Introduction

What is STEM?

In a nutshell, STEM is the integration of science, technologies, engineering and mathematics concepts using project-based and cooperative learning. Educators have been integrating learning areas since the beginning of time, so although the idea behind STEM is not new, this series hopes to make it easier for you to execute learning integration in the classroom.

The Australian Government, and governments around the world, have placed a high priority on STEM skills. The future workforce will require current students to be creative and critical thinkers who can collaborate and design solutions to problems. The skills utilised in STEM have never been more valued.

STEM education aims to prepare students for the roles of the future with skills such as innovation, creativity, reasoning, problem-solving, and technical science skills such as questioning, observing, systematic experimentation, and analysis and interpretation of data.

Format of this book

This series focuses on delivering a comprehensive and contemporary science program, culminating in a STEM project which applies the scientific knowledge acquired during the science lessons. The series incorporates the use of online resources, digital devices and iPad® applications where appropriate, in order to enhance the use of technology in the classroom.

The units

The science units are organised by sub-strand—Biological sciences, Chemical sciences, Earth and space sciences and Physical sciences. At the start of each sub-strand unit, keywords, a unit overview and curriculum scope and sequence are provided, as shown below.

Each unit contains a term's worth of work with 5–6 **lessons**, a **summative assessment** of the science knowledge with teachers notes, and a **STEM project**.

Unit overview

Title page

Unit overview

Curriculum scope and sequence

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Unit description

Lessons

The lessons are based on science knowledge and skills. The lessons contain a page of teachers notes, outlining the inquiry questions, science strands and any links to technologies and mathematics concepts, followed by a suggested lesson plan. Any resource sheets required for the lesson follow on.

Lesson 1 — Biological sciences: It's ALIVE!

Teacher notes

Science inquiry focus:
What do you know about living and non-living things?

Science Inquiry Skills:
- Questioning and predicting OP
- Planning and conducting PC
- Processing and analysing data and information PA
- Evaluating E
- Communicating C

Science as a Human Endeavour:
- Students make predictions about what a living or non-living thing is.
- Students predict what characteristics determine if something is a living or non-living thing.

Technology/Engineering/Mathematics links:
- collecting and sorting data in a table
- using a digital graphic organiser to sort information

Assessment focus:
- Use the resource sheet on page 6 as a diagnostic assessment, to see if the student can sort living and non-living objects, and use as a benchmark for later assessments.
- Use the resource sheet on page 6 as a diagnostic assessment, to see if the student has any misconceptions about what living and non-living things are.

Background information
- Living things are alive which is sometimes easily visible—e.g. a dog—and at other times difficult to tell, e.g. a seed.
- All living things are made up of one or more cells and exhibit the seven main life functions of growth, movement, reproduction, sensitivity, respiration, elimination and nutrition.
- Things that were once part of a living thing, such as wood, fruit and cut grass, are usually classified as once-living; this also includes anything dead. Non-living is the condition of never being alive, such as a metal saucepan or a computer.
- Non-living things do not reproduce. They may change and increase in size due to certain natural processes, but they do not develop and adapt to the environment. Non-living things do not respond to stimuli, or require air, food or water.
- The DVD series *Miniscule* contains many short animations about insects that will keep students engaged for short periods. A game of 'I spy a living or non-living thing' can then be incorporated. View a sample episode at <https://tinyurl.com/zrktgmv>.

Resources
- *Mary had a little lamp* by Jack Lechner and Bob Staake. Online version at <https://tinyurl.com/j5z7dl4>
- Online T-chart <http://tinyurl.com/h6x4ecz>
- Copies of page 6 for students
- Is it alive? video <http://tinyurl.com/h39upv2>

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Biological sciences: It's ALIVE! — Lesson 1

Lesson plan

Introduction:
1. Read *Mary had a little lamp* by Jack Lechner and Bob Staake at <https://tinyurl.com/j5z7dl4>. Discuss why the story is funny and the concept of non-living. *How do you know something is non-living? What does it mean? How does it compare to a living thing? Is the lamp living or non-living? What if the lamp is switched on—is it living?* OP
2. *What are some examples of living and non-living things?* List living and non-living things and any key words or phrases in an online T-chart found at <http://tinyurl.com/h6x4ecz> or <https://tinyurl.com/j38v5pk>. OP PA

Note: This is to establish students' prior knowledge including any misconceptions, so it is important to not correct them at this stage. It will also highlight any confusion around the idea of what living is; e.g. do you consider an apple living or non-living?

Development:
3. In pairs, with a camera, students search the playground area for living and non-living things. They should find at least five items to take a photograph of or draw in the table on page 6. If photographs were taken, students can print them out and paste onto their sheet. They will also need to provide an explanation for the classification. PC PA
4. Students present their T-chart for the class to agree or disagree with the classifications. Note any items that cause confusion; e.g. Is the leaf living or non-living? What reason did you give to classify it that way? E C

Differentiation
- Less capable students can fill out page 6 using drawings.
- More capable students can draw their own T-chart and classify more than five items.

Reflection:
5. As a class discuss how easy it was to know if something is living or non-living just by looking at it. *How can you tell living things from non-living things? Is an apple growing on a tree a living thing? What about an apple that is picked?* Individually, students complete the sentence at the bottom of page 6 about what they think the similarities are among living things and non-living things, and share their thoughts with the class. OP E
6. If there is time, share the *Is it alive?* video at <http://tinyurl.com/h39upv2> for students to identify whether they think each thing shown is living or non-living. OP

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Lesson 1 — Biological sciences: It's ALIVE!

Living or non-living hunt

Living	Non-living	Why?

I think something is living if …

I think something is non-living if …

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Lesson plan **Resource sheets**

Assessment

A teacher page is provided outlining the assessment indicators and answers for the following assessment page(s). The assessment page(s) covers the science knowledge explored in the previous lessons.

Assessment — Biological sciences: It's ALIVE!

Teacher notes

Science knowledge
Living things can be grouped on the basis of observable features and can be distinguished from non-living things (ACSSU044) AC

Indicators
- Identifies examples of living, non-living and once-living things and products of living things.
- Identifies observable characteristics that all living things have in common.
- Creates a table to represent data.
- Sorts living things by characteristics.

Assessment answers
Page 33
1. Teacher check. Answers could include:

Living	Non-living	Once-living	Products of living things
Any animal or plant	Anything that was never alive; e.g. car, scissors, cup, stapler	Anything that was once alive; e.g. apple, fossil, fallen leaf, picked flower	Anything that came from a living thing; e.g. milk, honey, cotton, rubber, wood

2. Any of the seven characteristics: Growth, movement, reproduction, sensitivity to stimuli, respiration (breathing), elimination of waste, nutrition (food)
3. Teacher check. Groups could be like the following, or based more on observed features:

Plants	Birds (things with feathers)	Mammals (things with fur)	Amphibians	Reptile	Fish (things that have gills)
oak tree rose bush	eagle emu	possum cat dog horse	frog	snake lizard	shark goldfish

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Biological sciences: It's ALIVE! — Assessment

1. Give two examples of each thing:

Living	Non-living	Once-living	Products of living things

2. How do you know something is living? Name five characteristics you can observe in living things.

Characteristics of living things

3. Draw a table or something similar, to sort the following living things into more than two groups.

oak tree, rose bush, eagle, dog, possum, emu, lizard, snake, goldfish, cat, horse, frog, shark

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Teacher notes **Assessment page(s)**

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Unit description

STEM project

The STEM project provides students with the opportunity to apply what they have learned in the previous science lessons while incorporating technologies, engineering and mathematics concepts where possible. The project entails group collaboration and an extended learning period of 3–4 weeks. This gives students a real-life experience of working with 'colleagues' to share ideas and test designed solutions. Each STEM project contains an overview listing STEM concepts and alternative project ideas, curriculum links, teacher notes and a group assessment rubric, and a project brief and checklist for students. Any resource sheets required are also provided, as well as a self-assessment sheet.

STEM project overview and STEM curriculum links

Teacher notes

Project brief

Project steps

Resource sheets

Self-assessment and Group assessment rubric

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