Edu.Cat

STEM Challenge

LEVEL 2B

Teacher Guide



TenLives

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About Ten Lives

Ten Lives is a leader in cat management and operates Tasmania's largest cat shelter taking into our care all lost, stray, unwanted, wild and feral cats. Ten Lives receives no government funding and relies on funds generated from our own operations and the support of the general community through donations and bequests.

Operating for over seventy years Ten Lives has cared for tens of thousands of cats and kittens. In kitten season we have on average one cat or kitten coming into our care every 30 minutes during our 7 day a week operation.

By changing the way we collectively care for cats, we are benefiting not only cats but also members of our community and the environment.

Ten Lives has an independent board and has a professional and dedicated team that ensure Ten Lives is a sustainable organisation for the long term.

Ten Lives objectives are:

- To promote and improve the welfare of cats and kittens.
- To promote responsible cat ownership and humane animal welfare principles.
- To shift public attitude towards the welfare of their cats in order to reduce the number of stray, abandoned, lost, unwanted or feral cats.
- To provide education throughout schools and the general public to create positive outcomes for cats, the environment and communities.
- To reduce unnecessary euthanasia of cats and kittens.

Ten Lives promotes responsible cat ownership and all cats adopted are microchipped, de-sexed, vaccinated and have received all necessary veterinary care.

Ten Lives plays a leading role in cat management and works with all levels of government, community groups, education and research institutions, conservation groups and business.

Ten Lives believes that education is key to creating long term social change in the way we care for our cats, the community and our environment.

Ten Lives

About Edu.Cat

Edu.Cat is an Australian-first STEM education program focusing on issues surrounding cat welfare, cat management and the positive and negative impact cats have on individuals, communities and wildlife. The subject matter of the program (cats) is tangible and appealing to students whilst the incursions and STEM Challenges and additional work book activities engage students in areas of Science, Technologies, Engineering and Maths, inspiring students in these professional fields and empowering them to make positive choices in cat ownership.

Edu.Cat, developed in Tasmania by Ten Lives is available to all schools. The program includes complete Australian Curriculum – linked suggested unit plans for Kinder to Yr 6 students in 4 levels. 1A, 1B, 2A, 2B: 1A = K/P; 1B = Yr 1/2; 2A = Yr 3 /4; 2 B = Yrs 5 /6. However, any level might be presented due to the needs and background knowledge of students. As students' progress through the program, they engage in new and exciting inquiry-based learning and STEM Challenges to build on information they have learnt in previous years.

Ten Lives provides teachers with all supporting resources: Teacher Guides, Students Books, STEM Challenges and additional activities linked to the Australian Curriculum and the Early Years Learning Framework.

All **Edu.Cat** curriculum-linked presentations are tailored to specific levels and to the needs of individual schools which is highly desirable for teachers, as well as being engaging for students.

Enquiries can be made for kittens to attend **Edu.Cat** sessions as an additional component to the program, subject to availability.

Ten Lives also offers schools the opportunity to book a behind the scenes tour of Ten Lives, Tasmania's largest cat shelter.

Edu.Cat paves the way for students to:

- **inquire**
- **problem solve**
- **design**
- **create**
- **evaluate**
- **work as a team**
- **innovate**
- **be inspired**
- **participate in interactive learning**
- **engage in STEM**



Ten Lives Edu.Cat STEM Challenge

Kinder to Year 6

The Big Question: What is responsible cat ownership? (Welfare, Environment and Community)

Background Information: Foundations of STEM (Science, Technologies, Engineering, Maths)

STEM education is a term used to refer collectively to the teaching of the disciplines within its umbrella - Science, Technologies, Engineering and Mathematics.

Today's students need to acquire core subject knowledge as well as the skills of collaboration, critical thinking, creativity and problem solving - and STEM education has a crucial role in achieving this.

International research shows that building STEM capacity across the population is critical in helping to support innovation and productivity regardless of occupation or industry. Consistent with this research, industry surveys show that STEM literacy is increasingly becoming part of the core capabilities that Australian employers need. (National STEM School Education Strategy 2016 - 2026)

STEM education is an interdisciplinary approach to learning where rigorous academic concepts are coupled with real-world lessons as students apply Science, Technology, Engineering, and Mathematics in contexts that make connections between school, community and work... (Tsupros, N., R. Kohler, and J. Hallinen, 2009)

Edu.Cat is committed to contributing to the way in which Tasmanian students experience STEM fields. The Edu.Cat program paves the way for students to collaborate, inquire and problem solve within their school community, whilst preparing them for future endeavours.

Level 2B STEM Challenge Overview

	Guiding Questions	Resources Required	Learning Intentions
Activity 1	• How do cats play? • How do we know when cats are happy?	• Videos, websites on cat toys, how they play, what they do when happy etc. • Short story - The day in the life of a stray cat. (Link to one online or video etc.)	• Students recall living things have adaptations that help them survive, and environmental conditions affect the survival of living things. • In teams, students produce a table of features for a cat toy, which adaptation it meets and what indicators will show the cat enjoys it.
Activity 2	• What does the shape, colour, size, materials and sound of a cat toy tell us about the adaptations of a cat to hunt?	• Videos, information sheets, websites etc. of the top 10 cat toys and why they are the top ten. • Plain paper, grey leads and a selection of coloured pencils.	• In teams, students create a labelled diagram, to scale, of a toy for a pet cat suited to its hunting adaptations.
Activity 3	• What does the design and use of your materials tell us about how cats have adapted to the life of a pet e.g. impact on furniture, quiet enjoyment of cat owners inside.	• A selection of recycled everyday materials, natural and not e.g. string, leaves, gumnuts, plastic, newspaper, cardboard boxes, glue, scissors etc.	• In teams, students construct their cat toy from their detailed plan. • Where possible, students test and modify their design. • Students share cat toys with the whole school in an assembly or school event. • Students can film their toys being tested with a cat and present their results to the class. They discuss any modifications that were made.

Success Criteria - Evidence of work

In teams, students produce an accurate table of features for a cat toy, which adaptation it meets and what indicators will show the cat enjoys it.

- An accurately labelled diagram to scale of the toy, including:
  a) top view
  b) side view
  c) description of features that meet the hunting adaptations of a pet cat.
- An accurate model of the designed toy demonstrating appropriate choice of materials or reasoning of why the materials were chosen.
- A clearly written record and/or film and oral presentation of testing and reasoning for any modifications made (where possible).

Note to teachers: STEM Challenges are deigned to fit into existing science unit concepts. Not all units are compulsory.

Level 2B STEM Challenge Part 1
Captivating Cat Toy

STEM Challenge Part 1 of 3

Learning intentions for STEM Challenge Part 1

Students recall living things have adaptations that help them survive, and environmental conditions affect the survival of living things.

Success Criteria

- In teams, students will have produced an accurate table of features for a cat toy, which adaptation it met and what indicators show the cat will enjoy it (in workbook).

Knowledge and Understanding - Australian Curriculum

Science		
Science Understanding **Strand: Biological Sciences** **AC9S5U01** Examine how particular structural features and behaviours of living things enable their survival in specific habitats. **Strand: Biological Sciences** **Yr 6: AC9S6U01** Investigate the physical conditions of a habitat and analyse how the growth and survival of living things is affected by changing physical conditions.	**Science as a Human Endeavour** **Strand: Nature and development of Science** **Yr 5: AC9S5H02** Investigate how scientific knowledge is used by individuals and communities to identify problems, consider responses and make decisions. **Sub strand: Use and influence of science** **Yr 6: AC9S6H02** Investigate how scientific knowledge is used by individuals and communicates to identify problems, consider responses and make decisions.	**Science Inquiry Skills** **Sub Strand: Communicating** **Yr 5: AC9S5106** Write and create texts to communicate ideas and findings for specific purposes and audiences, including selection of language features, using digital tools as appropriate. **Yr 6: AC9S6106** Write and create texts to communicate ideas and findings for specific purposes and audiences, including selection of language features, using digital tools as appropriate.

<table>
<tr><th colspan="2">Technologies</th></tr>
<tr><td>Knowledge and Understanding:
Yr 5/6
Sub Strand: Technologies and society
AC9TDE6K01
Explain how people in design and technologies occupations consider competing factors including sustainability in the design of products, services and environments.

Sub Strand: Technologies context: Materials and technologies specializations.
AC9TDE6K05
Explain how characteristics and properties of materials, systems, components, tools and equipment affect their use when producing designed solutions</td><td>Processes and Production Skills:
Yr 5/6
Sub Strand: Investigating and defining.
AC9TDE6P01
Investigate needs or opportunities for designing, and the materials, components, tools, equipment and processes needed to create designed solutions.</td></tr>
<tr><th colspan="2">General Capabilities</th></tr>
<tr><td>Personal & Social Capability: Expanding students' capacity to question, solve problems, explore and display curiosity. Students use their scientific knowledge to make informed choices about issues that impact their lives such as environmental change, and consider the application of science to meet a range of personal and social needs.</td><td>Critical and Creative Thinking: Creative thinking enables the development of ideas that are new to the individual, and this is intrinsic to the development of scientific understanding. Scientific inquiry promotes critical and creative thinking by encouraging flexibility and open-mindedness as students speculate about their observations of the world and the ability to use and design new processes to achieve this. Students' conceptual understanding becomes more sophisticated as they actively acquire an increasingly scientific view of their world and the ability to examine it from new perspectives.</td></tr>
<tr><td>Literacy: By learning the literacy of science, students understand that language varies according to context and they increase their ability to use language flexibly. Scientific vocabulary is often technical and includes specific terms for concepts and features of the world, as well as terms that encapsulate an entire process in a single word, such as 'photosynthesis'. Language is therefore essential in providing the link between the concept itself and student understanding and for assessing whether the student has understood the concept.</td><td>Numeracy: Many elements of numeracy are evident in the Australian Curriculum: Science, particularly in Science Inquiry Skills. These include practical measurement and the collection, representation and interpretation of data from investigations.</td></tr>
<tr><td colspan="2">Ethical Understanding: They explore what integrity means in science, and explore and apply ethical guidelines in their investigations. They consider the implications of their investigations on others, the environment and living organisms.
They use scientific information to evaluate claims and to inform ethical decisions about a range of social and environmental issues, including the treatment of animals.</td></tr>
</table>

Resources

- Videos, photos of cat toys, how they play
- Best 15 Cat Toys of 2017 https://catsareontop.com/best-toys-for-cats/
- Short story - "The day in the life of a stray cat" https://www.youtube.com/watch?v=YpUNVB_h7ic

STEM teaching and learning activities

- Discuss and review what students found out from the Ten Lives incursion.
- Students recall specific adaptations of a cat. Group features using a T chart with the headings 'structural adaptations', (what they have) and 'behavioural adaptations' (what they do).
- Cat Language information in student workbooks page 25 and use Think. Pair. Share. or See. Think. Wonder.
- Share videos and images of cat toys with class. Note variations to match the individual needs of cats! https://www.amazon.com/Best-Sellers-Pet-Supplies-Cat-Toys/zgbs/pet-supplies/2975303011 https://catsareontop.com/best-toys-for-cats/ Link to Best 15 Cat Toys of 2017.
- Students choose at least three toys to study and discuss how the toys meet a cat's adaptations.

Vocabulary list

Agile - able to move quickly and easily

Flexible - able to bend easily and without breaking or hurting

Structural adaptations - adaptations the living thing has on their body e.g. claws and fur

Behavioural adaptations - adaptations the living thing does with their body e.g. balancing, bouncing

Key inquiry questions

How do cats play?

How do we know when cats are happy?

What actions do cats make when playing? (run, bounce, jump etc.)

Support materials

Student Workbooks - Cat Language information sheet.

Level 2B STEM Challenge Part 2
Captivating Cat Toy

STEM Challenge Part 2 of 3

Learning intentions for STEM Challenge Part 2

In teams, students plan the design of a toy for a pet cat suited to its hunting adaptations. In doing so, they will know and understand how to describe key features of living things and how their growth is affected by their environment, as well as the design process and material selection.

Success Criteria

In teams, students will have created an accurately labelled diagram to the scale of the toy, including:

a) top view

b) side view

c) a description of features that meet the hunting adaptations of a pet cat.

Knowledge and Understanding - Australian Curriculum

Science		
Science Understanding **Sub Strand: Biological Sciences** **Yr 5 AC9S5U01** Students will examine how particular structural features and behaviours of living things enable their survival in specific habitats.	**Science as a Human Endeavour** **Yr 5:** **Sub Strand:** **Use and influence of Science** **AC9S5H02** Investigate how scientific knowledge is used by individuals and communities to identify problems, consider responses and make decisions. **Yr 6:** **AC956H02** Investigate how scientific knowledge is used by individuals and communities to identify problems, consider responses and make decisions.	**Science Inquiry Skills** **Sub Strand:** **Questioning and Predicting** **Yr 5:** **AC9S5I01** Pose investigable questions to identify patterns and test relationships and make reasoned predictions. **AC9S5I02** **Sub Strand: Planning and conducting:** Plan and conduct repeatable investigations to answer questions, including, as appropriate, deciding the variables to be changed, measured and controlled in fair tests; describing potential risks; planning for the safe use of equipment and materials; and identifying required permissions to conduct investigations on Country/Place.

Science (continued)		
		Yr 6: **Sub Strand: Communicating** **AC9S6I06** Write and create texts to communicate ideas and findings for specific purposes and audiences, including selection of language features, using digital tools as appropriate. **Sub Strand: Planning and conducting:** **AC9S6I02** Plan and conduct repeatable investigations to answer questions including, as appropriate, deciding the variables to be changed, measured and controlled in fair tests; describing potential risks; planning for the safe use of equipment and materials; and identifying required permissions to conduct investigations on Country/Place.

Maths
Measurement: **Yr 6:** **AC9M6M01** **Strand: Measurement** Convert between common metric units of length, mass and capacity; choose and use decimal representations of metric measurements relevant to the context of a problem.

Technologies	
Knowledge and Understanding: **Yr 5/6** **Sub Strand:** **Technologies and Society** **AC9TDE6K01** Explain how people in design and technologies occupations consider competing factors including sustainability in the design of products, services and environments. **AC9TDE6K05** **Sub Strand: Technologies context: Materials and technologies specializations.** Explain how characteristics and properties of materials, systems, components, tools and equipment affect their use when producing designed solutions.	**Processes and Production Skills:** **Yr 5/6:** **Sub Strand: Investigating and defining.** **AC9TDE6P01** Investigate needs or opportunities for designing, and the materials, components, tools, equipment and processes needed to create designed solutions. **AC9TDE6P02** Generate, iterate and communicate design ideas, decisions and processes using technical terms and graphical representation techniques, including using digital tools. **Sub Strand: Evaluating** **AC9TDE6P04 (and possibly AC9TDE6P05)** Negotiate design criteria including sustainability to evaluate design ideas, processes and solutions.

General Capabilities	
Personal & Social Capability: Expanding students' capacity to question, solve problems, explore and display curiosity. Students use their scientific knowledge to make informed choices about issues that impact their lives such as environmental change, and consider the application of science to meet a range of personal and social needs. Critical and Creative Thinking: Creative thinking enables the development of ideas that are new to the individual, and this is intrinsic to the development of scientific understanding. Scientific inquiry promotes critical and creative thinking by encouraging flexibility and open-mindedness as students speculate about their observations of the world and the ability to use and design new processes to achieve this. Students' conceptual understanding becomes more sophisticated as they actively acquire an increasingly scientific view of their world and the ability to examine it from new perspectives.	**Critical and Creative Thinking:** Creative thinking enables the development of ideas that are new to the individual, and this is intrinsic to the development of scientific understanding. Scientific inquiry promotes critical and creative thinking by encouraging flexibility and open-mindedness as students speculate about their observations of the world and the ability to use and design new processes to achieve this. Students' conceptual understanding becomes more sophisticated as they actively acquire an increasingly scientific view of their world and the ability to examine it from new perspectives.
Literacy: By learning the literacy of science, students understand that language varies according to context and they increase their ability to use language flexibly. Scientific vocabulary is often technical and includes specific terms for concepts and features of the world, as well as terms that encapsulate an entire process in a single word, such as 'photosynthesis'. Language is therefore essential in providing the link between the concept itself and student understanding and for assessing whether the student has understood the concept.	**Numeracy:** Many elements of numeracy are evident in the Australian Curriculum: Science, particularly in Science Inquiry Skills. These include practical measurement and the collection, representation and interpretation of data from investigations.
Ethical Understanding: They explore what integrity means in science and explore and apply ethical guidelines in their investigations. They consider the implications of their investigations on others, the environment and living organisms. They use scientific information to evaluate claims and to inform ethical decisions about a range of social and environmental issues, including the treatment of animals.	

Resources

- Look up websites of the top 10 cat toys and why these toys are great for cats.
- Video from ABC Splash Thinking about the Design Process
- Plain paper, grey leads, selection of coloured pencils.

STEM teaching and learning activities

- Discuss and review what was found out from the toy research.
- Introduce the Challenge to design a cat toy suited to their adaptations.
- Watch the short video from ABC Splash Thinking about the Design Process.

Discuss:

- Step 1. Look at the requirements.
- Step 2. Look at the environment.
- Step 3. What equipment do I have?
- Why is it important to be flexible in the design?
- What experience do you want the cat to have with the toy?

- In teams, students first brainstorm, agree, then start to design their toy. Students create a labelled diagram, with a top view, side view and which features meet the adaptations of a cat.

Vocabulary list

Requirements – what is needed or wanted in the design?

Environment – the area or conditions in which the living thing lives or operates.

Features – a specific attribute or part of a living thing.

Key inquiry questions

What do the shape, colour, size, materials and sound of a cat toy tell us about its adaptations?

Can you train a cat to hunt a toy? To walk quietly?

What would happen over time to a cat with no access to toys?

Level 2B STEM Challenge Part 3
Captivating Cat Toy

STEM Challenge Part 3 of 3

Learning intentions for STEM Challenge Part 3

In teams, students work cooperatively to construct their cat toy from their detailed plan. Where possible students test and modify their design (homework).

Students can clearly communicate and explain their thinking in relation to which adaptations their toy will highlight, in a class presentation, and/or whole school at an assembly. Students who tested toys incorporate into their presentation what modifications were made because of testing.

Success Criteria

1. An accurate model of the designed toy demonstrating appropriate choice of materials or reasoning of why the materials were chosen and what makes an effective cat toy.
2. A clearly written record and/or film and oral presentation of testing and reasoning for any modifications made (where possible).

Knowledge and Understanding - Australian Curriculum

Science		
Science Understanding: **Yr 5:** **Sub Strand:** **Biological Sciences** **AC9S5U01** Examine how particular structural features and behaviours of living things enable their survival in specific habitats. **Yr 6:** **Sub Strand: Biological Sciences** **AC9S6U01** Investigate the physical conditions of a habitat and analyse how the growth and survival of living things is affected by changing physical conditions.	**Science as a Human Endeavour** **Yr 5:** **Sub Strand: Use and influence of Science** **AC9S5H02** Examine why advances in Science are often the result of collaboration or build on the work of others. **Yr 6:** **Sub Strand: Use and influence of Science** **AC9S6H02** Investigate how scientific knowledge is used by individuals and communities to identify problems, consider responses and make decisions.	**Science Inquiry Skills** **Yr 5:** **Sub Strand: Questioning and predicting:** **AC9S5I01** Pose investigable questions ot identify patterns and test relationships and make reasoned predictions. **Yr 6:** **Sub Strand: Questioning and Predicting** **AC9S6I01** Pose investigable questions to identify patterns and test relationships and make reasoned predictions. **Sub Strand: Planning and conducting** **AC9S6I02** Plan and conduct repeatable investigations to answer questions including, as appropriate, deciding the variables to be changed, measured and controlled in fair tests; describing the potential risks; planning for the safe use of equipment and materials; and identifying required permissions to conduct investigations on Country/ Place.

Science (continued)		
		Sub Strand: Evaluating **AC9S6I05** Compare methods and findings with those of others, recognize possible sources of error, pose questions for further investigation and select evidence to draw reasoned conclusions. **Sub Strand: Communicating** **AC9S6I06** Write and create texts to communicate ideas and findings for specific purposes and audiences, including selection of language features, using digital tools as appropriate. communicate ideas and findings for specific purposes and audiences, including selection of language features, using digital tools as appropriate.
Maths		
Measurement: **Yr 5** **Strand: Measurement** **AC9M5M01** Choose appropriate metric units when measuring the length, mass, capacity of objects; use smaller units or a combination of units to obtain a more accurate measure. **Yr 6:** **AC9M6M02** Establish the formula for the area of a rectangle and use it to solve practical problems.		

Technologies	
Knowledge and Understanding : **Yr: 5/6** **Sub Strand: Technologies and society** **AC9TDE6K01** Explain how people in design and technologies occupations consider competing factors including sustainability in the design of products, services and environments. **Sub Strand: Technologies context: Materials and technologies specialisations** **AC9TDE6K05** Explain how characteristics and properties of materials, systems, components, tools and equipment affect their use when producing designed solutions.	**Processes and Production Skills:** **Yr 5/6:** **Sub Strand: Investigating and defining** **AC9TDE6P01** Investigate needs or opportunities for designing, and the materials, components, tools, equipment and processes needed to create designed solutions. **Sub Strand: Generating and designing** **AC9TDEP02** Generate, iterate and communicate design ideas, decisions and processes using technical terms and graphical representation techniques, including using digital tools. **Sub Strand: Producing and implementing** **AC9TDEP03** Select and use suitable materials, components, tools, equipment and techniques to safely make designed solutions. **Sub Strand: Evaluating** **AC9TDEP04** Negotiate design criteria including sustainability to evaluate design ideas, processes and solutions.
General Capabilities	
Personal & Social Capability: Expanding students' capacity to question, solve problems, explore and display curiosity. Students use their scientific knowledge to make informed choices about issues that impact their lives, such as environmental change, and consider the application of science to meet a range of personal and social needs.	**Critical and Creative Thinking:** Creative thinking enables the development of ideas that are new to the individual, and this is intrinsic to the development of scientific understanding. Scientific inquiry promotes critical and creative thinking by encouraging flexibility and open-mindedness as students speculate about their observations of the world and the ability to use and design new processes to achieve this. Students' conceptual understanding becomes more sophisticated as they actively acquire an increasingly scientific view of their world and the ability to examine it from new perspectives.
Literacy: By learning the literacy of science, students understand that language varies according to context and they increase their ability to use language flexibly. Scientific vocabulary is often technical and includes specific terms for concepts and features of the world, as well as terms that encapsulate an entire process in a single word, such as 'photosynthesis'. Language is therefore essential in providing the link between the concept itself and student understanding and for assessing whether the student has understood the concept.	**Numeracy:** Many elements of numeracy are evident in the Australian Curriculum: Science, particularly in Science Inquiry Skills. These include practical measurement and the collection, representation and interpretation of data from investigations.

General Capabilities (continued)
Ethical Understanding: They explore what integrity means in science, and explore and apply ethical guidelines in their investigations. They consider the implications of their investigations on others, the environment and living organisms. They use scientific information to evaluate claims and to inform ethical decisions about a range of social and environmental issues, including the treatment of animals.

Resources

- A selection of recycled and craft materials e.g. string, leaves, gumnuts, plastic, newspaper, cardboard boxes, feathers etc. Students to bring items from home, too.
- Glue, scissors, tape etc.

STEM teaching and learning activities

- Students present their design to the class or other teams and ask for feedback. Feedback is recorded and adjustments to the design are made in the diagram.
- In teams, students create a model of a cat toy, or the real toy with features that meet the adaptations of a cat.
- Where possible and time allows, students can test the toy with a pet at home and record with video or photos the testing and any modifications that were made afterwards.

Vocabulary list

Modifications - make partial or minor changes to something

Materials - what something is made from

Key inquiry questions

Have you considered the needs of the cat owner (e.g. impact on furniture, quiet enjoyment)?

What do the design and use of your materials tell us about how cats have adapted to the life of a pet?

Support materials

Student templates

Examples of homemade cat toys



Homemade cat toys/Pinterest

Cats, the experts in hunting

Cats are carnivores. To survive in the wild without the help of humans, cats need to be successful hunters. Their physical features and enhanced senses are key to their hunting success.

Cats are fast and powerful, from a sitting start they can spring up to nine times their height. They are also very flexible and can narrow their shoulders and chest to squeeze through tight spaces. While chasing and catching prey, they can make sudden changes in direction and rotate their bodies to land on their feet.



duben/123RF

The challenge

In teams, design and construct a cat toy from recycled materials. The toy needs to be suited to the cat's hunting adaptations.

OR as a question - What is the best, safe toy you can design specifically for a cat to play with?

Working as a team can be a challenge. Here are some different roles people take in teams.

Ideas generator – Suggests many different ideas. Does not think about the details or how it is done.

Evaluator – Checks in with the task to see if the project is on track. If off track, that is OK: they will let everyone know and provide feedback.

Problem solver – Asks questions such as: What if we....? Maybe we can....? I wonder if we change this, move that... would it...?

Details person – Often the one finishing the task. Asks questions like: Will it work? What materials do we need? Where can we get those materials? Is there a simpler way?

How do you like to work in a team?



What do you think you are good at?

The engineering design process



Factors to consider when designing a cat toy

Needs of the animal

Does it provide physical and mental exercise?

Does it improve brain function (problem-solving) and social interaction?

Does it add to their quality of life?

Is it safe for cats to play with?

Needs of the owner

Is it quiet or does it make a pleasant sound?

Is it durable and safe?

Is it good value for money?

Does it reinforce the human-cat bond?

How does a cat like to play? Like it is catching prey!

A cat's instinct is to hunt to survive; even well-fed pet cats are driven by their instinct to hunt, they simply cannot help themselves.

Domestic pet cats, especially kittens, love to play with toys and other cats and kittens. This type of play helps them practise their hunting skills.

Pet cats and kittens like to play with toys that resemble prey, and they play more when they are hungry.

Domestic pet cats may simply enjoy a hunting game.

Let's keep them entertained at home so they don't need to hunt living things for fun.



Funix/123RF



Creativo 123RF

ASK:
Define the problem

Questions our team is wondering...

1. _____
2. _____
3. _____

What is the best toy you can design specifically for a pet cat?

IMAGINE:
Brainstorm possible solutions...

Do your own research
... search for the best cat toys

Here are a few links to get you started

www.petplay.com/awards/

catsareontop.com/best-toys-for-cats/ Best 15 Cat Toys of 2017

www.amazon.com/Best-Sellers-Pet-Supplies-Cat-Toys/zgbs/pet-supplies/2975303011

www.pinterest.com.au/lacey_pentland/diy-homemade-cat-toys/?lp=true

Have you thought of these simple ideas?

- Round, plastic shower curtain rings.
- Ping-pong balls and plastic practice golf balls with holes. Try putting one in a dry bathtub; for many cats, the captive ball is much more fun than one that disappears under the sofa.
- Paper bags with any handles removed. Paper bags are good for pouncing, hiding and interactive play.
- Empty cardboard tubes from toilet paper and paper towels; unwind a little cardboard to get them started.
- Cardboard boxes. Fasten some together with strong packing tape and cut out doors and windows to make a fun cat playhouse.

Like children, cats become bored with their toys, so rotate toys often to keep them exciting.

'Hide and seek' is a fun game for cats to play. 'Found' toys are often much more attractive than a toy that is obviously introduced.

Provide toys that offer a variety of uses —

- at least one toy to carry
- one to wrestle with
- one to roll
- one to snuggle with.



Lufimorgan / 123RF

These items are not cat toys

Don't allow cats to reach these things:

- String, wool, cotton, ribbon and dental floss
- Paper clips
- Pins and needles
- Rubber bands and hair ties
- Plastic bags, especially drycleaner bags (a cat could suffocate inside)
- Anything else that your cat might chew, including electrical cords.

Other choking risks:

- Small eyes and noses on soft toys can be swallowed or inhaled.
- Plastic bits can break apart, leaving sharp edges which can cut stomachs and intestines on the inside.
- Stuffing can be made of cotton, kapok, polyester fibres, plastic, or foam beads. These materials can be dangerous to cats and kittens if swallowed or eaten.
- Check all toys for wear and tear daily. If a toy is broken, bin it.

Cat toys with long cords or dangly bits are for supervised play only and must be stored in a catproof cupboard when you aren't around to control the stick.

When not in use, put dangly toys like this away in a cupboard that cats/kittens cannot open.



Ukususha / 123RF

Tinsel, Christmas lights and most of the fun stuff on Christmas trees, are dangerous to cats. Cellophane grass used to line Easter baskets is also dangerous.

Balls of wool and string may look innocent enough. However, due to the design of a cat's tongue, which has fine backward facing barbs, it is very easy for cats to ingest wool as they try to get it out of their mouth. Wool, once swallowed, can cause a blockage or serious damage to the intestines, which can be life threatening.



Fieldsphotos / 123RF

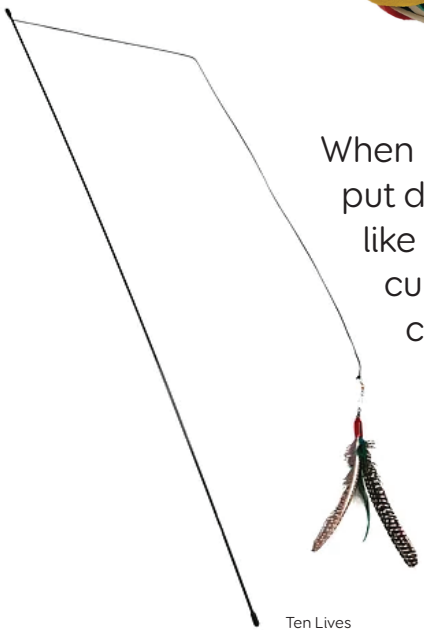


Belchonock / 123RF

Tritooth / 123RF

Rubber bands and hair elastics/ties are choking hazards, and cats should not play with them as toys.

Keep these items safely away from cats in a draw or container with a secure lid.



Ten Lives

When not in use, put dangly toys like this away in a cupboard that cats/kittens cannot open.

Fill in this table to think about how your toy design meets a cat's adaptations to hunting

Part of your toy design	Cat's hunting features
Example: soft fabric toy filled with cat-safe toy filling	Example: use sharp claws and teeth to catch 'prey'

How cats' senses are adapted to hunting

Sight

- Cats' short noses allow them to use both eyes at once, this is called binocular vision. This gives cats better vision to accurately work out the distance and aim required to catch prey.
- Cats have exceptionally good eyesight, day and night, and will prey on whatever wildlife is around at that time.
- Cats have split pupils that get bigger and smaller much faster than round pupils.
- When cats' pupils are in the slit position, it affects how clearly they can see - some things will be out of focus. Cats can see clearly from 30 cm up to 35 metres away, but distances less than or more than this will be blurry. Cats also have a blind spot under their nose.
- Scientists believe cats can recognise blues, greens and yellows fairly well but cannot distinguish reds very well. Take a look at this video online to see how cats see the world. https://www.businessinsider.com.au/how-cats-see-world-unlike-what-you-thought-2017-1?r=US&IR=T



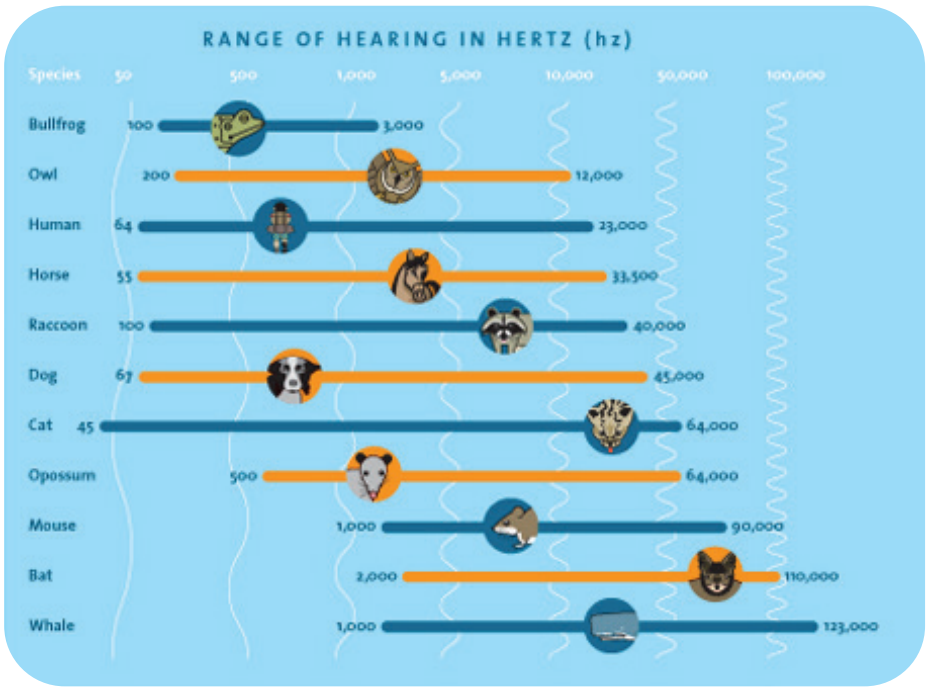
Erika8213 / 123RF

Hearing

- Cats have very sensitive hearing and can hear very high-pitched (ultrasonic) sounds that dogs and humans cannot hear. Their super hearing allows them to detect the location of rodents who communicate using ultrasonic sounds.
- Cats have 32 muscles in each ear, which allows them to move their ears incredibly precisely. The dexterity of a cat's ear is like the dexterity of a human hand.
- Cats can move each ear 180 degrees, independently of each other, at the same time. This allows cats to track the direction sounds are coming from to help them find their prey to within 7-8 cm.
- A cat's ear shape is parabolic to a degree - like a satellite dish. This shape helps to amplify sounds, allowing cats to hear fainter, further-away sounds - most cats can hear sounds from over 1.6 km away.

Dog Vs Cats

Cats have better hearing than dogs. Not only can they hear higher frequencies but they can distinguish a sound's tone and locate its source far better too. With 30 different muscles, the cat can rotate each of its ears 180 degrees and position one ear or both facing any sound the cat detects. Sound gets funnelled down to a cat's middle ear so effectively that from a metre away it can easily distinguish the sound of you opening the cat food.



infographiclist.files.wordpress.com

Touch

- Cats whiskers are very sensitive. Whiskers are located above their eyes, and on their chin, cheeks and the back of their lower front legs.
- There are about 12 whiskers on each side of the muzzle, although some cats have more. These are the longest whiskers on a cat's body.
- Unlike human hair, whiskers are deeply embedded and connected to the nervous system. This allows a cat to detect the precise location, size and texture of an object its whiskers brush against, even in the dark.
- Whiskers also detect changes in air currents, helping cats detect approaching dangers.
- A small muscle 'sling' attached to each of the whiskers of a cat's muzzle allows them to move independently of the others, or they can move all the whiskers together.
- Playing with or pulling a cat's sensitive whiskers can be painful for a cat.
- Cats also learn about their environment through their fur and the paw pads on their feet, which are strong but sensitive. These pads are like our finger tips: they are loaded with touch receptors and allow cats to evaluate temperatures as well as the texture, location and liveliness of caught prey.



Record-breaker: Whiskers the Cat boasts facial hair measuring a staggering 12 inches (30.48 cm) from tip to tip

Source: http://www.dailymail.co.uk/news/article-2579169/Adorable-homeless-cat-thought-longest-whiskers-Britain-measure-12-INCHES.html

Smell

- Cats rely on their acute sense of smell to provide them with information about the world around them. With approximately 200 million scent receptors in their nasal cavity a cat's sense of smell guides them to prey, tells them if food is edible or toxic and can even help find their home if lost. Humans only have approximately 5 million scent receptors and dogs vary from 147 million to 300 million depending on the breed; the bigger the dogs nose the more scent receptors.
- Providing familiar items used by your cat and/or using calming pheromones like Feliway are important when cats are stressed, moving to a new house, boarding etc. The familiar smells of these items help reassure the cat that everything is ok. Their acute sense of smell is also why it is best to avoid strong smelling sprays and other products in your home and to use unscented natural litter. Keep litter trays exceptionally clean; if you think your cats litter tray smells clean, your cat may not agree.



Vitalytyagnov/123RF

Taste

- Cats have 473 taste buds on their tongues compared to humans who have 9,000. Cats also lack taste buds that can detect sweet food. The smell of food stimulates cats to eat rather than the flavor of food. This is one of the reasons why cats with respiratory infections (cat flu), other nasal blockages or injuries stop eating: If they can't smell their food, they won't get hungry.



Vitalytyagnov/123RF

PLAN:
Think, sketch and label

Sketch a plan of your cat toy design.
Make sure you label all its features. Work as a team.

IMPROVE:
Adjust your design to make it better

Meet with another team to present your sketch and listen to their feedback. Then swap.

Using complete sentences, explain what changes you will make to your design based on the feedback. Sketch ideas and label features.

CREATE:
Make it

1. Using recycled materials from home, create your cat toy from your detailed design plan.
2. Where possible, test and modify your design (at home with a pet cat). Video the results to present to class and discuss what improvements you made.
3. Present cat toys to your whole class or school community.
4. Reflect and celebrate.

Add a photo of your captivating cat toy here

Further reading

Cats: The adaptable hunter

Cats can be divided into 3 groups:

Domestic cats - are owned, pet cats that rely on humans to provide for them. Even well fed pet cats will hunt.

Domestic pet cat hofmeester/123RF





Stray cat kapongza/123RF

Stray cats - are unowned cats that roam cities, towns and some rural areas.

They generally live in areas where they can access a food source to supplement what they are able catch. They may or may not be friendly to people.

Feral cats — survive without any human contact or assistance. They live, hunt and reproduce in the wild.

The cats in the 3 groups are all the same species, and individual cats may move between these groups. For example, a domestic cat that is abandoned and finds a food source, such as someone who will feed it but not take ownership of it, will become a stray cat. Kittens from a female stray cat, that has found a good food source will either:

- become domestic if taken in by humans and socialised before 8 weeks old
- remain as strays
- if their food source dries up, become feral cats and move into bushland to hunt.



Feral cat image courtesy of the Invasive Animal CRC

Feral Cats

- Feral cats are exceptional hunters and pose a significant threat to the survival of many native species including small mammals, birds and reptiles.
- Feral cats have been implicated in the extinction of some Australian native animals.
- They mainly eat small native and introduced mammals, but also birds, lizards and insects.
- When a feral cat catches prey, it will eat the entire animal, including the bones.
- Feral cats can be found everywhere, including deserts, forests, woodlands and grasslands.



dbrus / 123RF

- Their physical features and senses allow them to survive in Australia's harshest conditions. Cats are found in 99% of Australia, including many offshore islands.
- The number of feral cats in Australia is impossible to calculate because of variation of the numbers of cats living in different environments, and the way the population fluctuates with prey availability and climate. The number of native Australian animals killed by feral cats each night is also difficult to calculate, due to differences in the size of prey.
- Feral cats are generally nocturnal and will rest during the day in den sites such as hollow logs, piles of debris, rabbit warrens or dense scrub.
- A feral cat's average life expectancy is about 3 to 5 years.



dbrus / 123RF

Discarded cats suffer in the wild

- Thousands of homeless domestic and stray cats roam Tasmania. Many of them suffer trying to survive in and around our suburbs.
- They spend most of their time looking for food and security, avoiding danger, fighting, marking territory, breeding and raising young. They may suffer from: diseases such as cat flu, feline parvovirus, feline aids or feline leukemia; fleas, intestinal worms and other parasite infestations; injuries from fighting.
- They are at greater risk of being hit by a car, attacked by dogs or hurt by people.
- Their life expectancy is dramatically reduced from approximately 21 years for a well-cared for indoor domestic pet cat, to 3-5 years for a stray. The oldest confirmed pet cat lifespan is 38 years.
- Unknowingly, well intentioned people increase the homeless pet cat problem by occasionally feeding the local stray without taking full ownership.
- Shelters across Tasmania receive thousands of unwanted domestic, stray and feral cats and kittens every year. Many of these cats and kittens are malnourished and sick with cat flu, upset stomachs, feline aids or leukemia. They have skin diseases like flea allergy dermatitis or ringworm, and are suffering from parasites like worms, fleas, mites and ticks.
- Kittens that have not been socialised (bonded with humans) before eight weeks old are difficult to tame to become pets.
- The suffering and subsequent consequences of discarded pet cats and kittens is a worldwide issue.
- The role of euthanasing unwanted domestic, stray and feral cats and kittens falls to those who care the most — the employees of animal shelters. This is a task that can take a terrible personal toll.



goce / 123RF

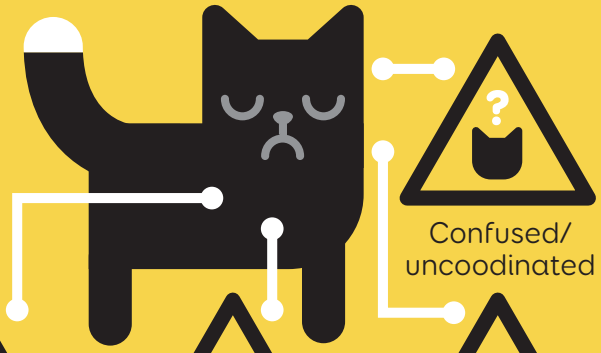
POISON SAFETY AT HOME FOR CATS

Common cat poisons

- Dog flea treatments
- Human Medicine
- Antifreeze
- Household chemicals
- Lillies
- Human Foods

Symptoms of poisoning

The symptoms of poisoning aren't always obvious and can vary, but there are a few of the most common signs...



- Confused/ uncoodinated
- Fitting/ seizures
- Difficulty breathing
- Vomiting
- Drooling

What should I do if I think my cat has been poisoned?

DO:

- Take them to the vet immediately
- Show your vet labels or samples of the suspected poison, if known
- Keep other pets away from source

DO NOT:

- Try to make your cat vomit or feed them salt water
- Wait for the symptoms to stop or assume they will go away
- Panic

Prevention is better than a visit to the vets!

Remember, keep poisonous substances out of cats' reach - ideally stored in a sealed container or closed cupboard or shed.

This list and advice is not exhaustive.
For further advice please consult your vet
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Cat Language



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What you can do to help?

- Cats can live up to 21 years, so owning a cat is a long-term commitment.
- As a general rule treat kittens for fleas straight away and treat for worms from 2 weeks of age. Talk to your local veterinarian about which products are safe to use on kittens younger than 8 weeks of age. All other pets need to be treated as well.
- Vaccinations protect pets from a range of diseases which can be life threatening. Kittens should have their first vaccination between 6 - 8 weeks of age.
- Desexing male and female kittens can be done from 8 - 10 weeks of age.
- Provide your cat or kitten with a collar, id tag and microchip, even if they live indoors.
- Think about keeping your cat or kitten in an enclosure or indoors: this keeps them safe from being lost, injured, killed or abused. It will also keep your neighbours happy and protect the wildlife.
- Encourage people you know to make good choices for the care of their cat/s, their community and the environment.
- Where possible kittens should remain with their mother until 8 - 10 weeks of age. This gives them the best opportunity to develop physically and socially.
- Encourage owners of unwanted cats and kittens to surrender them to a reputable shelter instead of giving them away.
- Anyone can sell or give away a cat or kitten but legally it must be at least 8 weeks old, microchipped, desexed, wormed and vaccinated. Cats sold between registered breeders and genuine show cats are exempt.
- Do not take free or cheap kittens unless they are already desexed, microchipped and vaccinated.
- Never dump or abandon a cat or kitten (it is against the law).
- Call your local animal shelter for help on how to care for your cat/kitten or how to find a new home for your cat/kitten if you can no longer care for them.
- If you are eligible, National Desexing Network may help by reducing desexing fees. For more information go to www.ndn.org.au or phone: 1300 368 992

Vocabulary list

Binocular vision - both eyes are used at the same time to see a single image

Carnivore - an animal that gets its food from eating and killing other animals. They do not eat plants

Dexterity - the ability to perform an action quickly

Discarded - cast aside, get rid of, throw away

Domestic - no longer wild; tame

Embedded - fixed (an object) firmly and deeply in a surrounding mass

Euthanase - to kill gently, as with an injection performed by a vet

Feral - in a wild state, especially after escape from captivity or domestication

Interaction - communication or direct involvement with someone or something

Muzzle - the part of an animal's face that sticks out, including the nose and mouth

Parabolic - a shape that focuses energy, such as sound waves, to a point (such as an eardrum)

Predator - an animal that preys on others.

Prey - an animal hunted or caught for food, especially by a carnivorous animal

Stray cats - unowned cats that roam cities, towns and some rural areas. They generally live in areas where they can access a food source to supplement what they are able catch. They may or may not be friendly to people.

Ultrasonic sounds - sounds that are too high pitched to be heard by the human ear

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