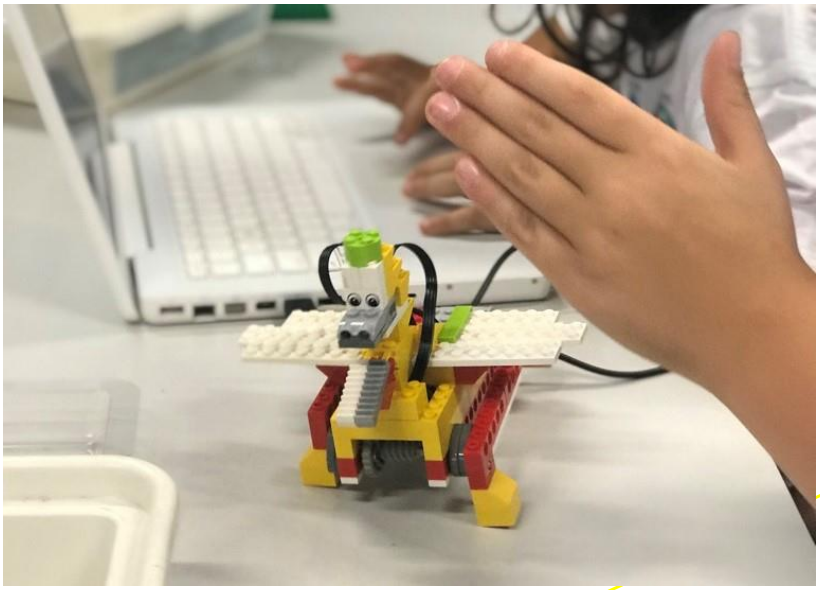
REGIONAL ARTS VICTORIA



Invert-a-bots

The Furals

Teacher Resources

2020

Ideal for Years 1-10

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ABOUT THIS RESOURCE

This resource has been created to provide teachers with curriculum links to the Victorian Curriculum, and includes some preliminary and post show ideas and activities as to how to extend their experience of *Invert-a-bots.* The activities are designed to be open-ended and multi-ability. They may need differentiation for your specific cohort.

The performances and workshops included in the Arts & Education program are designed to offer students engaging arts experiences with strong links to the Victorian Curriculum and to VEYLDF, and VCE subjects where appropriate. Each Arts & Education program varies in its purpose and content and as a result the scope for integration across the curriculum varies.

If you have any questions about this resource, its content or its implementation within your classroom please do not hesitate to contact the Arts & Education team on (03) 9644 1808 or at education@rav.net.au,

ABOUT REGIONAL ARTS VICTORIA

Regional Arts Victoria inspires art across the state. Through creative facilitation, touring, education, specialised resources, artistic projects and advocacy, we develop and sustain creative communities and artistic practice all over Victoria.

Regional Arts Victoria is an independent, not-for-profit, membership-based organisation working in long-term partnerships with every level of government, fostering contemporary and innovative regional cultural practice across five decades. We advise and impact on decision-making across multiple portfolios and levels of government.

Regional Arts Victoria is the peak body for regional artists and arts organisations, and the leading organisation for regional creative practice in Victoria.

PARTNERSHIPS	PROGRAMMING	PROJECTS
Regional Arts Victoria facilitates the partnerships, the organisations and the practices that create new work.	Regional Arts Victoria nurtures the experts who foster local artistic experiences and stimulate young minds.	Regional Arts Victoria presents major artistic projects that build local artistic leadership and legacy.
• Regional Cultural Partnerships • Creative Arts Facilitators • Membership program • Devolved grants programs • Resources, workshops and events • Sector advocacy and leadership development	• Arts & Education Program • Connecting Places • Touring programs • Education resources • Industry development resources and events • Sector advocacy and leadership development	• State-wide projects including *Small Town Transformations and Artlands Victoria* • Internal Creative Professional Development programs • Sector advocacy and leadership development

ARTS & EDUCATION

Regional Arts Victoria's Programming department has nearly 50 years of experience touring work to schools, community halls and theatres across Victoria and Australia. The department programs are the Arts & Education, Touring Services and Connecting Places programs.

The Arts and Education program also provides significant subsidy assistance (up to 75% of program costs) to eligible remote and disadvantaged schools. Your school may be eligible so please contact us to find out more.

For general enquiries please contact: education@rav.net.au

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INTRODUCTION TO THE PROGRAM

Bring your sculptures to life by looking at real insects and then making the Lego robot replicas. Choose from a diverse menu of instructional guides for a dragonfly, roboroach, scorpion and spider, then create and program your chosen beast. Then host a tour for your teachers and friends.

Throughout the workshops we will aim to answer a big science question: Why do insects look and act the way they do, and how can we study and explain their looks and actions? We will explore their structures and how they behave, and consider how animals' structure and behaviour enable survival in their environment. By writing programs that acknowledge animal behaviour we will identify animal behaviours that are in response to stimuli in the environment. We will also explain how behaviours help insects survive in their habitats and combine different materials, programs, shapes, and structures to design and build models of insects.

In this workshop, students will interact with real insects, pre-built models, build their own creature and design interact with obstacle course for some of the creepy crawlies. They will be able to learn and apply creativity, design skills, and learn programming using pictures for the robot to follow. When composing a program students may explore sound effects and composition of sound effects that represent the types of sound the insects could make.

BIOGRAPHIES

Mark Maxwell

Mark Maxwell is an artist and workshop presenter. His practice encompasses marques, woodwork, building, animation, set design and lighting. When creating miniature models he explores engineering principles and tries to design projects that promote open ended creativity. Mark has completed an Art and Design degree and has worked as technical engineer in many theatres. He presents workshops for Regional Arts Victoria, which brings professional art practitioners to schools, community groups, art galleries, libraries and art festivals

Carla Maxwell

Carla Maxwell is an Art, Design Technology and Robotics teacher who has completed a Masters of Information Technology in Education (by Research) at the University of Melbourne. She has also accomplished a Bachelor of a Teaching and Bachelor of Fine Art. This has allowed her to develop a unique perspective on teaching in a creative and integrated manner. Carla continues to plan activities for students that are fun, hands-on and experience based, taking into account aspects of mathematical and scientific principles

SUGGESTED PRE-VISIT ACTIVITIES

The following activities are designed for teachers and students to explore before *Invert-a-bots.* They aim to give the students some context to the workshop and help them better understand what they are going to take part in.

Activity 1: Studying Insect Behaviour

How do scientists study insects? They often have to go out in to their environments to carefully observe.

Take students outside on an insect finding mission with notebooks to record their findings. When students find an insect they should carefully study it and make notes and/or sketches. Ask them to consider the following:

- What does the insect look like? What colours can you see? Is it shiny, textured, smooth? How many legs does it have? Does it have wings or antennae?
- How does the insect move? Is it fast / slow?
- What is the insect doing while you observe it? How does it respond to external stimuli?
- Where did you find the insect? Describe the environment it is in.
- Try and sketch your insect- play close attention to the structure of its body.

If it is not possible to go outside to observe insects, use the youtube videos listed below instead.

Ask students to share their observations with the class and discuss why they think their insect looks and acts the way it does.

Resources:

https://museumsvictoria.com.au/learning/virtual-learning-excursions/mini-beasts-in-your-backyard/

Activity 2: Insect Models

Ask students to create models of the insect observed in activity one, either from Lego or craft materials. Tell them to place close attention to the structure of the model and how accurately it reflects their observations. Have them present and explain their models to the class.

Discussion: do you think the models were improved by how closely you observed your subject?

Activity 3: Habitats Research

A habitat is the type of environment where an animal or plant lives, such as tropical rainforests, grasslands, or freshwater ponds. Animals are adapted to live in a particular kind of habitat where their needs are meet. For example: a honey bee lives in a habitat where it can easily find its preferred food of flowers. Insects are one of the most versatile classes of organisms. They live in every environment on Earth, from the high-altitude mountains in Nepal, to the desert sands of the Sahara, to tropical rainforests. An insect's natural habitat is often an important clue to understanding why they look and act the way they do.

- Ask students to choose an insect and research its habitat and how it has adapted to live in these conditions e.g. a scorpion in the desert, a termite in a burrow. They should gather as much information about the insect as they can, including what they eat and what they need to survive. Then ask students to draw and label their insect in its ideal habitat.

Resources:

Museums Victoria- Habitats

Activity 4: Robo Roach

Scientists at the University of California Berkeley are convinced they are offering a breakthrough in robot design. Their study of living organisms has offered insights which they've adapted to make the world's first robotic cockroach, or, Robo Roach. The scientists have discovered how the ingenuity of nature may help develop technology that could finally bring about the robot revolution.

- Watch the video resource on Robot Mimicry and discuss with students what they thought about the ideas and discoveries.
- Students can have a go at designing their own robot insect inspired by Robo Roach and the insects they have researched in previous activities. Either draw or build a model from Lego or craft materials.

Resources:
Video on Robot Mimicry – Watch from 12mins 28s onwards
5 Robots Inspired by Insects

Activity 5: Scratch Coding

Scratch is a free, easy to use online block coding program that allows you to create stories, games and animations.

Introduce students to the Scratch platform by watching the 'Getting started' tutorial with the class and demonstrating key elements.

Using the 'Imagine a world' tutorial, students can design an interactive environment for a particular animal chosen from the 'chose a sprite' menu. Ask them to think about their habitat research in Activity 3 to inspire them. They will share their environment with others in the group and consider whether each animal is a good match for its habitat.

The Scratch Educator Guide provides a lesson plan for the 'Imagine a World' project (and others) which will be helpful in getting you and the students started.

There are also Scratch coding cards available to print which give step by step instructions for this and other projects.

If the students are successful in creating their animal habitat, they can move on to other tutorials for projects e.g. 'animating characters' or 'creating games.'

Encourage students to play with the programme and discover all of the possibilities of coding! To extend this activity further, or for more advanced students visit the ACMI website for toolkits on game building, pitched at different levels.

Resources:
Scratch for Educators
Scratch Tutorials
Scratch Educator Guides (lesson plans)
Scratch Coding Cards
ACMI Game Builder Toolkit for Teachers and Students

SUGGESTED POST-VISIT ACTIVITIES:

Activities that dissect and expand upon the content of the workshop that the teacher and students can engage in post-performance.

Activity 1: Emotions in Robots

Will robots ever feel human emotions like happiness or sadness, anger or even amazement? Pepper is a humanoid robot designed by Alderman Robotics which can display emotions. Pepper's 'emotions' come from the ability to analyse facial expressions and voice tones. Watch the video in the resource link below with students.

Discussion:

Emotions

- How do animals communicate their emotions and needs? Can you tell if your cat is happy or frightened? How do you know if your dog is hungry or cold?
- Ask the students to think about how they might communicate the emotions of a particular animal by programing their robot to behave in a certain way, depending on the animal's characteristics.

Triggers

- Pepper analyses facial expressions and voice tones, using them as triggers to behave in a certain way that we interpret as displaying emotion. In robots you can generate a certain behaviour by using sensors and setting a trigger like this.
- Talk about what sounds, smells or sights might trigger the emotions or behaviour of particular animals: eg. hunger (needs), sleep (needs), anger (emotions), sadness (emotions), restlessness (emotions).
- Do you think you could programme your robot to replicate the behaviours and emotions of animals by sensing and reacting to different triggers? E.g. a light sensor that triggers the robot to sleep when it's dark and turn on when it's light, to mimic an animal's trigger to sleep at night time and wake in daylight. Brainstorm ideas with the class.

Resources:

Pepper the humanoid robot

Activity 2: Climate Change & Adaptation

With rising temperatures and seas, massive droughts, and changing landscapes, successfully adapting to climate change is increasingly important. For humans, this can mean using technology to find solutions. But for some plants and animals, adapting to these changes involves the most ancient solution of all: evolution. Erin Eastwood explains how animals are adapting to climate change in this animation resource.

- Ask students to research one animal, insect or plant that has had to adapt due to climate change and draw and label it with its adaptations. They can then present their findings to the class.

Resources

Can Wildlife Adapt to Climate Change? – Erin Eastwood

10 Species that are evolving due to climate change - Smithsonian Article

Activity 3: Khan Academy – Design an Animal

Use JavaScript programming to design and programme your own animal through the Khan Academy. Think about the adaptations discussed in the last activity and how you might be able to include these in your design. If students need an introduction to this platform, start with the Khan hour of code tutorial video.

Resources

Khan Academy- Design an animal

Khan Academy- Hour of Code

Activity 4: Coding Exercises
Extend your students experience in coding with these exercises and tutorials.

- Scratch Lesson Activities F-8
  Fun tutorials to increase your student's capabilities in Scratch.
  https://codeclubprojects.org/en-GB/scratch/

- Lesson Title: Pet Game on Tinker Year F-5
  Create a fun game about pets – either real or imaginary! Beginners can use the self-guided tutorial while more advanced coders have the option to start off with a blank project.
  https://www.tynker.com/hour-of-code/pets-game

- Chatbot Year 3-6
  Learn how to program your own talking robot in Scratch.
  https://codeclubprojects.org/en-GB/scratch/chatbot-1.4/

- World Adventure Game Year 3-6
  In this project you'll learn how to create your own open world adventure game.
  https://codeclubprojects.org/en-GB/scratch/create-your-own-world/

FURTHER READING

BOOKS

Fantasy Robots by Clare Beaton Imaginary Animals: The Monstrous, the Wondrous and the Human Animal Robots by Erika L. Shores

INTERNET

Robot Zoo

Build virtual animal models online using Lego Digital Designer

Lesson plans on animal behaviour

TED Ed Curiosity, discovery and gecko feet - Robert Full

The scientific method is widely used to make many scientific discoveries, but Robert Full suggests the possibility of finding world-changing results with less formulaic approaches. In his TEDYouth Talk, Full describes the unlikely way he studied gecko's feet and how these beneficial discoveries could eventually save lives.

Compass - Paws for Thought, 2000: Do animals feel?

Animal and plant adaptations

CURRICULUM LINKS – Victorian F-10 Curriculum

Learning Areas	Capabilities
Digital Technologies **Strand- Data and Information** Manage, create and communicate interactive ideas, information and projects collaboratively online, taking safety and social contexts into account. **Strand- Creating Digital Solutions** Develop and modify programs with user interfaces involving branching, iteration and functions using a general-purpose programming language. Define and decompose real-world problems taking into account functional requirements and sustainability (economic, environmental, social), technical and usability constraints **Achievement Standard** By the end of Level 8 students explain how text, image and sound data can be represented and secured in digital systems and presented using digital systems. They analyse and evaluate data from a range of sources to model solutions and create information. They manage the collaborative creation of interactive ideas, information and projects and use appropriate codes of conduct when communicating online. Students define and decompose problems in terms of functional requirements and constraints. They design user experiences and algorithms incorporating branching and iterations, and develop, test, and modify digital solutions. Students evaluate information systems and their solutions in terms of meeting needs, innovation and sustainability.	Critical and Creative Thinking **Strand: Questions and Possibilities** Investigate different techniques to sort facts and extend known ideas to generate novel and imaginative ideas. **Achievement Standard** By the end of Level 6, students apply questioning as a tool to focus or expand thinking. They use appropriate techniques to copy, borrow and compare aspects of existing solutions in order to identify relationships and apply these to new situations. Students represent thinking processes using visual models and language. They practice and apply learning strategies, including constructing analogies, visualising ideas, summarising and paraphrasing information. Students disaggregate ideas and problems into smaller elements or ideas, develop criteria to assess and test thinking, and identify and seek out new relevant information as requires
Design and Technologies **Strand- Technologies and Society** Investigate the ways in which designed solutions evolve locally, nationally, regionally and globally through the creativity, innovation and enterprise of individuals and groups.	Personal and Social Capability **Strand- Self- Awareness and Management** Recognition and expression of emotions. Explore the links between their emotions and their behaviour **Strand- Social Awareness and Management** Collaboration- Identify the characteristics of an

Technologies Contexts Analyse how motion, force and energy are used to manipulate and control electromechanical systems when creating simple, engineered solutions. **Strand- Creating Designed Solutions** Apply design thinking, creativity, innovation and enterprise skills to develop, modify and communicate design ideas of increasing sophistication. **Achievement Standard** By the end of Level 8 students explain factors that influence the design of solutions to meet present and future needs. They explain the contribution of design and technology innovations and enterprise to society. Students explain how the features of technologies impact on designed solutions and influence design decisions for each of the prescribed technologies contexts. Students create designed solutions for each of the prescribed technologies contexts based on an evaluation of needs or opportunities. They develop criteria for success, including sustainability considerations, and use these to judge the suitability of their ideas and designed solutions and processes. They create and adapt design ideas, make considered decisions and communicate to different audiences using appropriate technical terms and a range of technologies and graphical representation techniques. Students apply project management skills to document and use project plans to manage production processes. They independently and safely produce effective designed solutions for the intended purpose. By the end of Level 10 students explain how people working in design and technologies occupations consider factors that impact on design decisions and the technologies used to create designed solutions. They identify the changes necessary to designed solutions to realise preferred futures they have described. When creating designed solutions for identified needs or opportunities	effective team and develop descriptions for particular roles including leadership, and describe both their own and their team's performance when undertaking various roles. **Achievement Standard:** By the end of Level 6, students describe different ways to express emotions and the relationship between emotions and behaviour. They describe the influence that personal qualities and strengths have on achieving success. They undertake some extended tasks independently and describe task progress. They identify and describe personal attributes important in developing resilience. Students recognise and appreciate the uniqueness of all people. They are able to explain how individual, social and cultural differences may increase vulnerability to stereotypes. They identify characteristics of respectful relationships. They contribute to groups and teams suggesting improvements for methods used in group projects and investigations. They identify causes and effects of conflict and explain different strategies to defuse or resolve conflict situations.

students evaluate the features of technologies and their appropriateness for purpose for one or more of the technologies contexts.	
The Arts – Visual Communication **Strand- Explore and Represent Ideas** Explore and apply methods, materials, media, design elements and design principles to create and present visual communications. **Strand- Visual Communication Design Practices** Use manual and digital drawing methods and conventions to create a range of visual communications. **Strand- Respond and Interpret** Identify and describe the purpose, intended audience and context in a range of visual communications from different historical, social and cultural contexts. **Achievement Standard** By the end of Level 8, students identify and describe how designers use visual communication practices to respond to briefs in different historical, social and cultural contexts. They apply this knowledge in the development of their own visual communication practices.	
Science **Strand- Science as Human Endeavour** Science and technology contribute to finding solutions to a range of contemporary issues; these solutions may impact on other areas of society and involve ethical considerations. **Strand- Science Understanding (Biological)** Living things have structural features and adaptations that help them to survive in their environment. **Strand- Science Inquiry Skills** With guidance, identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge	

Achievement Standard By the end of Level 4 Students describe how they use science investigations to identify patterns and relationships and to respond to questions. They follow instructions to identify questions that they can investigate about familiar contexts and make predictions based on prior knowledge. They discuss ways to conduct investigations and suggest why a test was fair or not. They safely use equipment to make and record formal measurements and observations. They use provided tables and column graphs to organise and identify patterns and trends in data. Students suggest explanations for observations and compare their findings with their predictions. By the end of Level 6, students explain how scientific knowledge is used in decision making and develops from many people's contributions. They discuss how scientific understandings, discoveries and inventions affect peoples' lives. They analyse how structural and behavioural adaptations of living things enhance their survival, and predict and describe the effect of environmental changes on individual living things. By the end of Level 8, students explain how evidence has led to an improved understanding of a scientific idea. They discuss how science knowledge can be applied to generate solutions to contemporary problems and explain how these solutions may impact on society.	

Contact the Arts & Education team at education@rav.net.au with further questions or, even better, examples of your work!