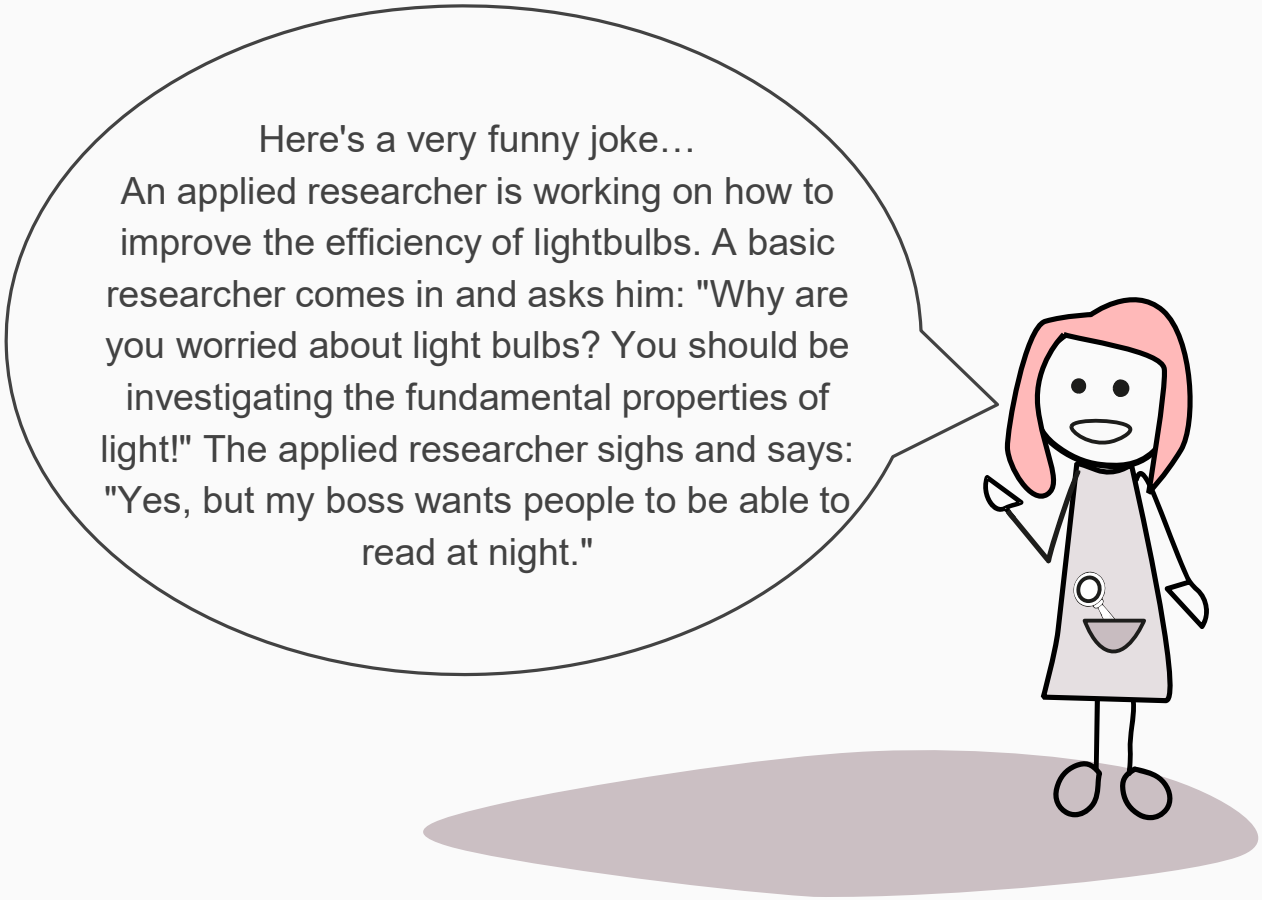
This consists of experimental or theoretical work undertaken primarily to obtain new knowledge about the fundamental aspects of observable phenomena and facts, without thinking about using or applying them in any particular way.

Scientific activity

2.1. Scientific activity

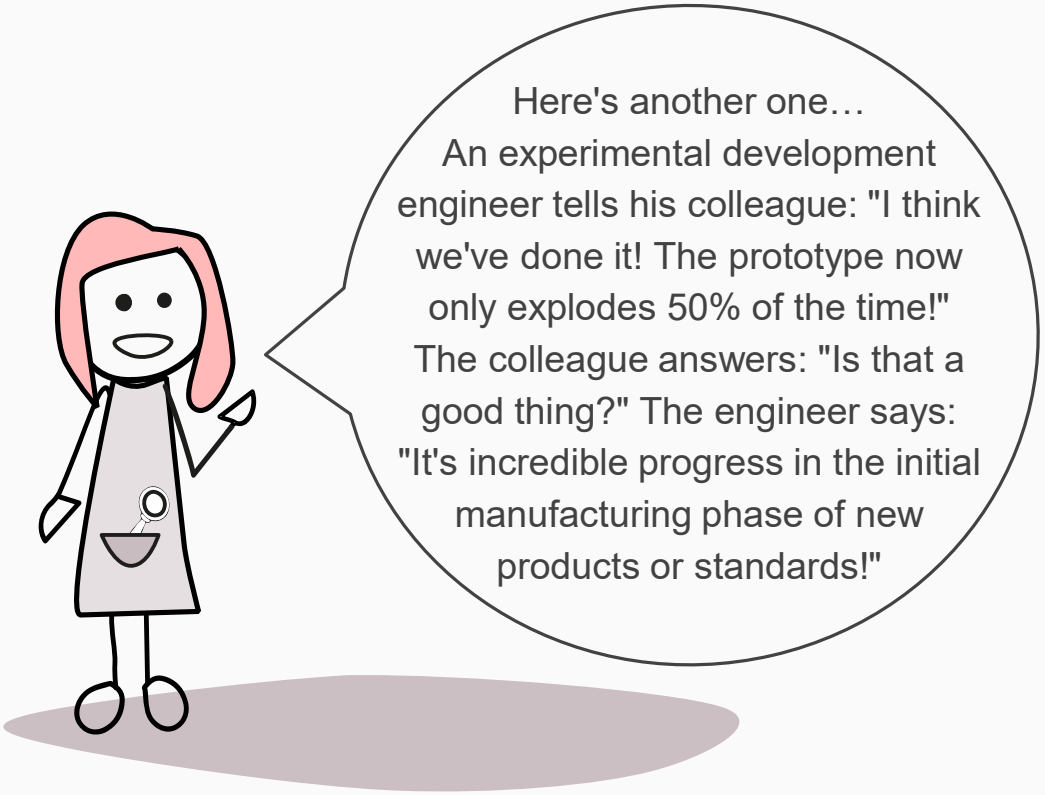
Applied Research

Original work carried out to acquire new knowledge, but which is aimed primarily at a specific practical objective.



Scientific activity

2.1. Scientific activity



Experimental development

Systematic work based on existing knowledge obtained from research or practical experience, and the production of new knowledge for use in the production of new products of processes, or in the improvement of existing products.

Scientific activity

2.1. Scientific activity

In the next slide, Lucía poses a question to awaken the students' initiative and creativity, and to consolidate the knowledge they have worked on by applying it to practical examples. They should be given some time until the end of the session.

The teachers are now given a practical example involving ants, applied to the three types of research as a model for what the students should do.

Scientific activity

2.1. Scientific activity

1. Basic Research:

Research: a scientist observes colonies of ants in the laboratory and in nature. He conducts experiments in which he isolates ants, exposes them to different chemical substances and studies their behaviour. He discovers that ants release messaging chemicals called pheromones. They use different pheromones to indicate danger, food or which way the anthill is.

The scientist learns something new about the behaviour of ants and their social organisation. There is no currently direct application for the sale or use of this knowledge in everyday life.

The main aim is to increase our knowledge of ant biology, without seeking a solution to a specific human problem.

Scientific activity

2.1. Scientific activity

2. Applied Research:

Problem: farmers are losing their crops due to a plague of plant-eating ants.

Research: a team of applied scientists takes the knowledge about ant pheromones discovered by the basic research. They investigate which pheromones attract these pest ants, and which repel them. They also study how these pheromones are dispersed in the field.

Result: they develop a trap with a specific pheromone that attracts the pest ant. Farmers can place these traps in their fields to attract the ants and prevent them from damaging their crops. They could also develop a substance that mimics a pheromone signalling danger, to act as a repellent and keep the ants away from the crops.

Scientific activity

2.1. Scientific activity

3. Experimental Development:

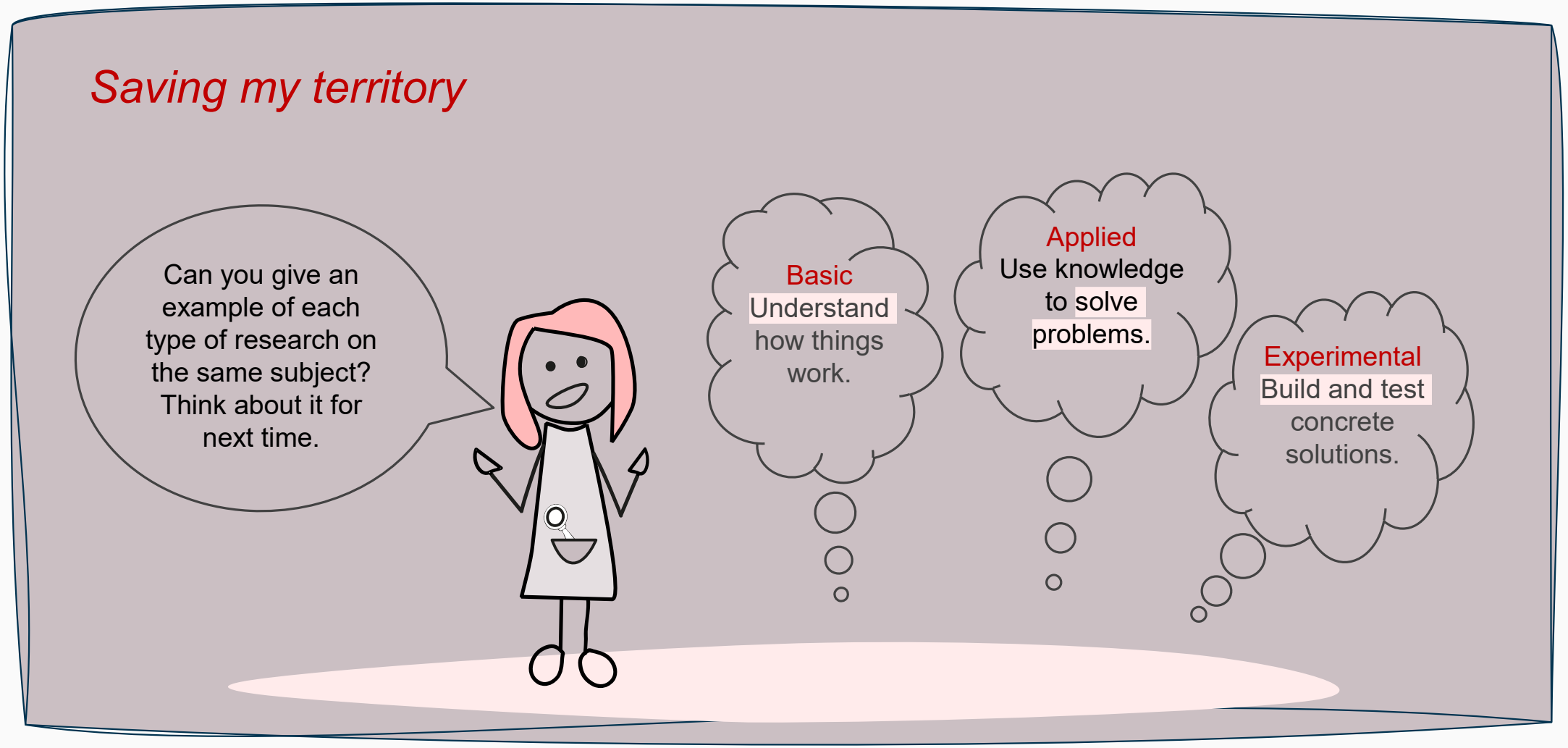
Idea: based on applied research, the aim is to create an effective pheromone trap that is easy for farmers to use.

Development: a team of engineers and technicians begins to design different types of traps: plastic, sticky containers with different mechanisms to release pheromones.

Experimentation: they build several prototype traps, and test them on ant infestations in real fields. They record which one attracts the most ants, which one is the most durable under different climate conditions, which one is the easiest to install, and which one is the cheapest to produce.

Result: after various tests and improvements, they design a trap that is effective, durable, easy to use and economical. This trap can be mass-produced and sold to farmers to protect their crops.

Scientific activity



Please use the following reference when citing this work:

Name(s) and surname(s) of the signatory/ies to this document (2025). Document title. *Saving My Territory* Intellectual Enrichment Programme. Miguel Hernández University of Elche. Available at https://salvandomiterritorio.umh.es/

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Workshop on Research and the Scientific Method

Thank you

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