
Science
Communication
The key to unlock complexity
for understanding
Marie McEntee, School of Environment


Approach
Audience
+
Accessibility
Assessment
+
Activities


My approach: Writing framed as
Communication

One-Way Transmission Model

One-Way Knowledge Deficit Model

Source: Why does the best sleep come in a boring lecture?

One-Way Tailored Approach

Two-Way Constructed Model

SCIGEN 101 dialogue session

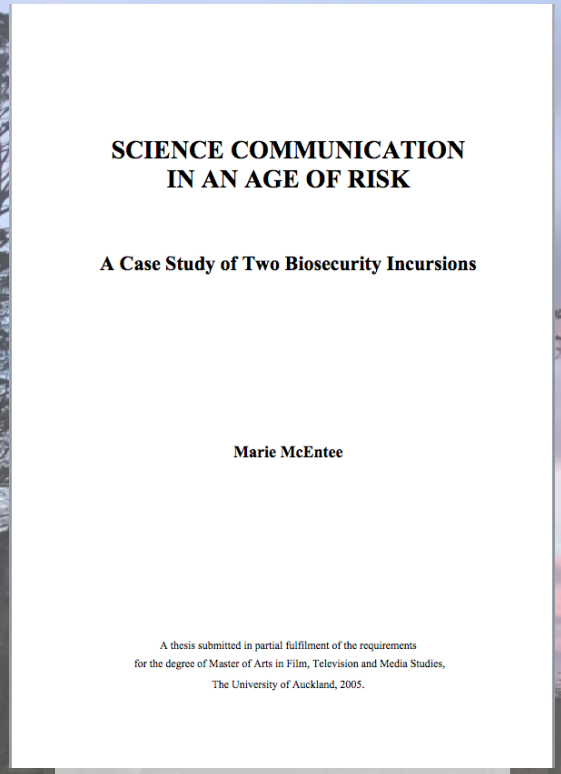
Sea Science Curious Minds Tertiary Outreach

Writing is **not** easy


Science Communication Challenges
1
Challenge of complexity
2
Challenge to be heard
3
Challenge of hearts & minds


Overcoming the Challenges

Know your **Audience**



SCIENCE COMMUNICATION
IN AN AGE OF RISK

A Case Study of Two Biosecurity Incursions

Marie McEntee

A thesis submitted in partial fulfilment of the requirements
for the degree of Master of Arts in Film, Television and Media Studies,
The University of Auckland, 2005.

Thesis
41,000 words /168 pages
250 references
I Year

The International
JOURNAL
of
INTERDISCIPLINARY
SOCIAL SCIENCES

Volume 2, Number 4

Participation and Communication Approaches that Influence Public and Media Response to Scientific Risk: A Comparative Study of Two Biosecurity Events in New Zealand

Marie J. McEntee

COMMON GROUND

www.socialsciences-journal.com

Journal Article
5000 words / 8 pages
24 references
12 weeks

YOU ARE GOING TO BE POISENED

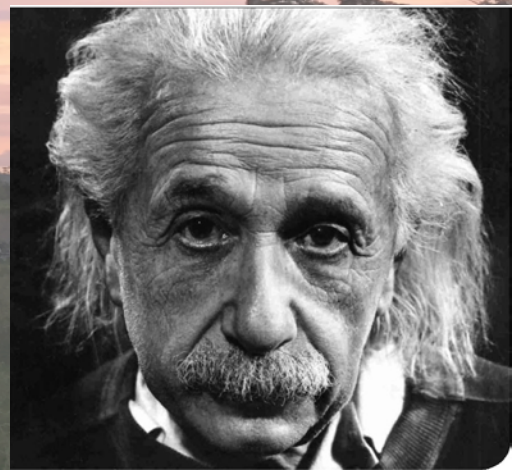
Lessons in mishandled anti-moth campaign

Local communities must be fully engaged by the authorities during future campaigns to eradicate pests, writes Marie McEntee

Concerns expressed by the West Auckland community and its elected local government were frequently overlooked.

Op-ed
650 words / ¼ page
No references
1 day

"The fundamentals of science are essentially simple and maybe expressed in a language comprehensible to everyone."



Accessibility

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The Journal of Neuroscience, September 26, 2007 • 27(39):●–● • 1

Behavioral/Systems/Cognitive

Paradoxical Facilitatory Effect of Low-Dose Alcohol Consumption on Memory Mediated by NMDA Receptors

Maggie L. Kalev-Zylinska[1] and Matthew J. During[1,2]

AQ: A [1]Department of Molecular Medicine and Pathology, Faculty of Medical and Health Sciences, The University of Auckland, 1142 Auckland, New Zealand, and [2]Molecular Virology, Immunology, and Medical Genetics, The Ohio State University, Columbus, Ohio 43210

Epidemiological studies have suggested a negative correlation between alcohol intake and Alzheimer's disease. *In vitro*, ethanol negatively modulates NMDA receptor function. We hypothesized that chronic moderate alcohol intake leads to improved memory via adaptive responses in the expression of NMDA receptors and downstream signaling. We fed liquid diets containing no, moderate, or high amounts of ethanol to control and matched rats with hippocampal knock-down of the NR1 subunit. Rats with increased hippocampal NR1 expression were also generated to determine whether they had a phenotype similar to that of ethanol-fed animals. We found that moderate ethanol intake improved memory, increased NR1 expression, and changed some aspects of neurotrophin signaling. NR1 knock-down prevented ethanol's facilitatory effects, whereas hippocampal NR1 overexpression mimicked the effect of chronic low-dose ethanol intake on memory. In contrast, high-dose ethanol reduced neurogenesis, inhibited NR2B expression, and impaired visual memory. In conclusion, adaptive changes in hippocampal NMDA receptor expression may contribute to the positive effects of ethanol on cognition.

Key words: ethanol; moderate drinking; memory; NMDA receptor; NR1 knock-down; NR1 overexpression

Introduction

Fn1 In contrast to the cognitive impairment associated with acute alcohol intoxication, moderate long-term drinking may paradoxically improve cognition in humans compared with abstention (Orgogozo et al., 1997; Ruitenberg et al., 2002; Truelsen et al., 2002; Stampfer et al., 2005; McDougall et al., 2006). In addition, human experiments performed on young socially drinking men demonstrated enhanced retrograde recall of visual and emotional stimuli (Parker et al., 1981; Hewitt et al., 1996; Bruce and Pihl, 1997). Despite alcohol being extensively studied and widely used, the biological processes underlying its beneficial effects on memory remain unknown.

The NMDA receptor (NMDAR) is crucial for learning and memory and represents an important target for ethanol in the brain (Ronald et al., 2001). Although ethanol does not directly interfere with the ligand-binding sites on the NMDAR, it interferes with glycine signaling and acts as a noncompetitive antagonist of the receptor (Lovinger et al., 1989; Wright et al., 1996; Smothers and Woodward, 2006). In response to sustained ethanol administration, compensatory increases in the expression of NMDARs, including the NR1 subunit, have been demonstrated in animal studies in a number of brain regions, including the hippocampus, cortex, and amygdala (Gulya et al., 1991; Trevisan et al., 1994; Roberto et al., 2006), although evidence to the contrary is also present (Tremwel et al., 1994; Carter et al., 1995; Rudolph et al., 1997). Differences are likely to be related to the dose and duration of ethanol administration, strain and age of rats, and the brain region studied (for review, see Kumari and Ticku, 2000). It remains unclear whether the changes in NMDAR subunit expression are involved in the behavioral consequences of ethanol consumption. Furthermore, animal studies into the effects of chronic low-level ethanol intake on learning and memory and on underlying neuronal changes are limited.

Here, by performing studies in rats, we examined how a model of moderate drinking influences cognition. We defined moderate drinking according to the criteria used for humans, as producing non impairing blood alcohol levels <20 mM (Eckardt et al., 1998). Based on previous reports, we hypothesized that a low-level ethanol intake could enhance memory for visual and emotional stimuli and that this requires NMDAR function. To test this hypothesis, we administered low and higher amounts of ethanol to rats, both unmanipulated and after knocking down the NR1 subunit in the hippocampus using RNA interference. We investigated effects on memory by testing performance in the novel object recognition and inhibitory avoidance tasks. These tasks examine recognition and emotional memory, respectively and both are hippocampus and NMDAR dependent (Maren, 1999; Broadbent et al., 2004; de Lima et al., 2005). In contrast to the recognition memory, which involves large hippocampal networks, emotional memory is predominantly controlled by the ventral hippocampus and amygdala (Cahill et al., 1996; Kjelstrup et al., 2002); however, dorsal hippocampus also contributes (Melik et al., 2006). In addition, we examined here a few selected

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This work was supported by the New Zealand New Economy Research Fund and the National Institutes of Health. We thank Drs. Vincent Stewart, Kevin Little, Jeffrey Greenwood, and Garth Cooper for advice; Elizabeth Steinberg, Andrew Humphrey, and Bridget Ecker for technical assistance; and Joanna Stewart for help with revising statistical analysis.

Correspondence should be addressed to Matthew J. During, Molecular Virology, Immunology, and Medical Genetics, The Ohio State University, Columbus, OH 43210. E-mail: during.1@osu.edu.

AQ: P 10.1523/JNEUROSCI.2709-07.2007

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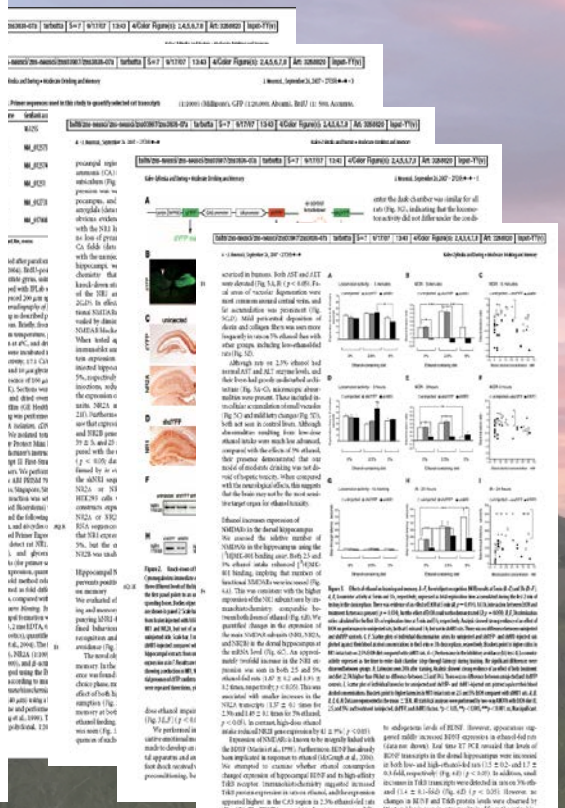
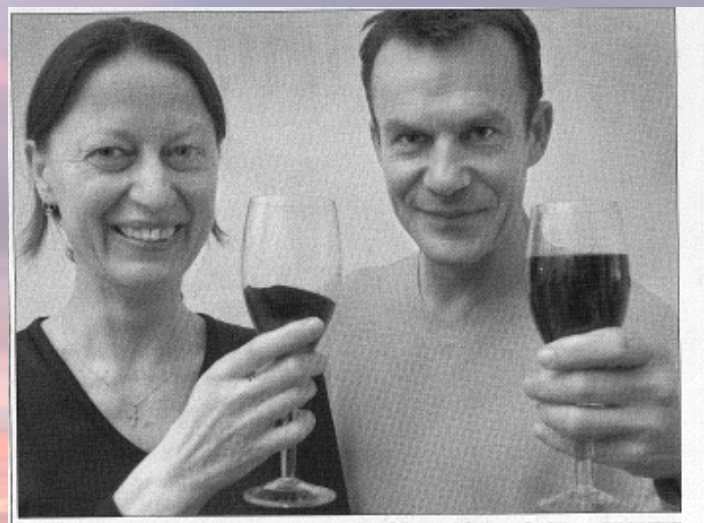




CHEERS: Dr Maggie Kalev and Professor Matt During hope their research will help find treatments for memory disorders. PETER J. PAUL, ESTUARY

Alcohol has memory hangover

Too much drinking reinforces negative memories, say university researchers

by Errol Elang
science reporter

A glass or two of wine a day may just make the mind a little bit sharper, but drinking to forget could make things worse.

A new Auckland University study found moderate levels of alcohol consumption could enhance memory.

But high levels of alcohol decrease the ability of new brain cells to develop and mature, and impair memory — except in memories of heightened emotion, when memory is increased.

"Low levels of alcohol promoted neutral memories, such as remembering objects," said researcher Dr Maggie Kalev.

"However, contrary to popular belief, we also found that excessive levels of alcohol enhanced memories of highly emotional stimuli, meaning the concept of 'drinking to forget' is not likely to be true. Our work suggests that heavy drinking actually reinforces negative memories."

The results of the study by Dr Kalev and Professor Matthew During are published in the latest *Journal of Neuroscience*.

Professor During said they were not entirely sure how moderate levels of alcohol aided in improving memory, but believed it was through its interaction with NMDA receptors in the brain.

"Alcohol interacts with that particular protein in the brain and disrupts and alters its function in a way that actually induces a little bit of stress in the brain."

It was a process similar to the strengthening of muscles by stressing them through exercise, he said.

But too much alcohol only enhanced negative memories, such as those involving some emotional trauma. Professor During believes this to be a control mechanism.

"Evolution's been going on for so long, why hasn't evolution made our memories better? It's probably because there's a little negative con-

DRINKING TO REMEMBER

A moderate level of alcohol consumption differs among individuals, but a guideline is:

- Two or three glasses a day for regular drinkers
- One or two glasses a day for occasional drinkers
- The driving limit as a good threshold.

The study, conducted on rats, holds an important key for unlocking future treatments for memory disorders such as Alzheimer's and other dementias, and improve recovery prospects for those who have had a stroke.

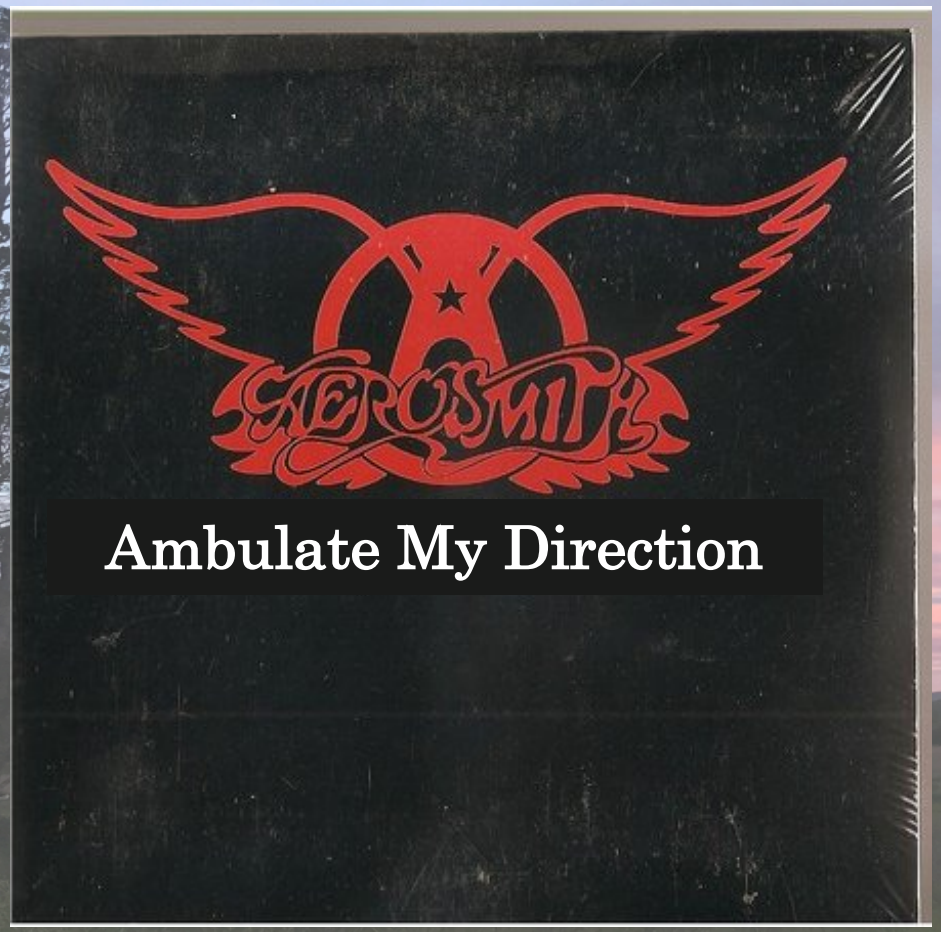
Dr Kalev and Professor During are now looking at therapies such as antibodies. "Pathways by which memory is laid down are unclear, but the NMDA receptor is critical in this process," she said.

Accessibility of Language

"Interpretation of water chemistry behaviour on the basis of these relationships presents a simplistic overview which reflects either an increase in concentration commensurate with a decrease in soil moisture levels in relation to soil water samples, or an increased dilution effect as a result of higher precipitation volumes diluting accumulated windblown dust."

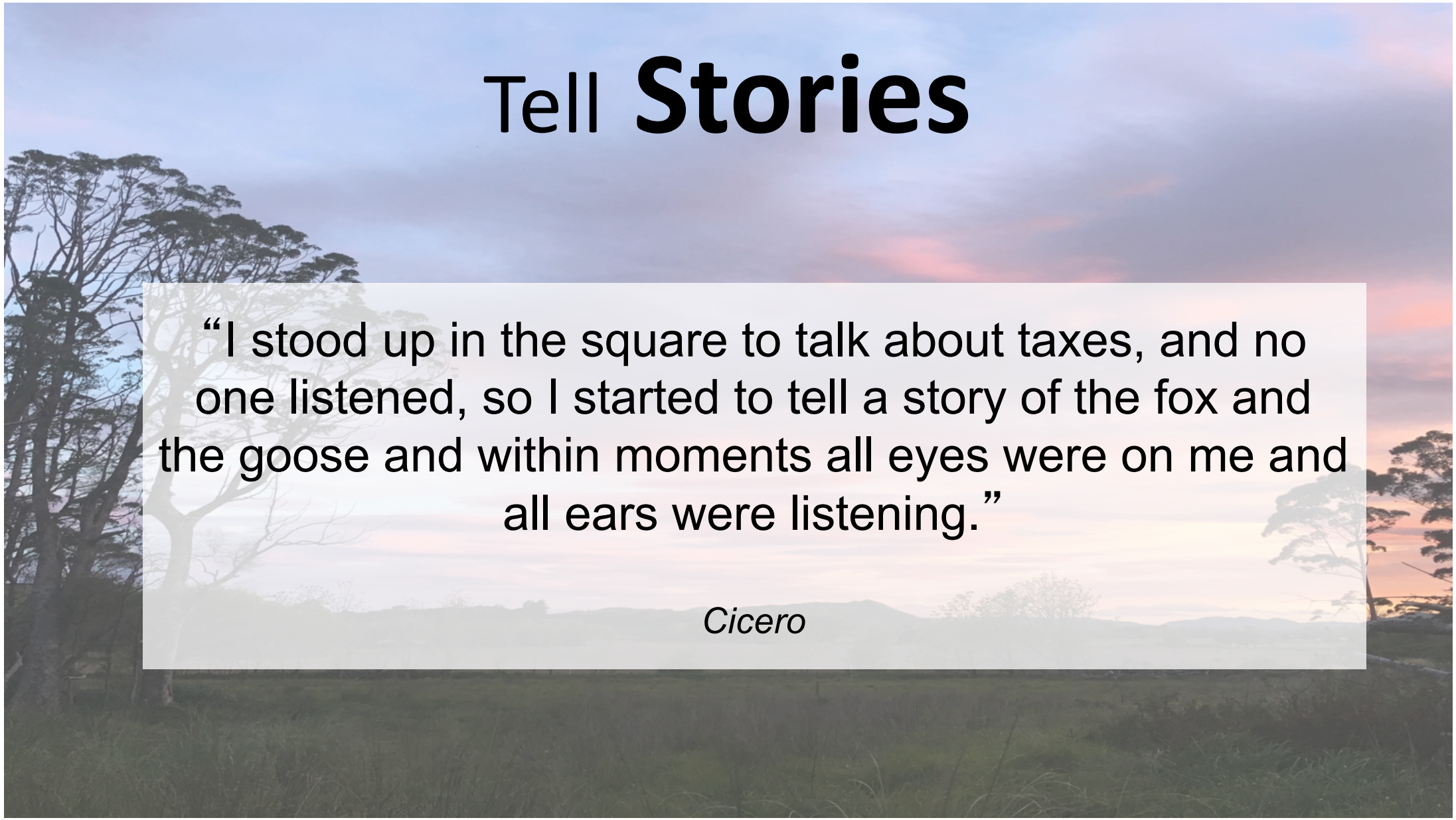
Source: An Editor's Farewell

Accessibility of **Language**



Source: Izil, T. (n.d). The power of simple words.

Keep the message simple



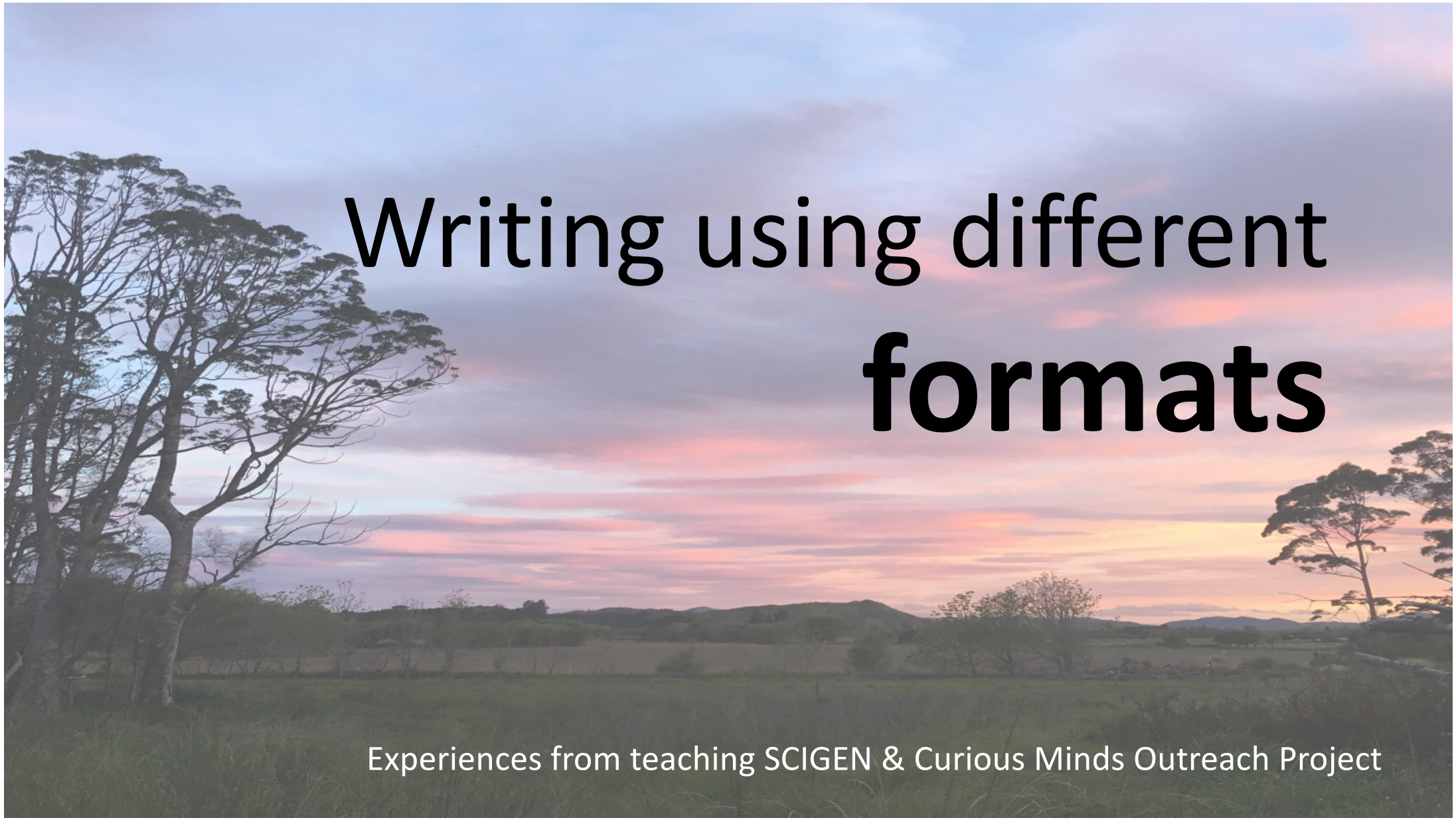
Tell **Stories**

"I stood up in the square to talk about taxes, and no one listened, so I started to tell a story of the fox and the goose and within moments all eyes were on me and all ears were listening."

Cicero

Simplicity & Story-telling


Building Student Confidence in Writing


Writing using different
formats
Experiences from teaching SCIGEN & Curious Minds Outreach Project

Pose a Question - Access, Analyse, Interpret literature

More Smart with Mozart

The Mozart Effect describes a phenomenon where the ability to accomplish a certain task can be enhanced when listening to music by the classical composer Mozart (Jenkins, 2001). It is suggested that this paradigm is especially evident in learning (Jaušovec, Jaušovec & Gerlič, 2006). Any element that enhances learning is particularly valuable to students, most of who are constantly required to learn new material quickly and accurately. By using published literature on the Mozart's Effect from the fields of neuroscience and psychology this work aims to reveal whether listening to Mozart's music enhances learning by students. While there are various kinds of information, behaviours and skills that can be learnt, studies indicate the Mozart Effect is explicitly apparent in the learning of spatial skills (Jaušovec, Jaušovec & Gerlič, 2006). A clinical trial shows students exposed to Mozart's music during the learning of spatial skills scored 8-9 spatial IQ points more in spatial reasoning tests than when they were not listening to Mozart while learning (Rauscher, Shaw & Ky, 1993). To learn spatial skills particular regions of the brain are activated (Jenkins, 2001). Studies show these brain regions are activated significantly further when listening to Mozart in comparison to both silence and other music types (Bodner, Muftuler & Shaw, 2001). However there is controversy involved with the Mozart Effect as nearly an equivalent amount of studies challenge the theory. The predominant rebuttal claims that the enhancement of learning is not specifically due to Mozart's music and instead can be an effect of listening to any upbeat and enjoyable music (Thompson, Schellenberg & Husain, 2001). Studies investigating this idea have not been consistent enough to determine that the Mozart Effect in learning is unapparent (Jones & Estell, 2007). In conclusion listening to Mozart's music doesn't enhance the learning of all knowledge, instead is specific to enhancing the learning of spatial skills by students, through additional activation of involved brain regions.

Key words: *Mozart's Effect, Learning, Students, Spatial skills*

Condensed mediums

e.g. An abstract

References

Bodner, M., Muftuler, L. T., & Shaw, G. L. (2001). FMRI study relevant to the Mozart effect: brain areas involved in spatial–temporal reasoning. *Neurological research*, 23(7), 683-690.

Jaušovec, N., Jaušovec, K., & Gerlič, I. (2006). The influence of Mozart's music on brain activity in the process of learning. *Clinical Neurophysiology*,117(12), 2703-2714.

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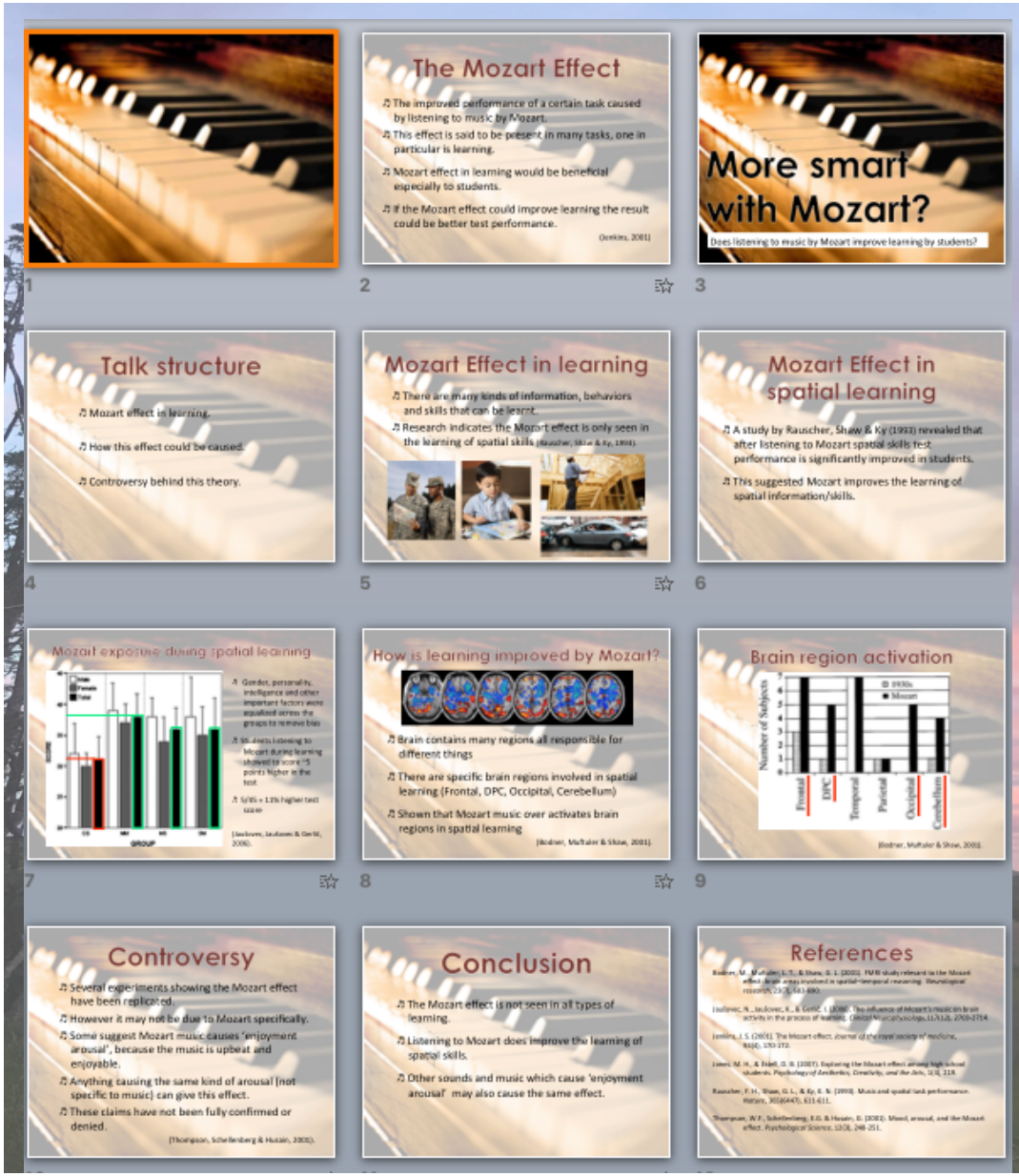
Jones, M. H., & Estell, D. B. (2007). Exploring the Mozart effect among high school students. *Psychology of Aesthetics, Creativity, and the Arts*, 1(4), 219.

Rauscher, F. H., Shaw, G. L., & Ky, K. N. (1993). Music and spatial task performance. *Nature*, 365(6447), 611-611.

Thompson, W.F., Schellenberg, E.G. & Husain, G. (2001). Mood, arousal, and the Mozart effect. *Psychological Science*, 12(3), 248-251.

Exemplar from SCIGEN 101



...and Communicate

Oral presentation & PowerPoint

Exemplar of slides for student talk from SCIGEN 101

Academic Poster

Balancing the visual & the written

Student poses question, presents defensible argument based on sound published evidence that is well referenced

MORE SMART WITH MOZART?

Does listening to music by Mozart improve learning by students?

Introduction

The Mozart effect is a phenomena which advocates that listening to music by Mozart while performing a certain task, improves ones ability to perform the task (1). This effect is said to be present in a range of tasks one in particular is the action learning. This "improvement" in learning refers to many things such as the speed of learning, the difficulty of learning or even the amount of detail able to be learnt. In general any improvement to learning is seen as a better result if one was tested on, or had to perform, what they had learnt (2). This would be hugely beneficial to students who are learning and being tested on a regular basis.

Mozart effect in spatial learning

Learning is a variable task, we can learn different kinds of information, behaviors and skills. Original studies indicated that the Mozart Effect is only apparent in the learning of spatial skills (2). These are skills that allow one to navigate objects within space (see Fig.1).

Fig 1. Examples of tasks that require use of spatial skills. Engineering or architecture of a house, reading a map, solving a puzzle.

Listening to Mozart while learning has been shown to give significantly better performance in spatial skills tests taken by students (See Fig 2). These findings suggest that Mozart improves the learning of spatial information which allow students to get better test scores (3).

Fig 2. Average number of correct responses given in spatial test by respondents (phycology students) of four groups. Each group varied in exposure to music by Mozart when learning the same spatial skills (SM exposed during learning, MS exposed prior to learning, MM exposed prior and during, CG never exposed). CG group (blue) showed significantly lower score in comparison to all groups exposed to Mozart (Orange). A 5 point difference in average score is seen between CG and MM, that is an 11% greater test score for the full Mozart exposed group. This difference is suggested to be due to an effect by the Music as other variable factors were equalized i.e. no gender, personality, IQ bias. (n=56).

Sourced data from data in (4)

Biology behind the Mozart effect

In order to confirm that Mozart is improving learning and also understand the mechanism behind how it acts, investigations looked at where learning occurs –The brain (4). To learn spatial skills particular regions of the brain are activated. Studies show these brain regions are activated significantly when listening to Mozart (See Fig.3). The activation of these regions by Mozart in addition to the activation occurring naturally when undertaking spatial learning is suggested to give an 'over activation' of these regions which cause the improvement in spatial learning (4).

1930s Piano Mozart Beethoven

Fig 3. fMRI scans at 4 angles of the brain in 1 individual. Red and yellow highlight areas of brain activation in subject during listening to 3 music types; 1930s piano, Mozart and Beethoven. All three show overlap of activation however Mozart induced significant additional areas (circled orange) which match known regions associated with spatial learning (4).

Controversy

Arguments are present around whether the Mozart effect may not be specific to Mozart (5). Some suggests Mozart causes 'enjoyment arousal', a brain stimulation caused by upbeat and enjoyable stimuli such as Mozart music. Hence anything causing the same kind of arousal (not specific to music) can give this effect. However studies do not consistently show Mozart causing all components of enjoyment arousal e.g. mood heightening not always seen (5).

Conclusion and Outcomes

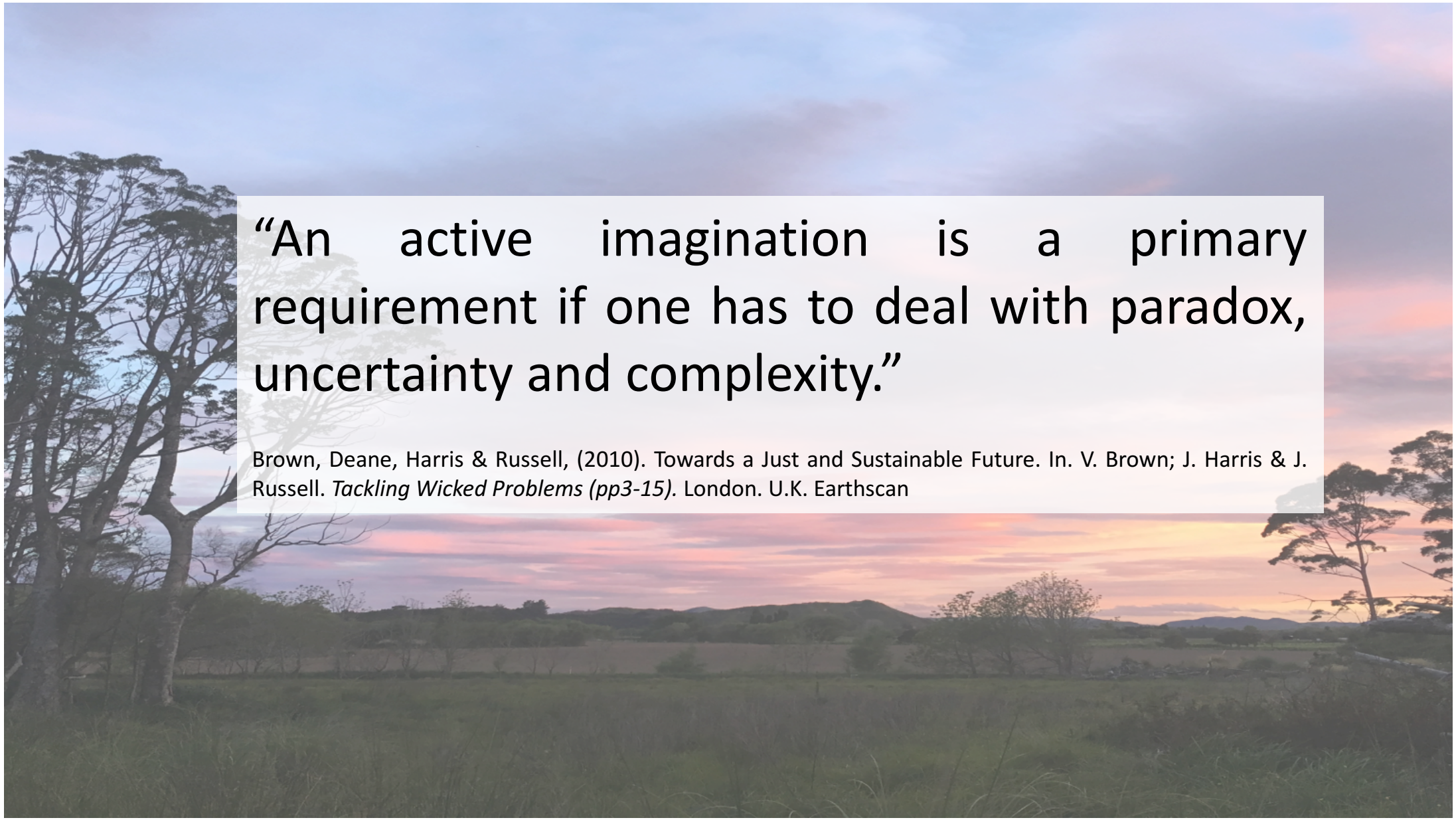
- **Listening to Mozart's music doesn't improve the learning of all knowledge, instead can only improve the learning of spatial skills by students.**
- This effect likely occurs through over activation of brain regions involved in spatial learning. Other stimuli which cause 'enjoyment arousal' may also cause similar effects.
- Quantitative data on Mozart music causing enjoyment arousal would have helped further understand the mechanisms through which the effect occurs.
- Now it can be asked how the Mozart effect's improvement in learning compares to other techniques known to help in learning spatial skills.

References

1. Jenkins, J. S. (2001). The Mozart effect. *Journal of the royal society of medicine*, 94(4), 170-172. **2. Rauscher**, F. H., Shaw, G. L., & Ky, K. N. (1993). Music and spatial task performance. Nature, 365(6447), 611-611 **3. Jaušovec,** N., Jaušovec, K., & Gerlič, I. (2006). The influence of Mozart's music on brain activity in the process of learning. *Clinical Neurophysiology*,117(12), 2703-2714. **4. Bodner,** M., Muftuler, L. T., & Shaw, G. L. (2001). FMRI study relevant to the Mozart effect: brain areas involved in spatial–temporal reasoning. *Neurological research*, 23(7), 683-690. **5. Thompson**, W.F., Schellenberg, E.G. & Husain, G. (2001). Mood, arousal, and the Mozart effect. Psychological Science, 12(3), 248-251.

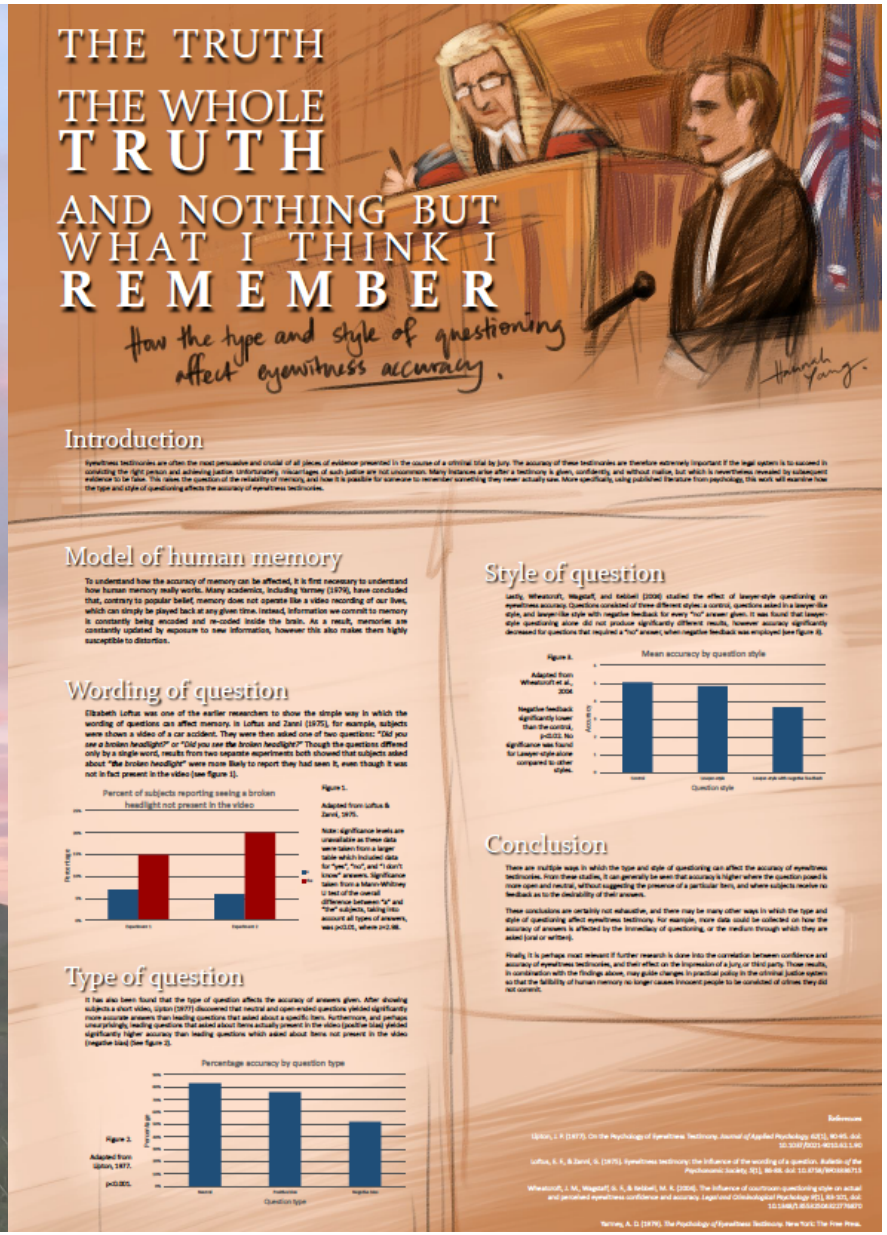
Exemplar of student poster from SCIGEN 101


Assessment to expose the imagination


“An active imagination is a primary requirement if one has to deal with paradox, uncertainty and complexity.”
Brown, Deane, Harris & Russell, (2010). Towards a Just and Sustainable Future. In. V. Brown; J. Harris & J. Russell. *Tackling Wicked Problems (pp3-15).* London. U.K. Earthscan

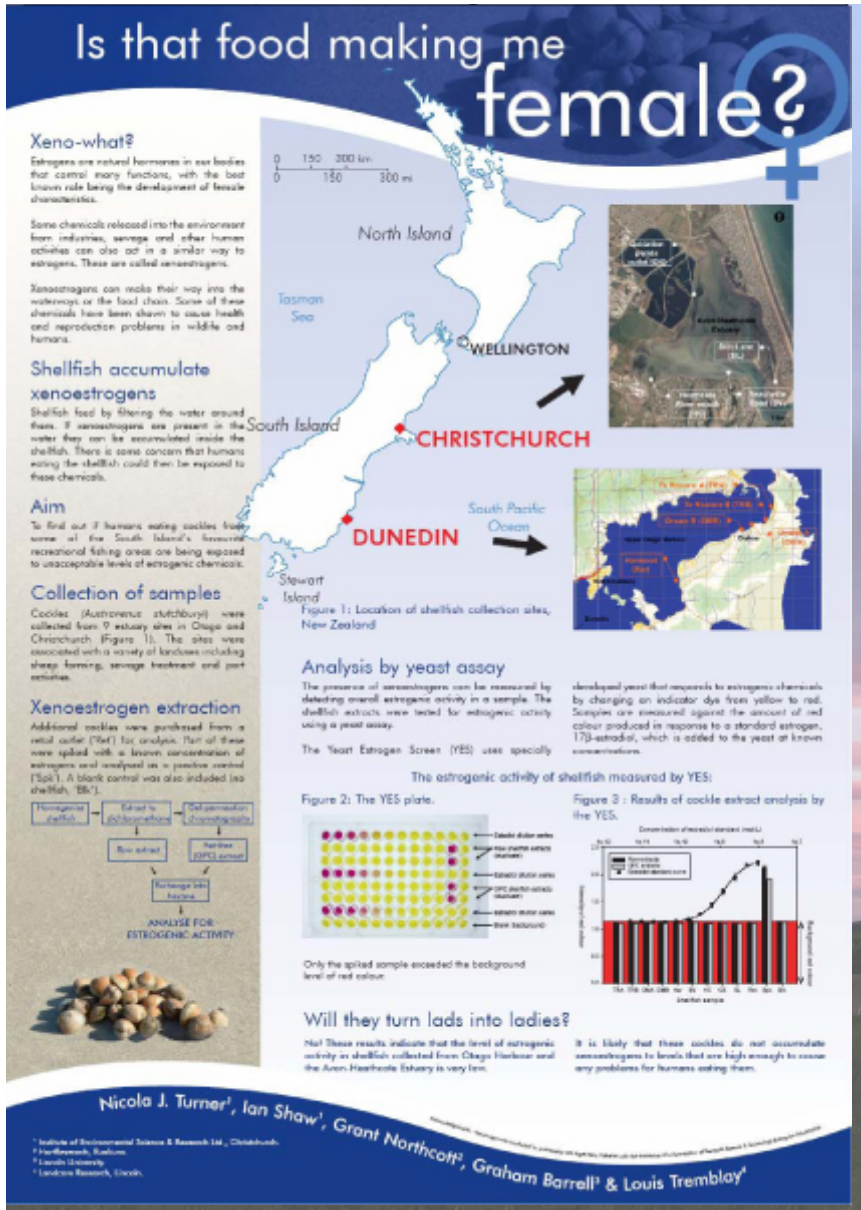
Creative Assessment

Exemplar of student poster from SCIGEN 101

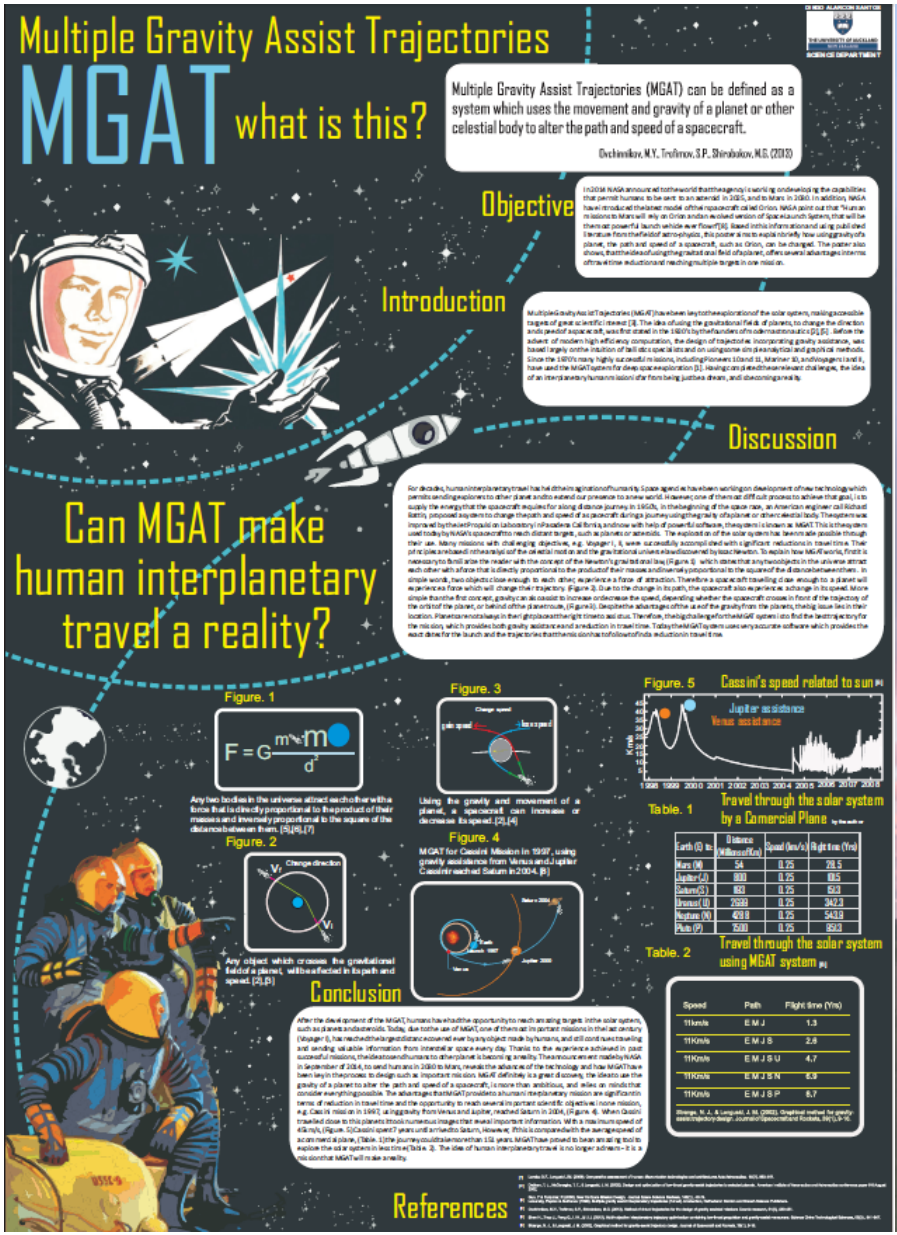


Creativity can draw in an audience…

Exemplar of student poster from SCIGEN 101


Is that food making me female?
Xeno-what?
Estrogens are natural hormones in our bodies that control many functions, with the best known role being the development of female characteristics.
Some chemicals released into the environment from industries, sewage and other human activities can also act in a similar way to estrogens. These are called xenoestrogens.
Xenoestrogens can make their way into the waterways or the food chain. Some of these chemicals have been shown to cause health and reproduction problems in wildlife and humans.
Shellfish accumulate xenoestrogens
Shellfish feed by filtering the water around them. If xenoestrogens are present in the water they can be accumulated inside the shellfish. There is some concern that humans eating the shellfish could then be exposed to these chemicals.
Aim
To find out if humans eating cockles from some of the South Island's favourite recreational fishing areas are being exposed to unacceptable levels of estrogenic chemicals.
Collection of samples
Cockles (Austrovenus stutchbury) were collected from 9 estuary sites in Otago and Christchurch (Figure 1). The sites were associated with a variety of landuses including sheep farming, sewage treatment and port activities.
Xenoestrogen extraction
Additional cockles were purchased from a retail outlet ('Net') for analysis. Part of these were spiked with a known concentration of estrogens and analysed as a positive control ('Spk'). A blank control was also included (no shellfish, 'Blk').
ANALYSE FOR ESTROGENIC ACTIVITY
North Island
Tasman Sea
WELLINGTON
South Island
CHRISTCHURCH
South Pacific Ocean
DUNEDIN
Stewart Island
Figure 1: Location of shellfish collection sites, New Zealand
Analysis by yeast assay
The presence of xenoestrogens can be measured by detecting overall estrogenic activity in a sample. The shellfish extracts were tested for estrogenic activity using a yeast assay.
The Yeast Estrogen Screen (YES) uses specially
The estrogenic activity of shellfish measured by YES:
Figure 2: The YES plate.
Figure 3 : Results of cockle extract analysis by the YES.
Only the spiked sample exceeded the background level of red colour.
Will they turn lads into ladies?
No! These results indicate that the level of estrogenic activity in shellfish collected from Otago Harbour and the Avon-Heathcote Estuary is very low.
It is likely that these cockles do not accumulate xenoestrogens to levels that are high enough to cause any problems for humans eating them.
Nicola J. Turner[1], Ian Shaw[1], Grant Northcott[2], Graham Barrell[3] & Louis Tremblay[4]

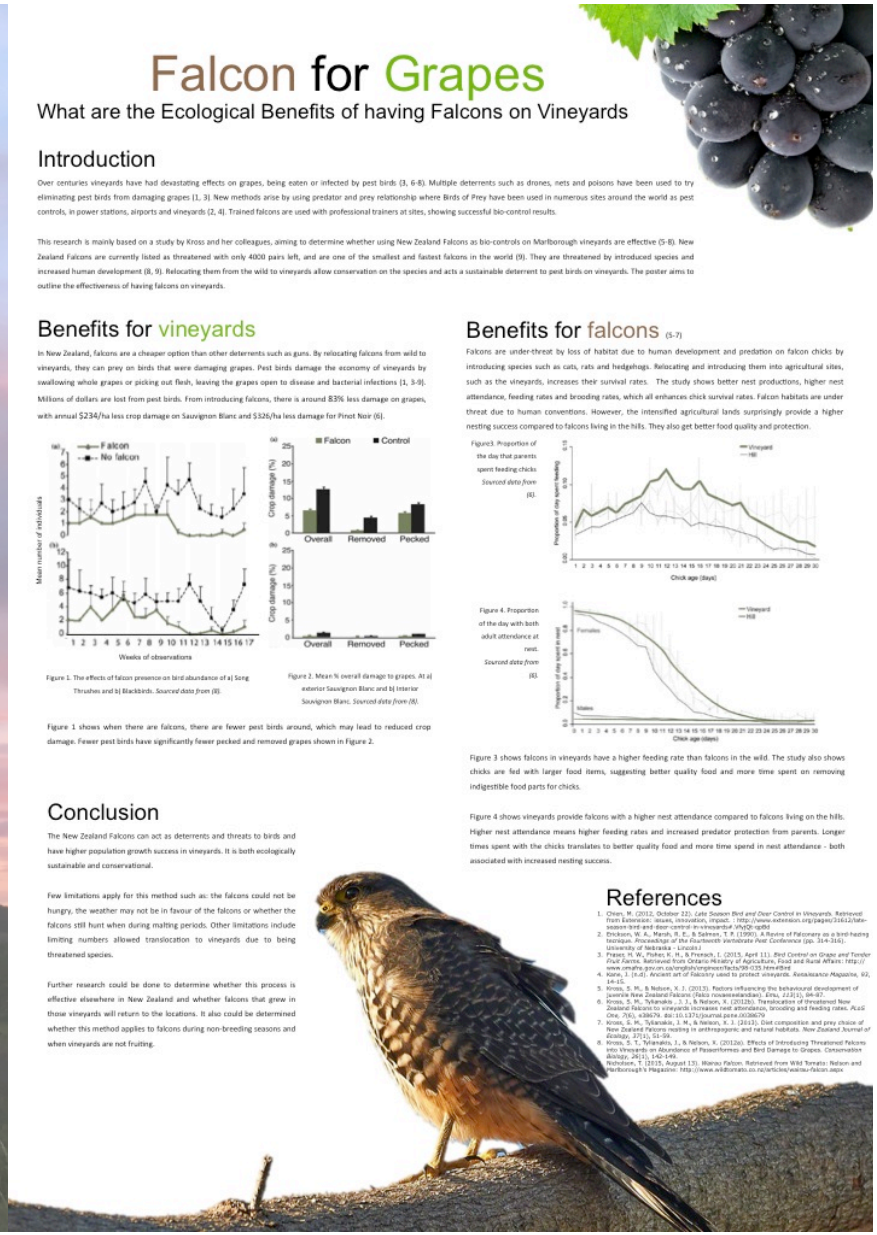

…and challenge them to think



Imagining across disciplines…

Physics & Ecology

Exemplars of student posters from SCIGEN 101



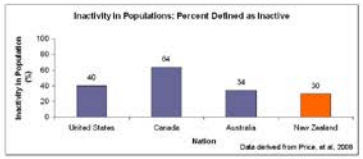
INTRODUCTION

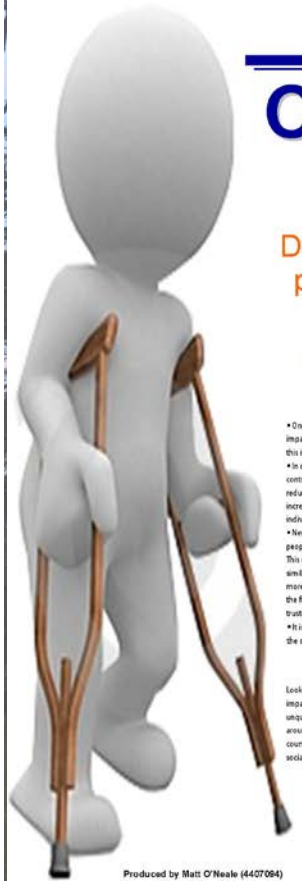
Since its inception in April of 1974, New Zealand's public accident compensation scheme, the Accident Compensation Corporation, or "ACC", has come to be regarded as an iconic national institution and a groundbreaking world first. But can this reputation be justified? This poster purports to briefly examine whether ACC should continue today in light of the economic and social benefits it provides to New Zealand.

Alternatives to ACC include either an uninhibited right to sue in response to injury, observable in the USA and UK, or a partial public scheme. Partial schemes, such as in Australia and Canada, provide assistance to injuries suffered in select circumstances, while allowing individuals to sue where government assistance is not available.

ECONOMIC BENEFITS

- One way that the economic benefits ACC delivers to New Zealand can be quantified is the reduced public healthcare costs that result from an active population. ACC provides financial assistance in the event of injury in sport, unlike in countries with no public assistance (USA, UK) or partial public schemes (Canada, Australia).
- A recent Australian report by the Standing Committee on Recreation and Sport found that increasing costs for participants in physical activity has a negative correlation with participation in the specified activity (Price, et al, 2008).
- The statistical methods used and definition of inactivity between Canada and New Zealand are not the same and so are not directly comparable.
- Conversely, the USA and Australia used roughly comparable indicators and data collection methods as New Zealand. It is fair then to compare these, particularly with Australia which has the greatest similarity in cultural, socio-economic and environmental factors which could impact on the results.
- It is fair to assume that the difference in inactivity between Australia and New Zealand can be attributed to the positive impact of ACC in encouraging participation in sports through creating a lower financial burden.
- Comparing population inactivity with Australia suggests New Zealand saves $26 million annually through the avoidance of health costs associated with inactivity (Price, et al, 2008).
- Sport and Recreation New Zealand conservatively estimates the total cost of physical inactivity to be $196 Million per annum, a figure which could double if New Zealand's inactivity rate (30%) increased to Canada's (64%) (Price, et al, 2008).
- Though inactivity is only one way to measure economic benefits, ACC appears to contribute favourably in this regard.



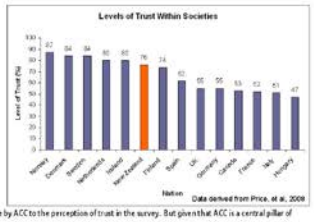


Compensate or Litigate?

Do the economic and social benefits of the public accident compensation scheme in New Zealand justify retaining it?

SOCIAL BENEFITS

- One perspective from which to gauge the benefits of ACC is its impact on social cohesion and loneliness. An important indicator of this is the level of trust present in a society.
- In covering all people for injury irrespective of fault or income, ACC contributes to a sense of fairness in society. This can translate into a reduction in mistrust and division between societal groups, increased tolerance, and lower rates of withdrawal of marginalised individuals from society (Price, et al, 2008).
- New Zealand's 2006 Quality of Life Survey found that 76% of people believed that people could be trusted (Price, et al, 2008). This compares favourably against Scandinavian countries with similar schemes. It also outperforms many OECD countries with more limited or non-existent public compensation schemes, such as the finding that 55% of people in the UK thought others could be trusted – a nation with no public compensation (Price, et al, 2008).
- It is impossible to attribute a particular share of the contribution made by ACC to the perception of trust in the survey. But given that ACC is a central pillar of the structure of New Zealand society, and that it promotes fairness and equality, we can assume the scheme's role is not marginal.



CONCLUSION

Looking briefly at economic and social benefits attributable to ACC, the scheme performs favourably compared with those of other nations. Considering ACC's impact on inactivity reveals a significant financial contribution through alleviation of the costs associated with healthcare. Socially, ACC has a positive though unquantifiable influence on increasing levels of trust within society. It would be useful to consider a wider variety of economic and social factors revolving around ACC. This would more strongly establish the extent of its bearing on New Zealand. As it appears a success here, it would be interesting to inquire why countries such as the USA and UK do not utilise this scheme model. However, based on the data presented it is reasonable to conclude that the economic and social benefits of the scheme do justify its continuance in New Zealand.

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Produced by Matt O'Neale (4407084)

Imagining across disciplines…

Law & Marketing

Exemplars of student posters from SCIGEN 101

Introduction

Touching, tasting, smelling, hearing and seeing are the five senses that we use in order to perceive the world we live in. Of these five senses, sight is the one that we use the most. The human eye sees colour before the brain recognises imagery in the form of shapes, symbols, words or other visual elements. As a marketing tool, colour can be a subliminally persuasive force, inducing positive or negative feelings with a brand and aiding the development of a brands identity.

The History of Colour Theory

The history of colour theory spans over several centuries and since ancient times, colour theorists have developed ideas and interpretations of colour relationships. Attempts to formalise and recognise order began with Leonardo da Vinci and have progressed ever since. Da Vinci noted that certain colours intensify each other, discovering the idea of complementary colours.

The first colour wheel was invented by Britain's Sir Isaac Newton who split white light into red, orange, yellow, green, blue, indigo and violet beams, then joined the two ends of the spectrum to form a circle showing the natural progression of colours.

More than a century later, while studying the psychological effects of colour, Germany's famed poet and playwright Johann Wolfgang van Goethe furthered colour theory. Goethe divided all colours into two groups. On the plus side he put the warm colours (red, orange and yellow), and on the minus side the cool colours (green, blue and violet). He noted that colours on the plus side produced excitement in viewers, while he associated the minus side colours with unsettled feelings. In 1810 Goethe published The Theory of Colour, in which he disagreed with Newton's conclusions. He believed that a scientific approach alone did not enable someone to fully understand colour, whereas Goethe's observations of the human perception of colour, rather than just the physics of light, allowed him to discover important aspects of colour theory, including a colours relationship to emotion.

How do consumers perceive colour?

More than just a visual phenomenon, colour distinguishes a brands personality, draws attention to its characteristics and enables it to stand apart from competitors within the chaotic retail environment we experience today.

Studies by marketing psychologists have found that a lasting impression is made within sixty seconds of first sighting the product and that colour accounts for over two thirds of the audience's reaction to the brand. This illustrates the power that colour can have in deciding the success or failure of a brand. Research by the University of Loyola found that the use of colour increases a consumer's brand awareness by 80 percent, and has been shown to significantly help memory recall, an important element to brand recognition. Countless consumer products are now recognised by the colour of their brand, such as Coca-Cola's cherry red and Cadbury's velvety purple. This is because colour has the ability to capture attention, relax or irritate the eyes.

If you understand the way people commonly perceive different colours, you can then use them effectively to evoke a certain response from the consumer, and create an appropriate style and personality for any brand.

The Power of Colour

How can colour affect the success of a brand?

Common colour associations

Colour communicates with consumers psychologically through common colour associations developed over time, and it is this association with colour that determines an individual's perception to a product. In general warm colours such as red, orange or yellow send an uplifting and energetic message, instilling excitement in the viewer, while cooler colours such as dark blue and green symbolise truth and loyalty, and are used to create a calmer, more reserved association.

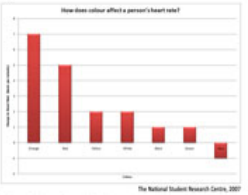
It is no accident that McDonalds use yellow and red, nor that the Bank of New Zealand uses blue. Warmer colours, like those seen in sale signs or in the brand for many fast-food restaurants, imply danger and urgency, encourage impulse buying and stimulate hunger, whereas the use of cooler colours in a brand is common with banks, dentists, medical centres and hospitals as customers feel safe and secure.

How colour affects the human heart rate

A colour will elicit an emotional and physical response. The common associations that we have developed are what affect how we feel psychologically, known as the emotional response. How our body physically reacts to the colour used in the brand is called the physical response, and it is this that affects the human heart rate. Research undertaken by the National Student Research Centre is summarised in Figure 1.1, illustrating the effects certain colours have on consumers.

When exposed to the colour orange, the heart rate increases dramatically, jumping from 80 to 87 beats per minute. The colour red had a very similar effect, increasing the heart rate by 5 beats per minute. These warm colours, as defined by Goethe, have a positive, exciting and stimulating effect on the viewer. In contrast, green (one of the cooler colours) does not affect the human heart rate significantly, only showing a change of one beat per minute. This supports the idea that the colour green makes consumers feel stable and have trust in the brand. When exposed to the colour blue, the heart rate decreased slightly. This illustrates the relaxation a consumer feels when they see a brand that incorporates this colour.

Figure 1.1:



NB: The standing heart rate of an adult is 80 beats per minute

Conclusion

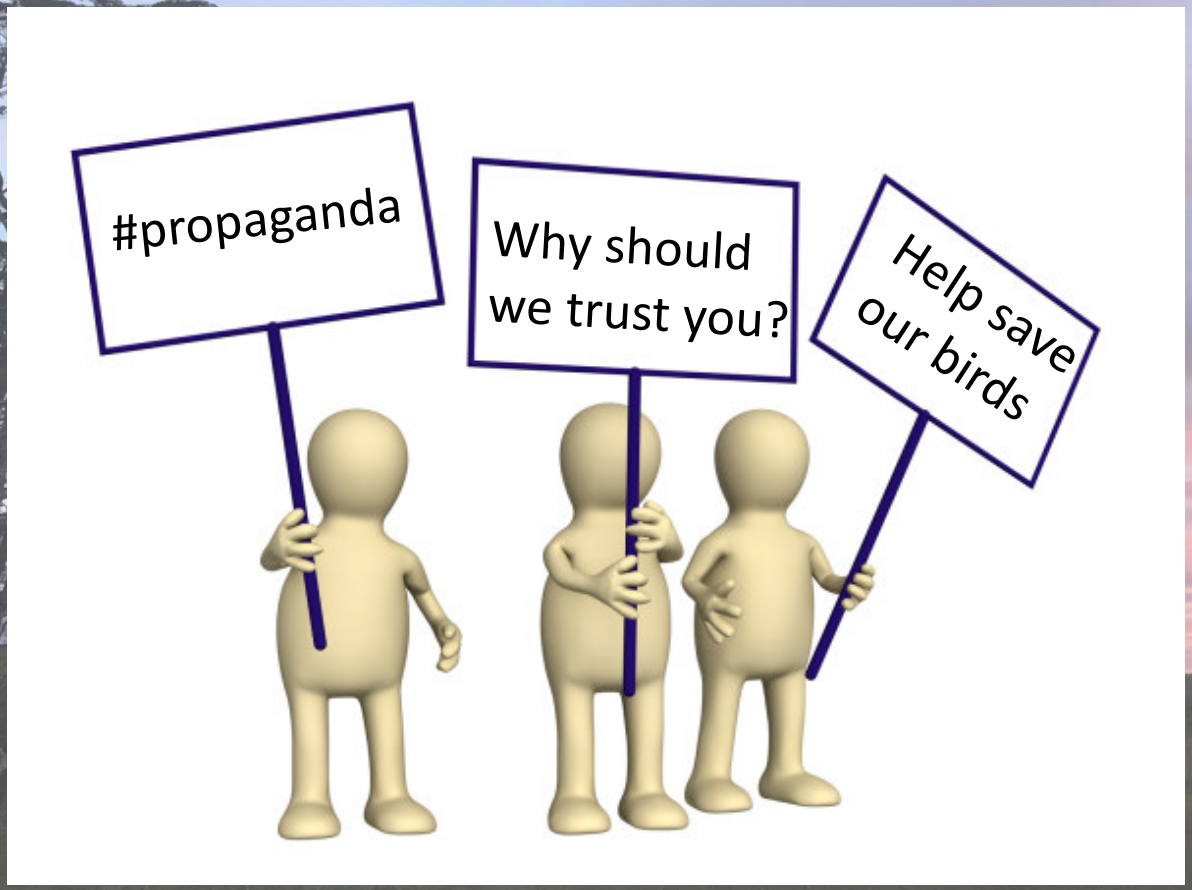
These findings offer support to the idea that colour impressions and decisions by consumers are both quick and enduring, proving that decisions about colour are crucial to the overall success of the brand. The use of the wrong colours could be a costly mistake.


Experiences to expose the imagination

On Campus…

Scenarios - class **dialogue** & **reflection**

Role Playing... learning about...



Lived Experience vs

Evidence-based research

Community voice is not homogenous

Some student placards from a 'mock' community meeting about 1080 pest control…

Off Campus…

Real-World Learning


Blogs & Reflections expose the imagination

Student Blog following a field trip to the Titirangi Village Market

"To me, I see most people that come to markets as hard working people trading their craftsmanship and products to make a living. However, watching that lady make that kids day kind of made me realise what my lecturer meant to "experience the community". And it wasn't just selling stuff to kids for an affordable price."

Extract from a student blog 2017, recalling an experience where a stall owner sold a piece of kauri gum to a small child for much less than the marked price because the child wanted the item but did not have enough money

Student Blog...Imagining community activism

"You march among the protestors up Queen St. Your voice thunders in synchronisation with the masses "We - demand – to let our Kauri stand!" There are no strangers in this crowd, there is no "I" or "you"; there is only "Us". Together the collective identity is a manifestation of the deeply spiritual Kauri roots which permeate the soil of the Waitakere Ranges. You are speaking for the trees, who cannot speak for themselves. If Dr Seuss' Lorax could see you, he would bow his head from the footpath as the troop stormed Queen St. Beneath his breath he would murmur his renowned philosophical wisdom;

'Unless someone like you, cares a whole awful lot.
Nothing is going to get better. It's not' ."

Extract from a student blog 2017, inspired by a talk from a community activist on a fieldtrip to Titirangi to investigate the struggle to save kauri

…and in **Outreach**

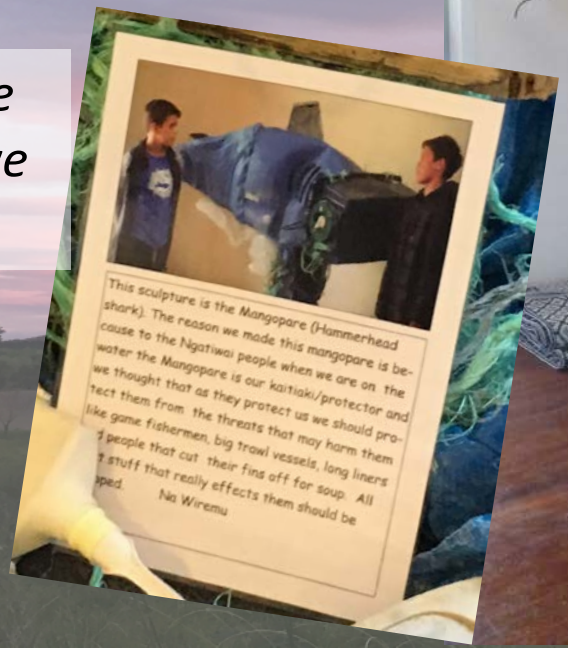
Curious Minds ‘Sea Science’ Project

Sea Science was a partnership between School of Environment social and physical scientists and the primary schools of Aotea Great Barrier Island to creatively unpack beach clean-up data.

Science Report Writing…

‘Mangopare’-
Hammerhead shark

The protector of the island. What are we doing to protect it?


This sculpture is the Mangopare (Hammerhead shark). The reason we made this mangopare is because to the Ngatiwai people when we are on the water the Mangopare is our kaitiaki/protector and we thought that as they protect us we should protect them from the threats that may harm them like game fishermen, big trawl vessels, long liners people that cut their fins off for soup. All stuff that really effects them should be pped.

Nia Wiremu

This sculpture was made entirely from beach debris

Collective Report
by Te Kura o Okiwi

Report Writing...

‘Footprints’

A statement on the health & safety of shards of glass found on the beaches.

6 year old student – ‘Sea Science’ Curious Minds project

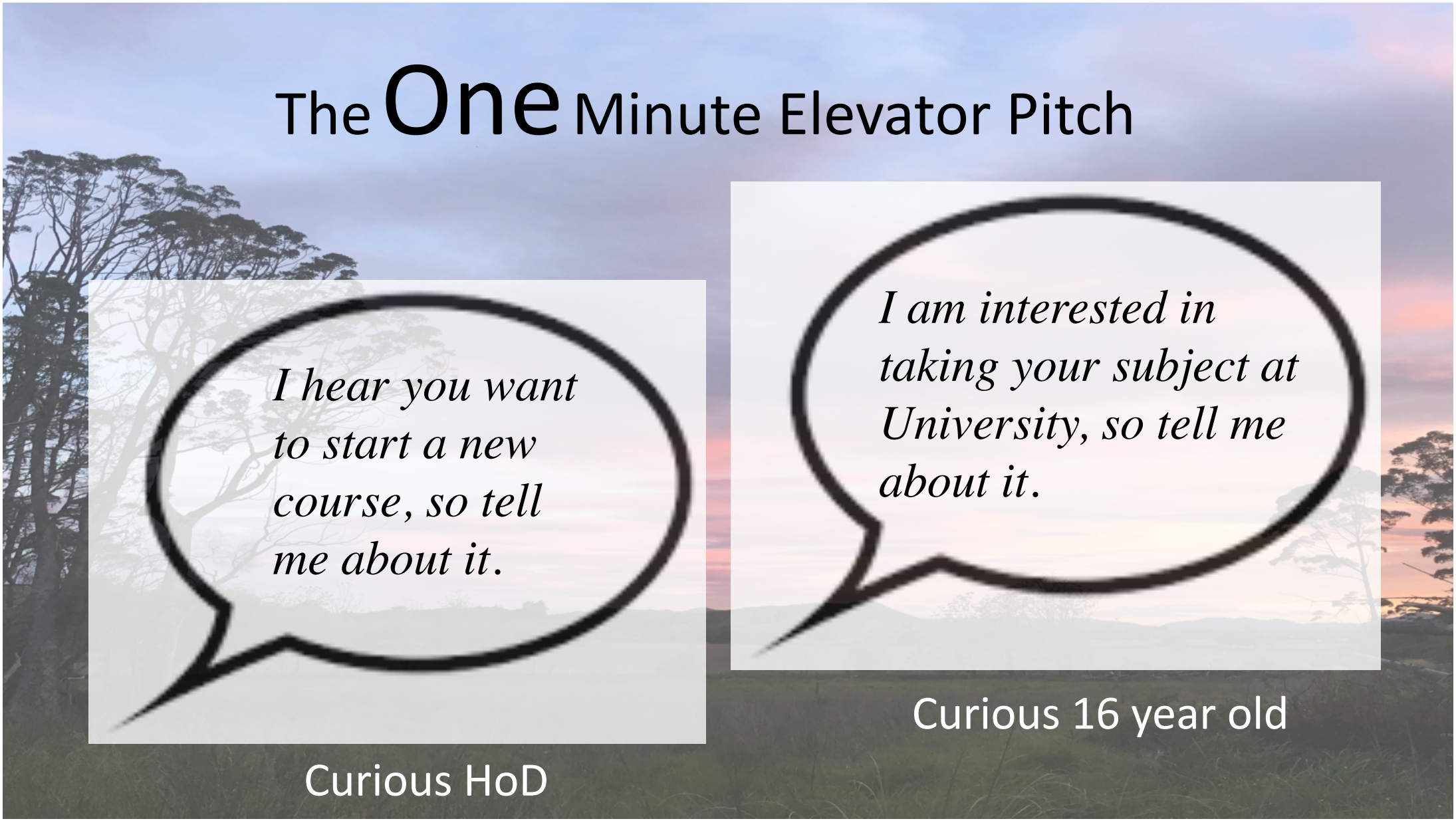
This sculpture was made entirely from beach debris


Where to start…


Start with the **WHY**
WHY
HOW
WHAT
It's the 'Why' that drives our passion.
Inspired by: Simon Sinek's *Start with why*


Interactive Group
Activity

The One Minute Elevator Pitch




Approach
Audience
Start with the why

Take-away message: overcome these Challenges

1 Challenge of **complexity**

2 Challenge to be **heard**

3 Challenge of **hearts & minds**