



Cross Curriculum Collaboration

Cross Curriculum Collaborations (CCCs) utilise the Visual Arts as a means of creating links to other non-arts subject areas. CCCs give students arts rich classroom experiences; engage students and approach subject matter from an alternative perspective; enhances teaching and learning in the classroom and builds on the knowledge and skills in all subject areas. The key to the success of these projects is that artists are utilised as a resource and collaborate closely with educators over a planning phase.

This template and materials are intended as a resource and source of ideas for educators to use as a model.

SCHOOL	Windaroo Valley State High School	TEACHER	Belinda Williamson-Science
LOCATION	Logan, South East Queensland	ARTIST	Therese Flynn-Clarke
YEAR LEVEL	Year 9	LESSON NAME	The Art of Chemistry

INTRODUCTION

A number of CCCs have been completed within Primary schools around the state of Queensland both in remote and regional areas a Pilot Project was conducted collaborating with a Middle School to implement an Art/Science project with a Year 9 Science class who were beginning a Chemistry unit. Windaroo Valley State High School is a large high school based in Logan, located between Brisbane and the Gold Coast. This topic aligned well with the art practice of the artist who experiments and produces eco dyed work using plants and metals to create works on fabric and paper.

LESSON IDEA

It was important for artist and teacher to collaborate closely to fine tune the details of the collaboration and linking closely to aspects of the ACARA Year 9 Science curriculum and the artist's own practice, with a particular focus on the following elaborations:

- investigating reactions of acids with metals, bases, and carbonates
- identifying reactants and products in chemical reactions
- considering the role of energy in chemical reactions

The artist worked within the constraints of a middle school timetable visiting the school over three consecutive days working in the Year 9 Science period of 90-100 minutes.

AUSTRALIAN CURRICULUM LINKS

Visual Arts

Yr 9-10 Manipulate [materials](#), techniques, [technologies](#) and processes to develop and represent their own artistic intentions ([ACAVAM126](#))

- Plan and design artworks that represent artistic intention ([ACAVAM128](#))

- Evaluate how representations communicate artistic intentions in artworks they make and view to inform their future art making ([ACAVAR130](#))

Science

Yr 9

Science as a Human Endeavour

Use and influence of science

- Advances in science and emerging sciences and technologies can significantly affect people's lives, including generating new career opportunities ([ACSHE161](#))
- People can use scientific knowledge to evaluate whether they should accept claims, explanations or predictions ([ACSHE160](#))

Science Inquiry Skills

- Communicating
- Communicate scientific ideas and information for a particular purpose; including constructing evidence based arguments and using appropriate scientific language, conventions and representations ([ACSIS174](#))
- Evaluating
- Evaluate conclusions, including identifying sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data ([ACSIS171](#))
- Planning and conducting
- Plan, select and use appropriate investigation methods, including field work and laboratory experimentation, to collect reliable data; assess risk and address ethical issues associated with these methods ([ACSIS165](#))
- Select and use appropriate equipment, including digital technologies, to systematically and accurately collect and record data ([ACSIS166](#))
- Processing and analysing data and information
- Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies ([ACSIS169](#))
- Use knowledge of scientific concepts to draw conclusions that are consistent with evidence ([ACSIS170](#))

Science Understanding

- Chemical sciences
- Chemical reactions involve rearranging atoms to form new substances; during a chemical reaction mass is not created or destroyed ([ACSSU178](#))
- Chemical reactions, including combustion and the reactions of acids, are important in both non-living and living systems and involve energy transfer ([ACSSU179](#))

APPROACH AND SEQUENCE OF LESSON

Lesson 1

1. Prior to lesson artist prepares brew pots for students to use to dye materials. These consist of plant matter, metals, alum etc. Pots are put on an element or stove to begin heating.
2. Summarise history of dyeing using plants and other substances
3. Artist shares art practice and inspirations and show samples of eco dyed work. Artist shows perspective and understanding of the science of eco dyeing and Chemistry and the process involved. Discuss process of recreating same colours and patterns in a scientifically controlled setting. Look at commercial products made using eco dyeing.
4. Share eco dyeing books and images for students to view.

5. Students gather leaves (e.g. eucalyptus leaves), and materials from school grounds to utilise. Artist can supplement with leaves from other places.
6. Using fabric samples (in this case 100% cotton) students lay out materials to be used for experimental dyeing. Wrap and bundle tightly materials and organic matter with string and decide which pot to place bundle into. Science assistant monitors pot and allows boil/simmer for an hour.

Lesson 2

1. Prior to lesson artist prepares brew pots for students to dye paper in.
2. Discuss solar dyeing in jars, variables in water e.g. dam, tap, rainwater, saltwater; other chemical possibilities e.g. ammonia, lichen, urine metals as mordant (artist use of copper pipes and rusty/iron- properties); the pot as a mordant.
3. Students unwrap bundles dyed the previous lesson. View results. Discuss from a scientific point of view using a control to monitor and measure results for more accurate recreation of colour pattern. Discuss and perspective from an artist point of view in the excitement and unpredictability of the unknown element of results dyeing with plants and metals as mordants.
4. Students view samples of eco dying on paper and create their own paper bundles with plants and other materials (e.g. onion skins). These are placed between tiles, clamped with bulldog clips, labelled with paddle pop sticks and placed in the brew pots with different plants and mordant in each pot. Science assistant monitors pot and allows boil/simmer for an hour.

Lesson 3

1. Students unwrap paper bundles dyed the previous lesson. View results. Discuss from a scientific point of view using a control to monitor and measure results for more accurate recreation of colour pattern. Discuss and perspective from an artist point of view in the excitement and unpredictability of the unknown element of results dyeing with plants and metals as mordants.
2. Students work on homemade Power Points in respective groups outside of class time on eco dyeing and present to the class and visiting artist. (At any point of this collaboration students could document process and methods for dyeing as a record and document results with various materials. In this case students documented digitally through photography of their results).
3. Science teacher discusses findings from a Chemistry perspective based on content to be covered:

Achievement standard

By the end of this unit, students explain chemical processes and energy transfers and describe examples of important chemical reactions. They design methods that include the control and accurate measurement of variables and systemic collection of data and describe how they consider safety. They identify relationships between variables and reveal inconsistencies in results. They analyse their methods and the quality of their data and explain specific actions to improve the quality of their evidence. They use appropriate language and representations when communicating their findings.

RESOURCE REQUIREMENTS

- Gas stove/stove/fire pit/open fire and something to sit cooking pots on over fire OR portable heating element OR Gas stove e.g. camping stove
- Enough materials/power/gas to 'brew' for at least an hour. It's preferable to do the boiling up outside if possible.
- Access to water to fill pots (can be pre-filled with water)
- Matches
- 3-4 Large pot/saucepan/s (not used for cooking)
- Tongs (long handled preferred)
- Onion skins - brown and purple
- Tiles able to fit into saucepan- minimum 10cm width (15cm-ish is better) half a dozen or so.
- Large bulldog clips- fold back ones (to clamp around two tiles). 2-4 per set of tiles
- Rusty things to put in pot as a mordant- flattish rusty pieces to put into 'bundles' to create a 'print' on paper and fabric eg old washers, rusty nails, bottle tops etc; old copper pieces eg copper pipe
- Gum leaves and other plants, e.g. berries
- Watercolour paper
- Fabric scraps of white/cream/plain 100% wool, 100% silk (animal fibres take up the dyes better) 100% cotton (e.g. Cotton t-shirts, pillowcases etc) rinsed in vinegar and water before hand or washing up liquid and water. Lots of strong string for bundling fabric
- Paddle pop sticks. Artline marker for labelling paddle pop sticks
- Elastic bands and marbles if students want to try tie-dyeing techniques

Additional Resources

- European Dye colours for Eco Prints
<https://wendyfe.wordpress.com/dye-colours-for-eco-prints/>

European Dye Plants for Eco Printing and Eco Dyeing

<https://wendyfe.wordpress.com/plants-for-eco-dyeing-and-eco-printing/>

Science behind Eco Dyeing Clip:

http://splash.abc.net.au/home?WT.tsrc=Email&WT.mc_id=Innovation_Innovation-Splash|Primary_email|20150826#!/media/1589896/dyeing-with-red-cabbage-

Dyeing to bring new life to old fabric

http://splash.abc.net.au/home?WT.tsrc=Email&WT.mc_id=Innovation_Innovation-Splash|Primary_email|20150826#!/media/1504378/dyeing-to-bring-new-life-to-old-fabric

Eco Dyeing segment on Gardening Australia

http://www.abc.net.au/gardening/video/default.htm?clip=http://mpegmedia.abc.net.au/tv/gardeningaus/prog_streams/harvestingcolour_ep15_2015.mp4&title=Harvesting%20Colour

Growing a Dye Garden

<http://theplanthunter.com.au/gardens/growing-dye-garden/>

Eco dye images

www.thereseflynnclarke.com

Solar Dyeing in jars

<https://obovate.wordpress.com/2014/07/23/solar-or-sun-kissed-dyeing/>

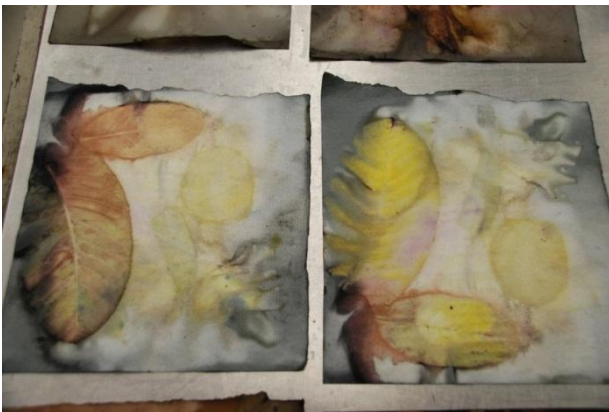
FEEDBACK

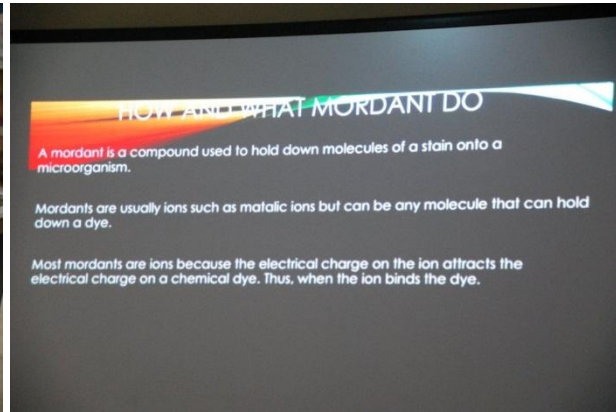
- The positives were that it was engaging for the students and allowed them to see the application of chemical reactions in a real-life context. It also tied beautifully as a link between our ecosystem unit and chemistry unit. It was a valuable experience in that it allowed the students an opportunity to be exposed to an external organisation. It is not often we have the opportunity to work with others from the community. (Year 9 science teacher)
- The opportunity to learn and gain an insight into alternative activities to use in the delivery of our Chemistry Unit "Chemical Patterns". It was a refreshing change from using test tubes and beakers in the lab. I will definitely incorporate this idea into the school's unit. (Year 9 science teacher)
- We cannot thank you enough for your visit here at Windaroo Valley State High School; you have taught us so much and expanded our knowledge in not only Art but Science as well. You have inspired us all so incredibly much and we cannot thank you enough. (Year 9 students)

PHOTOGRAPHS

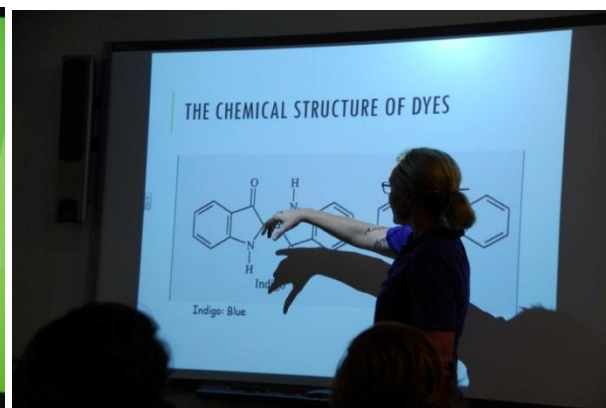
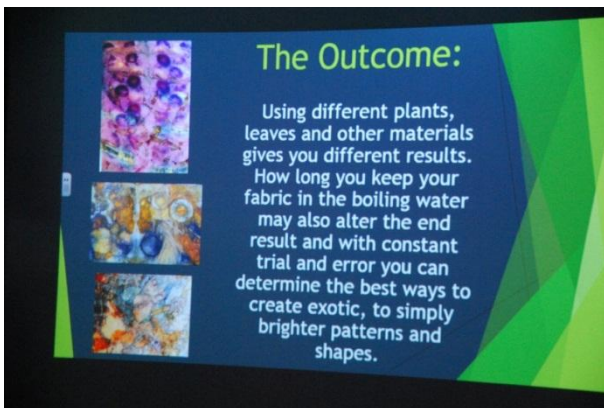








Presentation by students on topic.



Teacher presentation by on Science behind Eco dyeing

Image credits: Therese Flynn-Clarke